Education Outcome in Westchester County; The Role of Socioeconomic status and School Funding

by
Xu Tan

Submitted to the Department of Economics
School of Natural and Social Sciences
In partial fulfillment of the requirements
For the degree of Bachelor of Arts

Purchase College
State University of New York

12/17/2021

First Reader: Cedric Ceulemans
Second Reader: Sanford Ikeda

Abstract

This paper aims to examine the factors contributing to the educational gap between high and low-income families in Westchester County, New York. Using math and reading test scores of total 115 elementary schools in 26 out of 43 public school districts at Westchester County, I explore the relationship between students' performances and financial and educational resources of individual schools. I also analyze the relationship between student's performances and their parental socioeconomic status. The results show that the socioeconomic status is the most relevant predictor for education outcome. In addition, income segregation between school districts has also contributed to the racial achievement gap. Results show that Hispanic families are more likely to live in a district with concentrated poverty and underfunded schools.

Contents

Introduction

Education is a necessity for society, it plays an important role in improving living standards, freedom, and aspiration to create values and innovate in our lives. Education gives upcoming generations knowledge of the past and a platform for success. According to the United States Department of Education, low-income students who live in underdeveloped areas and attend ineffective elementary and secondary schools have lower rates of college participation. Compared to economically disadvantaged districts, higher-performing school districts are often well funded with facility and technology, well-resourced in a variety of effective curriculums, well connected in funding and programs, and staffed with well-trained highly educated teachers.

This research is trying to address two main questions: (1) How does funding for schools' impact educational achievement? (2) Why is it that people of color are disproportionately more likely to have worse educational outcomes than their white and Asian counterparts? This research approaches the above questions in several ways. First, examining academic literatures on factors impacting achievement gap between low- and high-income students. Second, use available data on Westchester County to conduct empirical research and analysis.

In the literature review sections, I referenced academic journals and books on historical events, government policies, and studies in education disparity related to race and income. Past research has found factors like wealth inequality, land-use restriction, school funding, teacher's experience, mothers' wellbeing, psychological burden and stereotypes associated with poverty has significant impacts on students' education outcome. In the quantitative analysis section, I will be examining Westchester district data collected from the National Center for Education Statistics, New York State Open Budget, and the US Census. Using available data to perform correlation and regression analysis on factors that might contributes to achievement gaps. Dependent variables would be consisting of 3rd grade ELA and math and collected through New York State Education Department Assessment Data. Datasets include 26 public school districts, 115 elementary schools, 8095 students, and 169 variables, such as local states funding and socioeconomic status, within Westchester between the years 2017-2019.

Section III presents the key findings in variables contribute to education inequality. Section IV presents collection of data and testing mythology. Section V discusses key results from regression model testing. And section VI concludes possible limitation in section V and IV. Extra detailed model regression is available in Section IX Appendix.

Literature Review

Housing discrimination

Rising income inequality has contributed to the rise in income segregation, it is deeply ingrained into the locally-controlled public school system where students of low economic status are left behind. In addition, the lack of government intervention to integrate families with different economic statuses breeds an economic barrier to education equality. This literature review will focus on historical discriminatory housing policy and how it contributes to current income inequality and education inequality.

In the United States, homeownership is a critical component of building generational wealth, it is considered an asset to pass down to children or grandchildren. However, after the abolishment of slavery, deep-rooted, troubling history of biases and oppression continued to exist for people of color. The creation of exclusionary zoning laws, racial covenants, and redlining were used to prevent racial and ethnic minorities from integrating into middle and upper-class neighborhoods. These policies have generational effects on the social mobility of impoverished Black families due to the inability to accumulate wealth via homeownership in a desirable neighborhood.

The practice of redlining and racial covenant comes from the development of the New Deal. They are meant to provide mortgage relief to American homeowners and encourage the construction of new homes and repair existing cities and neighborhoods. However, this state and federal-sponsored policy frequently demolished integrated neighborhoods to create segregated communities. Rulings such as *Corrigan v. Buckley (1926),* validated the legality for the practice of racially restrictive covenants that made selling a house to a Black family a void contract. Soon after the ruling, racial covenants became a legal justification for developers and neighborhood members to choose whom to sell property to. This practice restricts people of color from having a chance to find a home in a well-invested neighborhood.

Redlining was a credit-rationing policy used by the lender and the bank to target specific neighborhoods or communities. It kept track of groups and areas that were rejected for loans and other types of investment and aid on a discriminatory basis. Home Owners Loan Corporation, a government agency that kept track of the credit rating of thousands of cities and suburban areas around the nation, created area description maps that split up neighborhoods and communities into green, blue, yellow, and red groups. As a result, neighborhoods received grades: "A" or "B" (represented by green and blue respectively) indicated a minimal risk for bank and mortgage lenders; grades "C" or "D" (yellow and red respectively) indicated

working-class and hazardous neighborhoods. Because of redlining, economically disadvantaged Black Americans and other minority groups who lived in heavy industrial towns were considered high-risk for the investors; they could not become a homeowner without purchasing a house or apartment in full.

Due to the legacy of racial covenant and redlining, Black Americans have the lowest homeownership with the highest concentration for poverty compared to other racial groups. According to the Survey of Consumer Finance published by the Federal Reserve, the median net worth for homeowners in 2019 was $255,000, compared to $6,300 for renters. However, Black Americans who missed out on becoming homeowners were left out of home equity appreciation. This can be explained by the staggering disparity in 2019 consumer finance which shows Black median net worth were $24,100 compared to $188,200 for the Whites. Statistics show that Black Americans received less help from families to finance down payments or were less likely to generate down payments to become homeowners, this highlights the difficulty for Black Americans to accumulate generational wealth.

Not In My Back Yard

Exclusionary zoning laws place restrictions on land use and the type of homes built in a particular neighborhood. High-income communities try to protect their home value by setting restrictions on minimum land sizes to limit the housing supply in their communities (Ikeda, 2015) through lobbying and protest. In addition, they would often use tactics such as preserving the environment and quality of life to block new development around the community. This form of local pressure is called “Not In My Back Yard” (NIMBY).

Lens (2016) found that land-use restrictions affiliated with local pressure experienced higher-income segregation; on the other hand, land-use restrictions linked to state control are connected to lower-income segregation. Many affluent communities used exclusionary zoning laws to limit population density in order to further increase housing costs and exclude less affluent residents from entering their communities.

NIMBY neighborhoods have higher rent and strict zoning policy for population growth contrastingly poorer town has more efficient land-use and low cost of renting compare to similar size apartment or house in wealthy neighborhoods. The differences in rent are associate with neighborhood amenities premium such as schools and park (Beracha, 2018). The property value associated with better school quality also experiences greater liquidity and tempered price volatility (Beracha, 2018); oppositely, increasing school

risks (uncertainty of the quality, or quality school assignment) is also associated with home price reductions (Turnbull, 2018).

The greater supply of dwelling units allows for affordable housing because of an increase in density and efficient land use. On the other hand, restricting land use by size of the land, parking regulation, and family density, will increase the overall cost of constructing new houses and the value of the existing housing supply. Such policies disproportionately affect lower-income families because the cost of housing represents a larger share of their budget compared to higher income families (Ikeda, 2015).

Funding for Public School District

U.S. public education is largely funded from local property and state tax revenue. High poverty areas have lower home values, collect less property tax, and spend less on education. Concentrated poverty in a neighborhood will have fewer opportunities for disadvantaged families to benefit from the local spillover of public goods, such as schools, parks, and services that affluent communities will invest in.

Duncan (2017) shows that increases in the income gap between high and low-income children accounted for three-quarters of the increasing gap in completed schooling, one-half of the gap in college attendance, and one-fifth of the gap in college graduation. He found family income was the most powerful indicator for changing in the gap than other demographic factors. Low-income parents cannot choose better school districts because they cannot afford to live in a high-income neighborhood. As a result, children born in the bottom quintile will likely live in a poor neighborhood with other kids of similar status. Pfeffer (2018, page number) states that "for children born between 1970 and 1979, the college graduation rate among those who grew up in the top 20% of the wealth distribution was 39.5 percentage points higher than among those who grew up in the bottom 20%. However, for children born only a decade later, that wealth gap in college attainment has grown to 48.9 percentage points." As income inequalities grow, widespread income segregation results in neighborhoods divided by socioeconomic status. But for the impoverished students, their fate lies at the hands of the local school district's mercy.

In order to take a closer look at the disparity between neighborhoods and school districts, we have to examine different types of funding and their effects on local public schools. As income distribution becomes progressively unequal, progressive income taxes on high-income individuals are taxed at a higher rate to fund government projects and public goods for all income groups. The growing tax burden that wealthy individuals face has created incentives for them to prefer structural policies made by decentralized entities that represent less income-heterogeneous groups (Horstmann, 2008). At the decision-making level for public goods, one can expect to observe greater inequality and segregation in schooling if the policy is made by a less income diverse group (Horstmann, 2008, Posey-Maddox, 2016). For example, in Chicago, public schools where parent-run groups are involved with fundraising can offer art, music, and full-day kindergarten programs. However, the involvement of private interests can exacerbate the erosion of public sector interest, as common resources and programs are now treated as extra-curriculum, contributing to growing education inequality and neighborhood disparity (Posey-Maddox, 2016).

Higher-income allows parents to invest in their children's development (Nina, 2013). This type of investment has a strong correlation to children's academic success and social mobility. Low-income parents often spend less on education compared to their affluent counterparts. Empirical studies done by Greenwald (1996) found a strong and consistent positive relationship between school resources and students' academic achievement. Another study was done by Gigliotti (2018) who similarly found that increasing spending per pupil in disadvantaged school districts increases students' performances significantly. Inequitable funding in school districts between disadvantaged and affluent neighborhoods also has disproportionately affected immigrant children. Many immigrant children tend to experience barriers to graduating from high school because of high rates of poverty, segregation, underfunding, and unsafe school conditions (Jiménez-Castellanos & Oscar Hugo, 2017).

The consequences of insufficient school funding are found in the quality of teaching and educational resources. School districts with higher funding have the means to attract qualified and well-experienced teachers. A teacher's quality is crucial to a student's development and learning experience. Hammond (2005) used teacher's certification as a proxy for teacher's quality and found that having certified teacher compare to none certified teacher can have significant lead in student's achievement. The teachers' effectiveness is strongly correlated to the preparation they have received from training programs (Hammond, 2005). The inequity in the distribution of qualified teachers in poor neighborhoods is astonishing. Less qualified teachers are more likely to teach in economically disadvantaged school districts with a high percentage of low-income and minority students (Hammond, 2005).

To provide equal opportunity to students, college admission and selection of attendees should be based on a combination of ability and probability rather than purely on selecting the best of the best. Merit-based, performance base and ability base only encourage parents to spend an extensive amount of money for elite college test prep courses, tutoring, and college counselors (Schwartz, Barry 2005). Merit-based admission reproduces inequality in society as those young adults often come from the background of the elite wealthy class (Warikoo, 2018). According to Chetty (2017), children who born in the top 1% are 77 times more likely to attend an Ivy League college than children born in the bottom income quintile. The hidden advantages and opportunities associated with success are disproportionately favoring the more resourced and wealthy individuals. In the book Outliers, Gladwell describes outlier as such.

Income and Academic Achievement Gap

Achievement gaps in education between economically advantaged students and less advantaged students exist in all countries. In high-income countries, according to Chmielewski and Reardon (2019), the overall increase in the achievement gap between the top 10 percent to the bottom 10 percent is primarily driven by the middle and high-income students pulling away from low-income students. In low-income countries, the overall increase in the achievement gap is more evenly distributed across top income students to the low-income students at similar rates.

Sprietsma (2008) found that regional intensity of school choice yields a significant positive correlation with test scores for students. However, in the same study, she also found that school has the incentives to sort pupils according to their academic record as a prerequisite for admission. This type of elite sorting will benefit schools in reputation as pre-selecting students according to their ability will result in a concentration of students from good socioeconomic backgrounds. Merit-based education can exacerbate education inequality because the performance of students is highly correlated to their socioeconomic backgrounds.

Vinopal (2020) found that associations of neighborhood poverty and children's trajectories of cognitive growth start at an early age. She found that children who grow up in an economically disadvantaged community have lower scores on average than the children who live in wealthy communities. One surprising result from the study is that the cognitive growth for children who came from higher poverty communities will have a faster growth rate during kindergarten than the children who live in a relatively better neighborhood. As the children start elementary school, growth in math skills starts to vary more compared to reading with neighborhood poverty. This "catch-up" phenomenon was found to be associated

with learning loss from summer experience. Children in wealthy families were able to experience more cognitive growth in the summer relative to the poor family. The differences in the socioeconomic background in achievement gains during summertime were found in the previous studies (Alexander, Karl, 2001), when children leave school, greater disparities.

Income effects on a child's brain development from an early age. Researchers tried to find the relationship between economic status and brain structure by researching children by examining their demographics and brain imaging (Piccolo, 2016). Results indicated that affluent children would have thicker cortical muscles compared to disadvantaged counterparts (Piccolo, 2016). For lower socioeconomic status children, Cortical thickness shapely declined at a young age and began to plateau in late adolescence. On the other hand, affluent children have a steady rate throughout childhood and continue to decline through adolescence without plateauing (Piccolo, 2016). Environmental factors such as nutrition, material resources, healthcare, etc. can have a critical impact on children's brain development. Another study done by Brito (2016) has also found similar results on early infants. In this study, there was no disparity found at birth. However, the research suggests that socioeconomic disparity was correlated with later memory and language skills according to independent socioeconomic status.

Several research studies have documented the causal relationship between family income and children's education outcomes (Nobel, 2021, Dahl, 2017, Akee, 2010). Dahl observed that families who received extra income support have modest effects on children growing up in poverty. The results indicate that a $1,000 increase in income raises math and reading test scores by 6 percent (Dahl, 2017). Income effects are not only limited to academic performance; they also affect education attainment rate and chances of committing criminal offenses (Akee, 2010). In addition, parental quality improves with additional income support, resulting in better parent-child interaction (Akee, 2010). Preliminary results shows that unconditional cash transfer proved mothers with psychological security, affording marginal amount of services and goods are essential for mothers' psychological well-being and their adequacy as caregivers (Natalia, 2020, Nobel 2021).

Negative Stereotype and Environmental Impact of Poverty

The systemic oppression, segregation, and stereotypes associated with living in concentrated poverty can affect children's cognitive skills, physical health, and mental health. These negative stereotype's effects

were well recorded and tested in many psychophysiological studies. (Croizet, 1998). In Croizet's study, students from poor backgrounds perform worse than their high socioeconomic background counterparts when they were told the test was told to be a measure of intellectual abilities. However, when the test was presented as nondiagnostic of intellectual ability, low socioeconomic participants did not suffer performance differences compare to high socioeconomic background participants. The association of poverty stereotypes can be related to increased risk for negative life outcomes (Heberle, 2020).

People who live in disadvantaged neighborhoods have a high likelihood of exposure to pollution, stress, and violence. Gilbert (2004) found that segregation is associated with infant mortality, adult mortality, tuberculosis, homicide, teenage childbearing, tobacco and alcohol advertising, and air pollution exposure. In addition, disadvantaged neighborhoods are often unable to gather resources to avoid undesirable changes and issues. According to Vinopal (2018), "racist policies and preferences have led to highly segregated neighborhoods, under-resourced schools, and the devaluation majority-Black neighborhoods in many metropolitan areas—even controlling for neighborhood amenities and home quality—which has contributed to the Black-White wealth gap and led to less upward mobility by Black children in those neighborhoods." Achievement gaps between advantaged and disadvantaged students are not only due to a lack of financial capital, but also social capital, such as knowledge, behaviors, and values (Jury Mickael,2017).

Living in poverty exposes children to an unhealthy environment. Studies done by Brenner (2013) found that children and young adults living in disadvantaged neighborhoods have higher baseline cortisol levels than peers who live in less disadvantaged neighborhoods. Using cortisol as a natural indicator for stress, studies conclude that young adults living in disadvantaged neighborhoods are more likely to experience physiological harm and worsened health in adulthood. Another study done by (Mickael, 2017) shows that low socioeconomic status students can experience emotional distress, as well as a lesser sense of belonging, self-perception, and motivation. This leads to them experiencing worse academic outcomes than their wealthy counterparts.

The divergences in social norms and behavior are part of the consequences of income segregation. As affluent communities become more gated and polarized, disadvantaged neighborhoods become more entrenched with poverty. The notion of existing stereotypes and prejudice have severe consequences against poverty and ethnic minorities (Keenan, 2016). Consequences include limitations on social growth and deprivation of valuable social intergroup relationships. A study (Stathi, 2014) has found that children tend to assign more positive attitudes towards traits to their social, ethnic groups than others. This research has

found that prejudice and negative attitudes towards immigrants and other outer groups can be reduced by using mental imagery to stimulate contact without experiencing the anxiety of direct intergroup contact. The study has also shown that intergroup contact and closeness are the critical factors for building trust, reducing bias, and frequent cross-group friendship. (Stathi, 2014)

All children should have equal access to high-quality education, and it helps us grow and develop problem-solving skills to flourish in life. Education was reflected in longer life expectancy increases and early mortality reductions (Luy, 2019). Higher education allows people to specialize in a particular field, access a higher level of productivity, and receive more opportunities. The economic benefit of investing in education will generate ripple effects throughout the economy. Parents are willing to invest in their children's education to have better outcomes in life. As workers gain higher education in a specialized field, they can earn higher wages and consume more goods and services. The income effects from higher wages will boost sales for businesses, allowing them to invest in their workers and new machinery to produce more and better-quality goods and services at a lower cost. These ripple effects have contributed to endless technological innovation that improves our health and living standards. (Johanson, 2016)

Literature review reveals negative impacts of income segregation on students' academic performance of low socioeconomic status students. In the process of researching, many new factors such as parental care, early brain development were discovered. In the data section of this paper, it will address some of the findings and observations from Westchester County.

Method and Data

Hypothesis

It is hypothesized that, in Westchester County, students' socioeconomic status and school resources determines students' academic performances.

Method

The data includes 8058 enrolled students in 115 elementary schools within 26 school districts in Westchester County, New York. Dependent variables are collected based on mean scale scores at the school level. The data analysis will be using student enrollment as frequency weighting to adjust school size. The performance data provided by NYSED is inconclusive on the linearity of difficulty to score, however, it is

a valuable matrix to measure students' performances compared to their peers. In this study, third grade ELA and Math scores was closely examined and test as a dependent variable. In the dataset, 12 schools do not have third grade and have been excluded from the datasets. Hence the data consist of 103 schools and 7741 students. Visual analysis, descriptive statistics table, correlation, and multiple regression model used to analyze data and testing the hypothesis.

Variable Specification

The performance data used in this study is from the New York State Education Department's website. The performance data includes 3rd Grade, 4th Grade, and 5th Grade ELA and Math results from the years 2017-2019, however, only 3rd grade tests scores are used in this study. The other variables were collected through US Census, New York State School Funding Transparency, and New York State Education Department. These variables are grouped into three categories: school resources, socioeconomic status and racial makeup of students. The school resources variables include total local revenue per student, percentage of teachers with over five years of experience, instructional media per pupil, and average teacher salary. The socioeconomic status variables include school-level data on percentages of free reduced-price lunch students, and percentages of English language learners. This category also comprises district-level data on the percentages of adults with a bachelor degree or higher, median house value, total housing units, percentages of renter occupied housings, percentages of households for which the Selected Monthly Owner Costs as A Percentage of Household Income (SMOCAPI) is more than 35%, percentages of households for which the gross rent as a percentage of household income (GRAPI) is more than35%. The third category contains student racial makeup at the school level and contains five groups: Asian, Hispanic, Black, White, and multiracial.

Table 1 Summary Statistics

Variable	Obs	Mean	Std.dev	Min	Max
ELA Score	7,587.00	313.05	15.98	277.00	344.00
Math Score	7,587.00	313.25	18.17	263.00	349.00
Percentage of Black	7,587.00	13.74	22.99	0.00	100.00
Percentage of Hispanic	7,587.00	39.50	31.59	0.00	100.00
Percentage of Asian	7,587.00	3.79	7.30	0.00	35.29
Percentage of White	7,587.00	41.94	33.83	0.00	100.00
Percentage of Multiracial	7,587.00	1.04	2.99	0.00	15.52
Local Funding per students	7,587.00	19,107.03	7,458.67	8,968.30	35,024.10
Percentage of Experienced Teacher	7,587.00	0.95	0.07	0.63	1.00
Instructional media per pupil	7,587.00	624.64	597.30	0.00	2,639.92
Average Teacher Salery	7,587.00	120,620.30	16,761.97	69,559.21	163,957.40
Free reduced price lunch per enrollment	7,587.00	0.42	0.31	0.00	0.95
English Language Learner per enrollment	7,587.00	0.11	0.10	0.00	0.43
Median House Value	7,587.00	604,753.30	286,507.20	294,100.00	1,447,500.00
Total Housing Units	7,587.00	29,630.63	30,030.54	3,198.00	81,145.00
Percentage of SMOCAPI>35%	7,587.00	29.14	5.73	19.63	42.43
Percentage of GRAPI>35%	7,587.00	43.55	7.62	24.21	61.80
percentage of Renter Occuipied	7,587.00	37.44	17.58	5.24	62.25

Descriptive Statistics

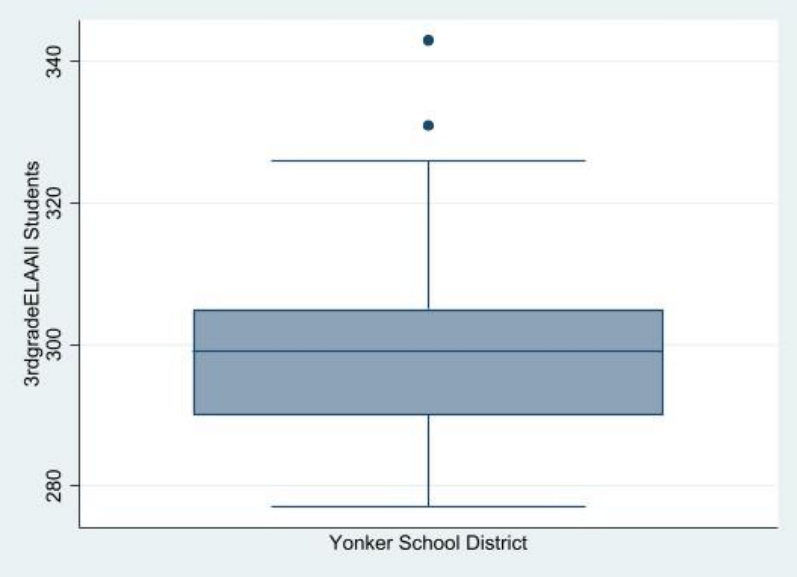
Table 1 shows summary statistics for all the variables that will be used in this study. All the variables are sampling weighted by the 3rd-grade student enrollment count of the schools. Third grade ELA and Math scores have a mean of 313.05 and 313.25 with a greater standard deviation for Math. Variables on schools' racial makeup has significant number of zeros indicate highly segregated neighborhood and school districts. However, it also includes schools without data on the racial makeup. Because of this inaccuracy, racial testing will be performed at the discussion section and excluded from hypothesis testing and regression analysis. Variables such as instructional media, free reduced priced lunch per enrollment, and English language learner per enrollment has absolute 0.

The first group of variables represents the funding and resources for a particular school. Table 1 shows that the disparity of funding per student range from $35,024 to $8,968 per student. Average teacher salary has significant range from $69,559 to $163,957. The disparity in funding and salary of the teacher also reflects the wealth gap between the wealthiest and the poorest communities in Westchester.

The second group of variables represents the socioeconomic status of the local school districts. Percentage of Free reduced-price lunch indicates some of the school can have as high as 95% concentration of poverty and as low as absolute zero poverty in school.

In Graph 1, sample data from Yonkers has two schools that are outliers. The reason for such disparity is unclear, it can only be explained by something that is more nuanced than district-level student funding such as elite sorting, or other variables. In the following sections, correlations and regressions will be conducted with and without Pearls Hawthorne School and Patricia A Dichiaro School.

Graph 5, Yonkers ELA Score Box Plot



Data Analysis and Results

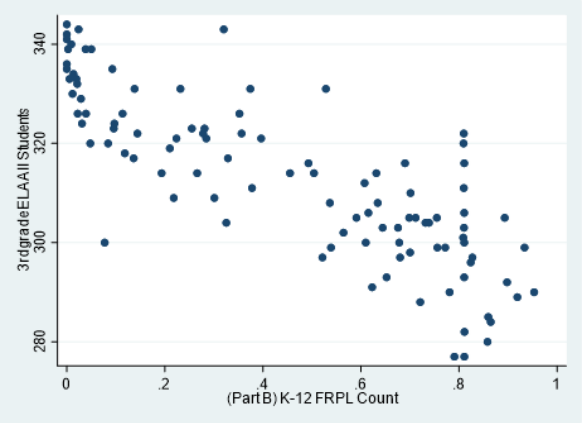
Correlation

In the correlation test (Table 2), the inclusion or exclusion of an outlier has no significant effects on the P-value of the correlation. The results reveal a negative correlation between students' performance and the variables percentage of free reduced-price lunch per enrollment, total housing units, percentage of SMOCAPI > 35%, percentage of GRAPI >35%, and percentage of renter occupied. The correlation coefficient between funding and resources is larger for math than ELA.

Variables like median house value, SMOCAPI, GRAPI, total housing units, and percentage of renters occupied can measure a certain degree of income segregation in the neighborhood. The correlation coefficient indicates statistical significance for the percentage of free reduced-priced lunch enrollment pairing with the percentage of renter occupied, total housing units, median house value, SMOCAPI, and GRAPI. Poverty is found in a neighborhood with more housing units with the majority of the housing units being renters occupied. A strong negative correlation coefficient between median house value and poverty also predicted poverty exists on the basis of housing affordability, poorer families are unlikely to be found in wealthy neighborhoods (Appendix.1).

In Graph 2 and Graph 3, the distribution of grading has a strong negative pattern associated with percentages of free reduced-price lunch students in the schools. In Graph 4 and Graph 5, positive relationship was found with local funding and grades. Some independent variables displayed above are highly correlated with each other, in order to closely examine the model, some variables will be excluded. Details are explained in the following section.

Graph 2. Correlation Between
Free Reduce Price Lunch to ELA



Graph 3. Correlation Between
Free Reduce Price Lunch to Math

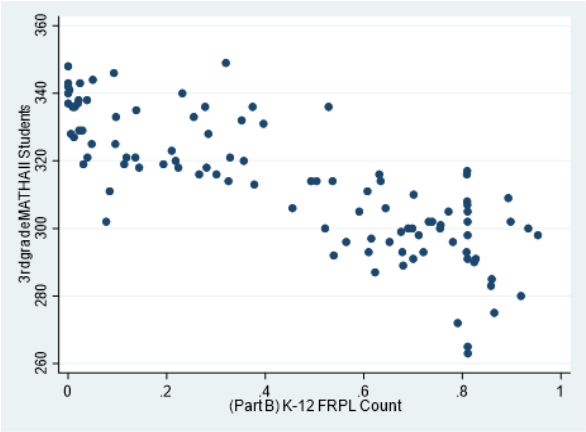
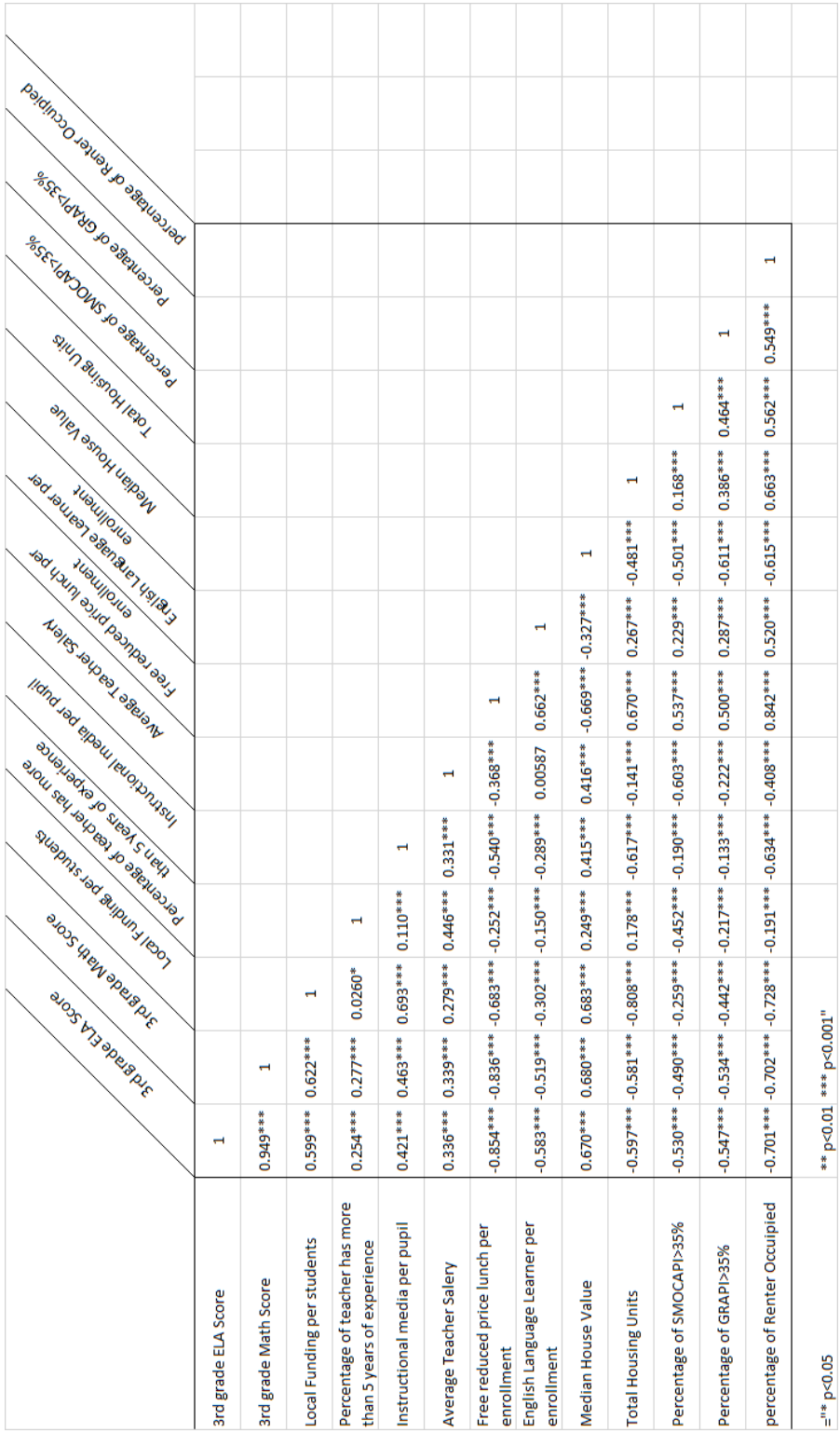


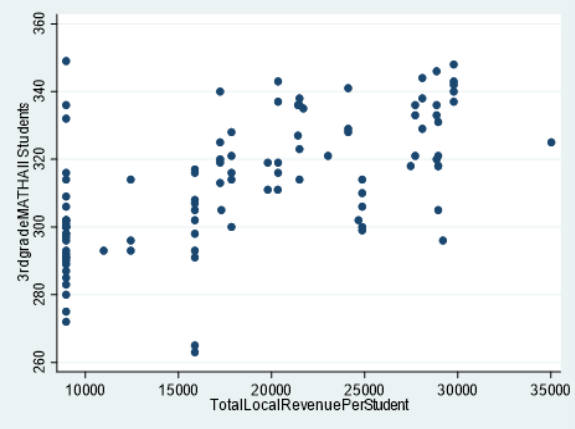
Table 2. Correlation Table



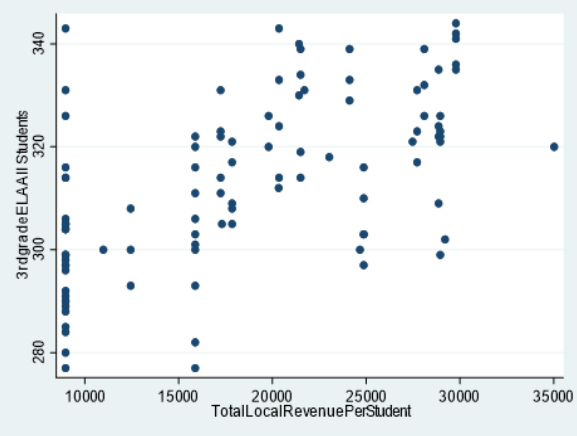
	3rd grade ELA Score	3rd grade Math Score	Local Funding per students	Percentage of teacher has more than 5 years of experience	Instructional media per pupil	Average Teacher Salery	Free reduced price lunch per enrollment	English Language Learner per enrollment	Median House Value	Total Housing Units	Percentage of SMOCAPI>35%	Percentage of GRAPI>35%	percentage of Renter Occuipied
3rd grade ELA Score	1												
3rd grade Math Score	0.949***	1											
Local Funding per students	0.599***	0.622***	1										
Percentage of teacher has more than 5 years of experience	0.254***	0.277***	0.0260*	1									
Instructional media per pupil	0.421***	0.463***	0.693***	0.110***	1								
Average Teacher Salery	0.336***	0.339***	0.279***	0.446***	0.331***	1							
Free reduced price lunch per enrollment	-0.854***	-0.836***	-0.683***	-0.252***	-0.540***	-0.368***	1						
English Language Learner per enrollment	-0.583***	-0.519***	-0.302***	-0.150***	-0.289***	0.00587	0.662***	1					
Median House Value	0.670***	0.680***	0.683***	0.249***	0.415***	0.416***	-0.669***	-0.327***	1				
Total Housing Units	-0.597***	-0.581***	-0.808***	0.178***	-0.617***	-0.141***	0.670***	0.267***	-0.481***	1			
Percentage of SMOCAPI>35%	-0.530***	-0.490***	-0.259***	-0.452***	-0.190***	-0.603***	0.537***	0.229***	-0.501***	0.168***	1		
Percentage of GRAPI>35%	-0.547***	-0.534***	-0.442***	-0.217***	-0.133***	-0.222***	0.500***	0.287***	-0.611***	0.386***	0.464***	1	
percentage of Renter Occuipied	-0.701***	-0.702***	-0.728***	-0.191***	-0.634***	-0.408***	0.842***	0.520***	-0.615***	0.663***	0.562***	0.549***	1

="* p<0.05 ** p<0.01 *** p<0.001"

Graph 4. Correlation Between Local Funding to Math



Graph 5. Correlation between Local Funding to ELA



Inaccuracy of the datasets are address by excluding data using cross examination in district demographic. School such as Buchanan-Verplanck Elementary School, Harrison Avenue Elementary School, Jefferson Elementary School, and Lincoln School are excluded from the observation.

Racial make-up is variable consist of number of each race over total enrollment. According to the literature review, higher level of Black and Hispanic population is expected to be seen in neighborhood with concentration of poverty and lesser school resources. Correlation results can confirm such phenomenon are happening in Westchester County.

Racial make-up category contains percentage of each racial makeup at the school level into five variables, Asian, Hispanic, Black, White, and multiracial. In Table 5, the result shows Increasing in percentage of Black and Hispanic in schools are strongly correlated with increases in percentage of free reduce-price lunch. The relationship between race and poverty was significant at 0.05 confidence level. Opposite results were shown with Asian and White, with a negative correlation to poverty. Correlation coefficients also show Black and Hispanic students are often found in neighborhood with more housing units and lower median house value. In addition, increase in Black and Hispanic population are associated with worst performance in 3rd grade ELA and Math score.

Table 5. Correlation Table with Race

	3rd grade ELA Score	3rd grade Math Score	Percentage of black Students	Percentage of Hispanic Students	Percentage of Asian Students	Percentage of white Students	Percentage of multicultural students	Local Funding per students	Percentage of teacher has more than 5 years of experience	Instructional media per pupil	Average Teacher Salery	Free reduced price lunch per enrollment	English Language Learner per enrollment	Median House Value	Total Housing Units	Percentage of SMOCAPI>35%	Percentage of GRAPI>35%	percentage of Renter Occuipied
3rd grade ELA Score	1																	
3rd grade Math Score	0.949***	1																
Percentage of black Students	-0.432***	-0.474***	1															
Percentage of Hispanic Students	-0.602***	-0.570***	-0.139***	1														
Percentage of Asian Students	0.471***	0.474***	-0.245***	-0.424***	1													
Percentage of white Students	0.762***	0.760***	-0.518***	-0.748***	0.341***	1												
Percentage of multicultural students	0.220***	0.241***	-0.173***	-0.146***	0.166***	0.142***	1											
Local Funding per students	0.599***	0.622***	-0.283***	-0.574***	0.395***	0.643***	0.247***	1										
Percentage of teacher has more than 5 years	0.254***	0.277***	-0.447***	0.0391***	0.156***	0.240***	0.111***	0.0260*	1									
Instructional media per pupil	0.421***	0.463***	-0.262***	-0.384***	0.163***	0.497***	0.267***	0.693***	0.110***	1								
Average Teacher Salery	0.336***	0.339***	-0.612***	-0.0171	0.363***	0.369***	0.0763***	0.279***	0.446***	0.331***	1							
Free reduced price lunch per enrollment	-0.854***	-0.836***	0.482***	0.704***	-0.444***	-0.904***	-0.199***	-0.683***	-0.252***	-0.540***	-0.368***	1						
English Language Learner per enrollment	-0.583***	-0.519***	0.0414***	0.692***	-0.202***	-0.637***	-0.117***	-0.302***	-0.150***	-0.289***	0.00587	0.662***	1					
Median House Value	0.670***	0.680***	-0.380***	-0.529***	0.630***	0.616***	0.250***	0.683***	0.249***	0.415***	0.416***	-0.669***	-0.327***	1				
Total Housing Units	-0.597***	-0.581***	0.191***	0.527***	-0.252***	-0.564***	-0.249***	-0.808***	0.178***	-0.617***	-0.141***	0.670***	0.267***	-0.481***	1			
Percentage of SMOCAPI>35%	-0.530***	-0.490***	0.565***	0.178***	-0.382***	-0.493***	0.0195	-0.259***	-0.452***	-0.190***	-0.603***	0.537***	0.229***	-0.501***	0.168***	1		
Percentage of GRAPI>35%	-0.547***	-0.534***	0.284***	0.335***	-0.376***	-0.437***	-0.0338**	-0.442***	-0.217***	-0.133***	-0.222***	0.500***	0.287***	-0.611***	0.386***	0.464***	1	
percentage of Renter Occuipied	-0.701***	-0.702***	0.486***	0.567***	-0.412***	-0.782***	-0.204***	-0.728***	-0.191***	-0.634***	-0.408***	0.842***	0.520***	-0.615***	0.663***	0.562***	0.549***	1
N	94																	
="* p<0.05	** p<0.01	*** p<0.001"																

Model specification

A standard linear regression equation is used to identify and describe the relationship between students' performance and all other independent variables. Patricia A Dichiaro elementary schools and Pearls Hawthorne elementary schools are excluded from the regression model test. The test will be performed and weighted by the number of observed students in each school. In order to test each hypothesis, three different models will be presented and tested according to each of the hypothesis bases. Dependent variables are also tested separately according to Math and ELA.

The propose of this study are trying to prove variables such as students' socioeconomic status and school resources will influence students' performance. In the following section, 4 models are used to test on 2 different hypotheses; (1) students in poverty are more likely to perform worse than their wealthy counterpart; (2), school with less resources are negatively affected students' performance.

$$Test\ Scores = \beta_0 + \beta_1 poverty_1 + \beta_2 school\ res_2 + \epsilon$$

Where Test Scores are the dependent variables that measures performances of students in 3rd grade ELA and Math. Independent variables are consisted of measurements of total local revenue per student, percentage of teachers with over five years of experience, instructional media per pupil, average teacher salary, free reduced-price lunch per enrollment, English language learner per enrollment, median house value, total housing units, percentages of renter occupied housings, percentages of SMOCAPI is more than 35%, percentages of GRAPI is more than35%.

Model 1 is used to test Hypothesis 1, sufficient funding and resources in a school lead to better students' performance. In order to test the relationship between resources and students' performance, the model has to exclude all other independent variables and hold them constant. The following Model 1 test contains independent variables such as local funding per student, percentage of teacher experience more than five years, instructional funding per pupil, and average teacher salary.

Model 2 is used to test Hypothesis 2, higher socioeconomic status students will have better performance compared to their counterparts. In order to test the relationship between students' performance and their socioeconomic status, the model has to exclude all other independent variables and hold them constant. The following Model 2 contains independent variables such as percentage of free reduced-price lunch,

percentage of English language learners, median house value, total housing units, percentage of SMOCAPI>35%, percentage of GRAPI, and percentage of renter occupied.

Model 3 is used to test Hypothesis 1 and 2, where socioeconomic status of the student and school resources will determine how students perform in school. This model will include all variables from Model 1 and Model 2.

Model 4 is used to test the effect of taking away independent variables that are measuring similar concepts. Variable such as Free reduced priced lunch and local funding per schools are taken out in order to closely examine effects of other variables.

Table 3

	Model 1 ELA	Model 2 ELA	Model 3 ELA	Model 4 ELA
Local Funding per students	0.0012618***		-0.0001080***	
Percentage of teacher has more than 5 years of experience	46.0921570***		10.8276982***	27.8750326***
Instructional media per pupil	-0.0012622***		-0.0007619*	-0.0028019***
Average Teacher Salery	0.0000870***		0.0000127	0.0000426***
Free reduced price lunch per enrollment		-3.186e+01***	-2.979e+01***	
English Language Learner per enrollment		-2.007e+01***	-2.175e+01***	-5.428e+01***
Median House Value		0.0000069***	0.0000081***	0.0000129***
Total Housing Units		-0.0000844***	-0.0001196***	-0.0002311***
Percentage of SMOCAPI>35%		-0.3935002***	-0.3228320***	-0.5137678***
Percentage of GRAPI>35%		-0.2257401***	-0.1924509***	-0.0629376***
percentage of Renter Occuipied		0.1995608***	0.1683476***	0.0157079
Intercept	2.347e+02***	3.402e+02***	3.282e+02***	3.046e+02***
Adjusted R Square	0.4221	0.7759	0.7779	0.733

Table 4

	Model 1 Math	Model 2 Math	Model 3 Math	Model 4 Math
Local Funding per students	0.0014139***		-0.0000147	
Percentage of teacher has more than 5 years of experience	59.6389421***		18.5856456***	41.8656885***
Instructional media per pupil	0.0000879		0.0013308***	-0.0011017***
Average Teacher Salery	0.0000724***		-0.0000255*	0.0000140
Free reduced price lunch per enrollment		-4.153e+01***	-4.000e+01***	
English Language Learner per enrollment		1.5959665	1.5163553	-4.150e+01***
Median House Value		0.0000104***	0.0000100***	0.0000176***
Total Housing Units		-0.0000242***	-0.0000399***	-0.0002032***
Percentage of SMOCAPI>35%		-0.0643494*	-0.0562649	-0.2890842***
Percentage of GRAPI>35%		-0.2354772***	-0.2510184***	-0.0763121***
percentage of Renter Occuipied		0.1038651***	0.1245131***	-0.0929279***
Intercept	2.200e+02***	3.324e+02***	3.171e+02***	2.869e+02***
Adjusted R Square	0.4586	0.7331	0.7376	0.6757

Regression Results

Regression results are summarized in Table 3,4 and detailed in Appendix 4. Regression Tables. The columns are presented as Model 1-4 indicated as ELA and Math. During regression testing in model 3, multicollinearity was presented through the VIF testing (Appendix 3. Multicollinearity Test**).** The percentage of free reduced-price lunch is highly correlated with all other independent variables. In order to limit the effects of highly correlated variables, Model 4 was presented without the percentage of free reduced-priced lunch and local funding per student.

I used regression analysis to explore the determinants of 3rd grade ELA and Math grades in the Westchester, New York, region in the year 2017. The results shown in Model 1 indicate that local funding per student is statistically significant at the 1% level. The estimated coefficient indicates that each additional 1,000 dollar increase for local funding per student increases 1.261 points for ELA and 1.413 for Math respectively. In addition, the coefficient differences from ELA to Math for the percentage of teachers who have more than five years of experience indicate that a more experienced teacher will benefit students' performance in math more than ELA. The regression test suggests significance in the effects of school resources, holding all else constant.

The results shown in Model 2 indicate that the percentage of free reduced-price lunch enrollment is statistically significant at the 0.1% confidence level. The coefficient on the percentage of free-reduced price lunch indicates that each additional percentage increase in free reduced-price lunch enrollment reduces students' performance by 0.32 for ELA and 0.42 for math respectively.

The concentration of poverty is shown across Model 2-4, where the coefficient on variables such as percentage of GRAPI, median housing value, and total housing units are consistently shown statistical significance at the 1%. The percentage of English learner enrollment in Model 2-3 Math has indicated a positive relationship to students' performance in math and failed to pass the 5% confidence level test. However, after adjusting for multicollinearity, Model 4 shows a negative relationship between the percentage of English learner enrollment and math score at the 0.1% confidence level.

Strong correlation in variables such as socioeconomic status and income segregation to student's performance in this study has also been consistent with past literature and studies, they become the most powerful predictors for students' academic achievement.

Discussion

Limitations

I should note several limitations in this study before the reader assesses the implications of my findings. My sample consists of 26 school districts and 115 schools in Westchester County; they are limited to school-level data provided by the New York State School Funding Transparency website. Datasets are not randomly sampled, as result, the conclusion is limited to school-level data in 26 out of 43 public school districts in Westchester. In addition, variables such as local school district funding per student, median house value, total housing units, percentages of renter occupied, percentages of Selected Monthly Owner Costs as A percentage of Household Income (SMOCAPI) more than 35%, and percentages of rent burden (GRAPI) >35% are recorded base on district-level and neighborhood bases. Nuance in the dataset can be lost by using school-level datasets in combination with district-level data. The use of student enrollment as frequency weighting on enrollment can introduce potential bias in the study. However, these concerns are somewhat reduced by large observation of a variety of school districts at different wealth levels and they are taken into consideration while performing data analysis and conclusion.

Addition limitation exist racial makeup in each school. The datasets are unreliable because of school level reporting style and consistency on student's demographic and racial ethnicity. Therefore, this study cannot make a reliable calculation and proper analysis into racial segregation at the district level. The results of racial analysis will be in the following section. Readers need to be aware the limitation on the accuracy of the racial report in each school, and perceive with caution.

Conclusion

As income inequalities grow, widespread income segregation allows different income level groups to concentrate in different neighborhoods. Students' academic performances are highly correlated to their parents' income and the environments that they grew up. The objective of this study is to identify and test existing factors that have contributed to the academic achievement gap between high-income and low-income families in Westchester County, New York. The literature review has examined past empirical studies and found that increase in income inequality and segregation has contributed to the education inequality. The evidence from the literature has also suggested historical discriminating housing policies

have disproportionally affected Black and other minority groups. As housing supplies dry up in an exclusive neighborhood because of restrictive land use and zoning, house prices within the neighborhood become unobtainable for lower-income families.

In addition, the necessary funding and education resources often fall short in economically disadvantaged neighborhoods. The data analysis results have also confirmed this finding in Westchester County, New York. The data have also shown evidence supporting the hypothesis that students' performances can be predicted through their socioeconomic status and school resources. That said, percentages of free reduce price lunch enrollments remains one of the strongest quantitative measurements and predictors for student's academic outcome.

Equal education opportunity should not be dependent on parents' socioeconomic status and zip code. It is economically inefficient to discriminate or to suppress socially and economically disadvantaged kids from getting quality education. Economically disadvantaged kids can benefit from polices that consist of providing extra income to the parents, creating equitable school funding, and giving incentives to qualified teacher to teach in poor performing schools. By doing so, parents can provide better childcare, school will have more resources, the next generation of low-income children can receive a better education and achieve greater social mobility.

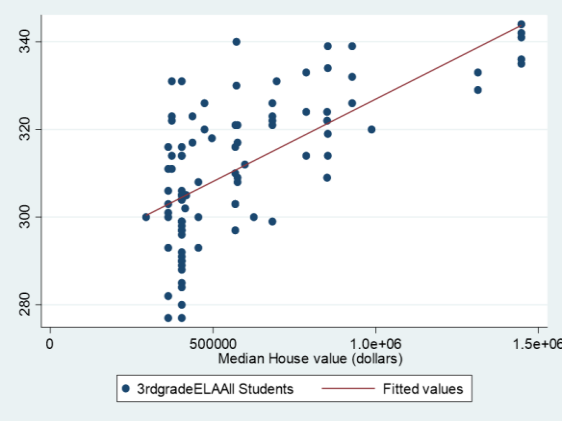
Acknowledgement

I would like to acknowledge and give big thanks to my senior project advisor prof. Cedric Ceulemans who made this work possible. His guidance and advice carried me through all the stages of research and writing my project. I would also like to thank all the faculties and professors in Economics department for their exceptional support and guidance.

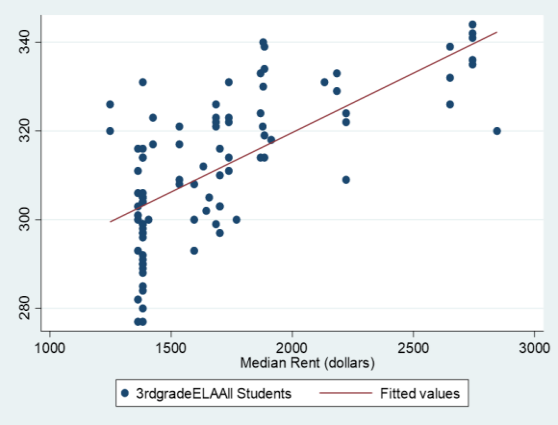
Appendix

Appendix 1. Correlation Testing and Best Fit Line

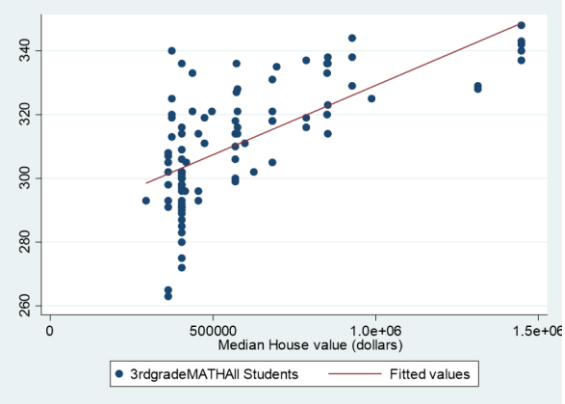
Median House Value vs ELA Score



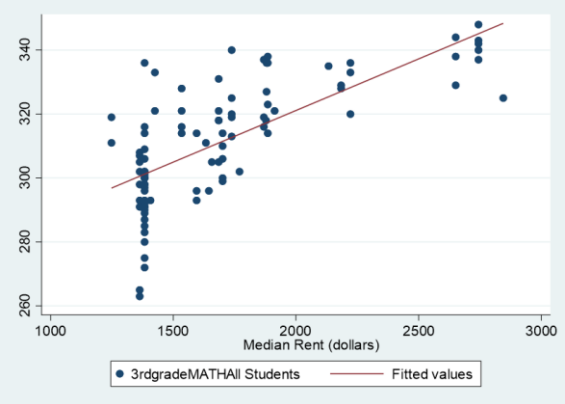
Median Rent vs ELA Score



Median House Value vs Math Score



Median Rent vs Math Score



Appendix 2. Racial Makeup Correlation

	3rd grade ELA Score	3rd grade Math Score	Percentage of black Students	Percentage of Hispanic Students	Percentage of Asian Students	Percentage of white Students	Percentage of multicultural students	Local Funding per students	Percentage of teacher has more than 5 years of experience	Instructional media per pupil	Average Teacher Salery	Free reduced price lunch per enrollment	English Language Learner per enrollment	Median House Value	Total Housing Units	Percentage of SMOCAPI>35%	Percentage of GRAPI>35%	percentage of Renter Occuipied
3rd grade ELA Score	1																	
3rd grade Math Score	0.949***	1																
Percentage of black Students	-0.432***	-0.474***	1															
Percentage of Hispanic Students	-0.602***	-0.570***	-0.139***	1														
Percentage of Asian Students	0.471***	0.474***	-0.245***	-0.424***	1													
Percentage of white Students	0.762***	0.760***	-0.518***	-0.748***	0.341***	1												
Percentage of multicultural students	0.220***	0.241***	-0.173***	-0.146***	0.166***	0.142***	1											
Local Funding per students	0.599***	0.622***	-0.283***	-0.574***	0.395***	0.643***	0.247***	1										
Percentage of teacher has more than 5 years	0.254***	0.277***	-0.447***	0.0391***	0.156***	0.240***	0.111***	0.0260*	1									
Instructional media per pupil	0.421***	0.463***	-0.262***	-0.384***	0.163***	0.497***	0.267***	0.693***	0.110***	1								
Average Teacher Salery	0.336***	0.339***	-0.612***	-0.0171	0.363***	0.369***	0.0763***	0.279***	0.446***	0.331***	1							
Free reduced price lunch per enrollment	-0.854***	-0.836***	0.482***	0.704***	-0.444***	-0.904***	-0.199***	-0.683***	-0.252***	-0.540***	-0.368***	1						
English Language Learner per enrollment	-0.583***	-0.519***	0.0414***	0.692***	-0.202***	-0.637***	-0.117***	-0.302***	-0.150***	-0.289***	0.00587	0.662***	1					
Median House Value	0.670***	0.680***	-0.380***	-0.529***	0.630***	0.616***	0.250***	0.683***	0.249***	0.415***	0.416***	-0.669***	-0.327***	1				
Total Housing Units	-0.597***	-0.581***	0.191***	0.527***	-0.252***	-0.564***	-0.249***	-0.808***	0.178***	-0.617***	-0.141***	0.670***	0.267***	-0.481***	1			
Percentage of SMOCAPI>35%	-0.530***	-0.490***	0.565***	0.178***	-0.382***	-0.493***	0.0195	-0.259***	-0.452***	-0.190***	-0.603***	0.537***	0.229***	-0.501***	0.168***	1		
Percentage of GRAPI>35%	-0.547***	-0.534***	0.284***	0.335***	-0.376***	-0.437***	-0.0338**	-0.442***	-0.217***	-0.133***	-0.222***	0.500***	0.287***	-0.611***	0.386***	0.464***	1	
percentage of Renter Occuipied	-0.701***	-0.702***	0.486***	0.567***	-0.412***	-0.782***	-0.204***	-0.728***	-0.191***	-0.634***	-0.408***	0.842***	0.520***	-0.615***	0.663***	0.562***	0.549***	1
N	94																	
="* p<0.05	** p<0.01	*** p<0.001"																

Appendix 3. Multicollinearity Test

Variable	VIF	1/VIF
partbk12fr~t	8.02	0.124744
percentage~d	5.81	0.172115
totallocal~t	5.48	0.182347
totalhousi~s	5.14	0.194614
medianhous~s	3.26	0.306703
partcinstr~p	2.82	0.354628
perce~capi35	2.70	0.370860
partbk12el~t	2.63	0.380630
perce~rapi35	2.25	0.444130
teacherave~y	2.10	0.475599
percentage~r	1.78	0.561860
Mean VIF	3.82	

Variable	VIF	1/VIF
medianrent~s	7.04	0.141976
medianhous~s	5.60	0.178523
percentage~d	4.91	0.203533
perce~capi35	2.21	0.453065
totalhousi~s	2.17	0.461887
perce~rapi35	1.83	0.545360
Mean VIF	3.96	

.

```
. regress rdgradeelaallstudents rapercentageblackela rapercentagehispanicela rapercentageasianela rapercentagmultiracialela partcstatelocalfundingperpupil percentageofexperienc
> edteacher partcinstructionalmediapp teacheraveragesalery teacherstudentratio partbk12frplcount partbk12ellcount educationinbachelororhigherage25 totalhousingunits percentageo
> frenteroccupied medianhousevaluedollars  percentagesmocapi35 percentagegrapi35  [fw= totalenrollment] if rdgradeelaallstudent>0 & rapercentageblackela <200

      Source |       SS           df       MS      Number of obs   =     7,587
-------------+----------------------------------   F(17, 7569)     =   1547.51
       Model |  1503651.59        17  88450.0933   Prob > F        =    0.0000
    Residual |  432615.978     7,569  57.1562925   R-squared       =    0.7766
-------------+----------------------------------   Adj R-squared   =    0.7761
       Total |  1936267.56     7,586  255.242231   Root MSE        =    7.5602

------------------------------------------------------------------------------
rdgradeelaallstudents | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
----------------------+-------------------------------------------------------
  rapercentageblackela |  -.0642677   .0072861    -8.82   0.000    -.0785505   -.0499848
rapercentagehispanicela |  -.0424495   .0059274    -7.16   0.000    -.0540689    -.03083
  rapercentageasianela |   .2363546   .0161454    14.64   0.000     .204705    .2680041
rapercentagmultiracialela |   .3880696   .0341076    11.38   0.000     .3212092     .45493
partcstatelocalfundingperpupil |  -.0005214   .0000399   -13.06   0.000    -.0005996   -.0004432
percentageofexperiencedteacher |   -5.90777   1.750128    -3.38   0.001    -9.338506   -2.477034
partcinstructionalmediapp |   .0020713   .0002535     8.17   0.000     .0015744    .0025682
teacheraveragesalery |   4.46e-06   8.11e-06     0.55   0.582    -.0000114    .0000203
teacherstudentratio |  -.0030974   .0006947    -4.46   0.000    -.0044592   -.0017356
partbk12frplcount |   -27.29184   .9705836   -28.12   0.000    -29.19446   -25.38923
partbk12ellcount |   -27.84249   1.569479   -17.74   0.000     -30.9191   -24.76587
educationinbachelororhigherage25 |   1.801167   1.170303     1.54   0.124    -.4929523    4.095286
totalhousingunits |  -.0000617   9.66e-06    -6.38   0.000    -.0000806   -.0000427
percentageofrenteroccupied |   .2856305   .0118596    24.08   0.000     .2623823    .3088786
medianhousevaluedollars |   1.97e-06   6.36e-07     3.09   0.002     7.20e-07    3.21e-06
percentagesmocapi35 |  -.4217237   .0267827   -15.75   0.000    -.4742252   -.3692222
percentagegrapi35 |  -.3299829   .0178757   -18.46   0.000    -.3650242   -.2949416
_cons |   359.0758   2.193965   163.67   0.000      354.775    363.3766
------------------------------------------------------------------------------

. vif

    Variable |       VIF       1/VIF
-------------+----------------------
partbk12fr~t |     11.88    0.084164
totalhousi~s |     11.17    0.089504
teacherstu~o |      6.90    0.144981
education~25 |      6.66    0.150192
percentage~d |      5.77    0.173386
raperce~cela |      4.65    0.214897
medianhous~s |      4.40    0.227026
raperce~kela |      3.72    0.268507
partcstate~l |      3.52    0.284358
partbk12el~t |      3.48    0.287171
perce~capi35 |      3.13    0.319870
partcinstr~p |      3.04    0.328650
perce~rapi35 |      2.46    0.406386
teacherave~y |      2.45    0.408174
percentage~r |      1.86    0.537701
raperce~nela |      1.84    0.543045
raperce~lela |      1.38    0.724433
-------------+----------------------
    Mean VIF |      4.61

.
```

Appendix 4. Regression Test

```
. regress rdgradeelaallstudents  totallocalrevenueperstudent  partbk12frplcount [fw= totalenrollment] if rdgradeelaallstudent> 0

      Source |       SS           df       MS      Number of obs   =     7,741
-------------+----------------------------------   F(2, 7738)      =   8480.60
       Model |  1372748.41         2  686374.206   Prob > F        =    0.0000
    Residual |  626271.809     7,738  80.9345838   R-squared       =    0.6867
-------------+----------------------------------   Adj R-squared   =    0.6866
       Total |  1999020.22     7,740  258.271346   Root MSE        =    8.9964

------------------------------------------------------------------------------
rdgradeelaallstudents | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
----------------------+-------------------------------------------------------
totallocalrevenueperstudent |  -.0000406   .0000183    -2.22   0.026    -.0000764   -4.82e-06
partbk12frplcount |   -43.63618    .438172   -99.59   0.000    -44.49511   -42.77724
_cons |   332.5071   .5011534   663.48   0.000     331.5247    333.4895
------------------------------------------------------------------------------
```

```
. regress rdgradeelaallstudents totallocalrevenueperstudent [fw= totalenrollment] if rdgradeelaallstudent>0
```

Source	SS	df	MS	Number of obs	=	7,741
				F(1, 7739)	=	3087.47
Model	570075.924	1	570075.924	Prob > F	=	0.0000
Residual	1428944.3	7,739	184.641982	R-squared	=	0.2852
				Adj R-squared	=	0.2851
Total	1999020.22	7,740	258.271346	Root MSE	=	13.588

rdgradeelaallstudents	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
totallocalrevenueperstudent	.0011551	.0000208	55.56	0.000	.0011144	.0011959
_cons	291.2943	.4269257	682.31	0.000	290.4574	292.1312

```
. regress  rdgrademathallstudents totalhousingunits percentageofrenteroccupied medianhousevaluedollars medianrentdollars percentagesmocapi35 p
> ercentagegrapi35 [fw= totalenrollment ] if rdgrademathallstudents>0
```

Source	SS	df	MS	Number of obs	=	7,741
				F(6, 7734)	=	1351.58
Model	1325778.95	6	220963.159	Prob > F	=	0.0000
Residual	1264393.56	7,734	163.485074	R-squared	=	0.5118
				Adj R-squared	=	0.5115
Total	2590172.51	7,740	334.647611	Root MSE	=	12.786

rdgrademathallstudents	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
totalhousingunits	-.0000838	7.17e-06	-11.69	0.000	-.0000978	-.0000697
percentageofrenteroccupied	-.187582	.0183163	-10.24	0.000	-.2234869	-.151677
medianhousevaluedollars	.000014	1.20e-06	11.66	0.000	.0000117	.0000164
medianrentdollars	.0067006	.0009325	7.19	0.000	.0048726	.0085285
percentagesmocapi35	-.4398092	.0371649	-11.83	0.000	-.5126624	-.366956
percentagegrapi35	-.1398374	.0259493	-5.39	0.000	-.1907051	-.0889698
_cons	321.993	1.832113	175.75	0.000	318.4016	325.5845

```
. regress  rdgrademathallstudents totalhousingunits percentageofrenteroccupied medianhousevaluedollars medianrentdollars percentagesmocapi35 p
> ercentagegrapi35 [fw= totalenrollment ] if rdgrademathallstudents>0
```

Source	SS	df	MS	Number of obs	=	7,741
				F(6, 7734)	=	1351.58
Model	1325778.95	6	220963.159	Prob > F	=	0.0000
Residual	1264393.56	7,734	163.485074	R-squared	=	0.5118
				Adj R-squared	=	0.5115
Total	2590172.51	7,740	334.647611	Root MSE	=	12.786

rdgrademathallstudents	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
totalhousingunits	-.0000838	7.17e-06	-11.69	0.000	-.0000978	-.0000697
percentageofrenteroccupied	-.187582	.0183163	-10.24	0.000	-.2234869	-.151677
medianhousevaluedollars	.000014	1.20e-06	11.66	0.000	.0000117	.0000164
medianrentdollars	.0067006	.0009325	7.19	0.000	.0048726	.0085285
percentagesmocapi35	-.4398092	.0371649	-11.83	0.000	-.5126624	-.366956
percentagegrapi35	-.1398374	.0259493	-5.39	0.000	-.1907051	-.0889698
_cons	321.993	1.832113	175.75	0.000	318.4016	325.5845

Source	SS	df	MS	Number of obs	=	7,266
				F(4, 7261)	=	1327.71
Model	748358.153	4	187089.538	Prob > F	=	0.0000
Residual	1023155.14	7,261	140.91105	R-squared	=	0.4224
				Adj R-squared	=	0.4221
Total	1771513.29	7,265	243.84216	Root MSE	=	11.871

rdgradeelaallstudents	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
totallocalrevenueperstudent	.0012618	.0000262	48.15	0.000	.0012104	.0013131
percentageofexperiencedteacher	46.09216	2.297237	20.06	0.000	41.5889	50.59541
partcinstructionalmediapp	-.0012622	.0003289	-3.84	0.000	-.001907	-.0006175
teacheraveragesalery	.000087	9.70e-06	8.97	0.000	.000068	.000106
_cons	234.6896	2.00258	117.19	0.000	230.7639	238.6152

Source	SS	df	MS	Number of obs	=	7,266
				F(4, 7261)	=	1539.64
Model	1041615.21	4	260403.802	Prob > F	=	0.0000
Residual	1228073.95	7,261	169.132895	R-squared	=	0.4589
				Adj R-squared	=	0.4586
Total	2269689.16	7,265	312.414199	Root MSE	=	13.005

rdgrademathallstudents	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
totallocalrevenueperstudent	.0014139	.0000287	49.24	0.000	.0013576	.0014702
percentageofexperiencedteacher	59.63894	2.516792	23.70	0.000	54.7053	64.57259
partcinstructionalmediapp	.0000879	.0003603	0.24	0.807	-.0006184	.0007943
teacheraveragesalery	.0000724	.0000106	6.81	0.000	.0000515	.0000932
_cons	219.9553	2.193973	100.25	0.000	215.6545	224.2562

Source	SS	df	MS	Number of obs	=	7,266
				F(7, 7258)	=	3595.22
Model	1374972.6	7	196424.657	Prob > F	=	0.0000
Residual	396540.692	7,258	54.634981	R-squared	=	0.7762
				Adj R-squared	=	0.7759
Total	1771513.29	7,265	243.84216	Root MSE	=	7.3915

rdgradeelaallstudents	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
partbk12frplcount	-31.85621	.7444924	-42.79	0.000	-33.31564	-30.39679
partbk12ellcount	-20.07151	1.276121	-15.73	0.000	-22.57308	-17.56994
medianhousevaluedollars	6.87e-06	4.69e-07	14.65	0.000	5.95e-06	7.79e-06
totalhousingunits	-.0000844	4.90e-06	-17.22	0.000	-.000094	-.0000748
percentagesmocapi35	-.3935002	.0219164	-17.95	0.000	-.4364626	-.3505378
percentagegrapi35	-.2257401	.0152	-14.85	0.000	-.2555365	-.1959437
percentageofrenteroccupied	.1995608	.010161	19.64	0.000	.1796423	.2194793
_cons	340.1947	.9312218	365.32	0.000	338.3693	342.0202

Source	SS	df	MS	Number of obs	=	7,266
				F(7, 7258)	=	2851.90
Model	1664523.23	7	237789.033	Prob > F	=	0.0000
Residual	605165.93	7,258	83.3791582	R-squared	=	0.7334
				Adj R-squared	=	0.7331
Total	2269689.16	7,265	312.414199	Root MSE	=	9.1312

rdgrademathallstudents	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
partbk12frplcount	-41.52973	.9197158	-45.15	0.000	-43.33264	-39.72682
partbk12ellcount	1.595967	1.576468	1.01	0.311	-1.494369	4.686303
medianhousevaluedollars	.0000104	5.79e-07	17.97	0.000	9.27e-06	.0000115
totalhousingunits	-.0000242	6.05e-06	-4.01	0.000	-.0000361	-.0000124
percentagesmocapi35	-.0643494	.0270746	-2.38	0.017	-.1174234	-.0112753
percentagegrapi35	-.2354772	.0187774	-12.54	0.000	-.2722864	-.1986679
percentageofrenteroccupied	.1038651	.0125525	8.27	0.000	.0792586	.1284717
_cons	332.4406	1.150394	288.98	0.000	330.1854	334.6957

.

Source	SS	df	MS	Number of obs	=	7,266
				F(11, 7254)	=	2314.27
Model	1378661.67	11	125332.879	Prob > F	=	0.0000
Residual	392851.625	7,254	54.1565516	R-squared	=	0.7782
				Adj R-squared	=	0.7779
Total	1771513.29	7,265	243.84216	Root MSE	=	7.3591

rdgradeelaallstudents	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
totallocalrevenueperstudent	-.000108	.0000272	-3.97	0.000	-.0001613	-.0000547
percentageofexperiencedteacher	10.8277	1.687791	6.42	0.000	7.519137	14.13626
partcinstructionalmediapp	-.0007619	.0002418	-3.15	0.002	-.0012358	-.000288
teacheraveragesalery	.0000127	7.35e-06	1.72	0.085	-1.74e-06	.0000271
partbk12frplcount	-29.78572	.7874949	-37.82	0.000	-31.32944	-28.242
partbk12ellcount	-21.75139	1.35387	-16.07	0.000	-24.40537	-19.09741
medianhousevaluedollars	8.13e-06	5.52e-07	14.73	0.000	7.05e-06	9.21e-06
totalhousingunits	-.0001196	6.61e-06	-18.11	0.000	-.0001326	-.0001067
percentagesmocapi35	-.322832	.024495	-13.18	0.000	-.3708493	-.2748148
percentagegrapi35	-.1924509	.0168978	-11.39	0.000	-.2255756	-.1593262
percentageofrenteroccupied	.1683476	.01173	14.35	0.000	.1453534	.1913419
_cons	328.1935	2.103881	155.99	0.000	324.0693	332.3178

Source	SS	df	MS	Number of obs	=	7,266
				F(11, 7254)	=	1857.28
Model	1674966.74	11	152269.704	Prob > F	=	0.0000
Residual	594722.417	7,254	81.9854448	R-squared	=	0.7380
				Adj R-squared	=	0.7376
Total	2269689.16	7,265	312.414199	Root MSE	=	9.0546

rdgrademathallstudents	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
totallocalrevenueperstudent	-.0000147	.0000335	-0.44	0.661	-.0000802	.0000509
percentageofexperiencedteacher	18.58565	2.076641	8.95	0.000	14.51482	22.65647
partcinstructionalmediapp	.0013308	.0002975	4.47	0.000	.0007477	.001914
teacheraveragesalery	-.0000255	9.05e-06	-2.82	0.005	-.0000433	-7.79e-06
partbk12frplcount	-39.99512	.968926	-41.28	0.000	-41.8945	-38.09574
partbk12ellcount	1.516355	1.665789	0.91	0.363	-1.749075	4.781786
medianhousevaluedollars	9.97e-06	6.79e-07	14.69	0.000	8.64e-06	.0000113
totalhousingunits	-.0000399	8.13e-06	-4.90	0.000	-.0000558	-.0000239
percentagesmocapi35	-.0562649	.0301384	-1.87	0.062	-.1153448	.0028151
percentagegrapi35	-.2510184	.0207909	-12.07	0.000	-.2917747	-.2102621
percentageofrenteroccupied	.1245131	.0144325	8.63	0.000	.0962212	.1528051
_cons	317.1334	2.588594	122.51	0.000	312.059	322.2078

Source	SS	df	MS	Number of obs	=	7,266
				F(9, 7256)	=	2217.28
Model	1299135.65	9	144348.406	Prob > F	=	0.0000
Residual	472377.64	7,256	65.1016593	R-squared	=	0.7333
				Adj R-squared	=	0.7330
Total	1771513.29	7,265	243.84216	Root MSE	=	8.0686

rdgradeelaallstudents	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
percentageofexperiencedteacher	27.87503	1.777001	15.69	0.000	24.39159	31.35847
partcinstructionalmediapp	-.0028019	.0002512	-11.16	0.000	-.0032942	-.0023096
teacheraveragesalery	.0000426	8.02e-06	5.32	0.000	.0000269	.0000584
partbk12ellcount	-54.28084	1.156361	-46.94	0.000	-56.54764	-52.01403
medianhousevaluedollars	.0000129	5.03e-07	25.58	0.000	.0000119	.0000139
totalhousingunits	-.0002311	5.36e-06	-43.08	0.000	-.0002416	-.0002206
percentagesmocapi35	-.5137678	.0258958	-19.84	0.000	-.5645311	-.4630045
percentagegrapi35	-.0629376	.0181354	-3.47	0.001	-.0984882	-.0273869
percentageofrenteroccupied	.0157079	.011549	1.36	0.174	-.0069315	.0383472
_cons	304.6449	2.196799	138.68	0.000	300.3385	308.9512

Source	SS	df	MS	Number of obs	=	7,266
				F(9, 7256)	=	1683.19
Model	1534627.34	9	170514.149	Prob > F	=	0.0000
Residual	735061.819	7,256	101.303999	R-squared	=	0.6761
				Adj R-squared	=	0.6757
Total	2269689.16	7,265	312.414199	Root MSE	=	10.065

rdgrademathallstudents	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
percentageofexperiencedteacher	41.86569	2.21669	18.89	0.000	37.52033	46.21105
partcinstructionalmediapp	-.0011017	.0003133	-3.52	0.000	-.0017159	-.0004876
teacheraveragesalery	.000014	1.00e-05	1.40	0.160	-5.57e-06	.0000336
partbk12ellcount	-41.50066	1.442482	-28.77	0.000	-44.32834	-38.67297
medianhousevaluedollars	.0000176	6.28e-07	28.00	0.000	.0000163	.0000188
totalhousingunits	-.0002032	6.69e-06	-30.36	0.000	-.0002163	-.00019
percentagesmocapi35	-.2890842	.0323033	-8.95	0.000	-.352408	-.2257603
percentagegrapi35	-.0763121	.0226227	-3.37	0.001	-.1206592	-.0319651
percentageofrenteroccupied	-.0929279	.0144066	-6.45	0.000	-.121169	-.0646868
_cons	286.8617	2.740359	104.68	0.000	281.4898	292.2336

Reference

Duncan, Greg J, Ariel Kalil, and Kathleen M Ziol-Guest. “Increasing Inequality in Parent Incomes and Children’s Schooling.” Demography 54.5 (2017): 1603–1626. Web.

Alba, Richard, Jennifer Sloan, and Jessica Sperling. 2011. ‘‘The Integration Imperative: The Children of Low-status Immigrants in the Schools of Wealthy Societies.’’ Annual Review of Sociology 37(1)

Sanbonmatsu, Lisa et al. “Neighborhoods and Academic Achievement: Results from the Moving to Opportunity Experiment.” The Journal of human resources XLI.4 (2006): 649–691. Web.

Grogan-Kaylor, Andrew, and Michael E Woolley. “The Social Ecology of Race and Ethnicity School Achievement Gaps: Economic, Neighborhood, School, and Family Factors.” Journal of human behavior in the social environment 20.7 (2010): 875–896. Web.

Blömeke, Sigrid, and Rolf Vegar Olsen. “Consistency of Results Regarding Teacher Effects Across Subjects, School Levels, Outcomes and Countries.” Teaching and teacher education 77 (2019): 170–182. Web.

Chmielewski, Anna K. “The Global Increase in the Socioeconomic Achievement Gap, 1964 to 2015.” American sociological review 84.3 (2019): 517–544. Web.

Johansen, Tom, and Kathleen Arano. “The Long-Run Economic Impact of an Institution of Higher Education: Estimating the Human Capital Contribution.” Economic development quarterly 30.3 (2016): 203–214. Web.

Chmielewski, Anna K, and Sean F Reardon. “Patterns of Cross-National Variation in the Association Between Income and Academic Achievement.” AERA open 2.3 (2016): 233285841664959–. Web.

Owens, Ann. “Income Segregation Between School Districts and Inequality in Students’ Achievement.” Sociology of education 91.1 (2018): 1–27. Web.

Shelly Brown-Jeffy. “School Effects: Examining the Race Gap in Mathematics Achievement.” Journal of African American studies (New Brunswick, N.J.) 13.4 (2009): 388–405. Web.

Wodtke, Geoffrey T, and Matthew Parbst. “Neighborhoods, Schools, and Academic Achievement: A Formal Mediation Analysis of Contextual Effects on Reading and Mathematics Abilities.” Demography 54.5 (2017): 1653–1676. Web.

Pearman, Francis A. “The Effect of Neighborhood Poverty on Math Achievement: Evidence From a Value-Added Design.” Education and urban society 51.2 (2019): 289–307. Web.

Kummings, J. Kenyon, and Christopher H Tienken. “Redlining Education.” Kappa Delta Pi record 57.3 (2021): 100–103. Web.

Ihlanfeldt, Keith, and Tom Mayock. “Affordable Housing and the Socioeconomic Integration of Elementary Schools.” The journal of real estate finance and economics 58.4 (2019): 567–595. Web

Charles, Kerwin Kofi, and Erik Hurst. “The Transition to Home Ownership and the Black-White Wealth Gap.” The review of economics and statistics 84.2 (2002): 281–297. Web.

Lens, Michael C, and Paavo Monkkonen. “Do Strict Land Use Regulations Make Metropolitan Areas More Segregated by Income?” Journal of the American Planning Association 82.1 (2016): 6–21. Web.

COATE, D, and J VANDERHOFF. “RACE OF THE HOMEOWNER AND APPRECIATION OF SINGLE-FAMILY HOMES IN THE UNITED-STATES.” The journal of real estate finance and economics 7.3 (1993): 205–212. Web.

Owens A, Reardon SF, Jencks C. Income Segregation Between Schools and School Districts. American Educational Research Journal. 2016;53(4):1159-1197. doi:10.3102/0002831216652722

Beracha, Eli, and William G Hardin. “The Capitalization of School Quality into Renter and Owner Housing.” Real estate economics 46.1 (2018): 85–119. Web.

Turnbull, Geoffrey K, Velma Zahirovic-Herbert, and Minrong Zheng. “Uncertain School Quality and House Prices: Theory and Empirical Evidence.” The journal of real estate finance and economics 57.2 (2018): 167–191. Web.

Charles, Kerwin Kofi, and Erik Hurst. “The Transition to Home Ownership and the Black-White Wealth Gap.” The review of economics and statistics 84.2 (2002): 281–297. Web.

Luy, Marc et al. “The Impact of Increasing Education Levels on Rising Life Expectancy: a Decomposition Analysis for Italy, Denmark, and the USA.” Genus 75.1 (2019): 1–21. Web.

Ikeda, Sanford, Washington Emily, “How Land-Use Regulation Undermines Affordable Housing.” Mercatus Center at George Mason University, (2015)

Horstmann, Ignatius J, and Kimberley A Scharf. “A Theory of Distributional Conflict, Voluntarism and Segregation.” The Economic journal (London) 118.527 (2008): 427–453. Web.

Posey-Maddox, Linn. “Beyond the Consumer: Parents, Privatization, and Fundraising in US Urban Public Schooling.” Journal of education policy 31.2 (2016): 178–197. Web.

Alexander, Karl L, Doris R Entwisle, and Linda S Olson. “Schools, Achievement, and Inequality: A Seasonal Perspective.” Educational evaluation and policy analysis 23.2 (2001): 171–191. Web.

Chmielewski, Anna K, and Sean F Reardon. “Patterns of Cross-National Variation in the Association Between Income and Academic Achievement.” AERA open 2.3 (2016): 233285841664959–. Web.

Chmielewski, Anna K. “The Global Increase in the Socioeconomic Achievement Gap, 1964 to 2015.” American sociological review 84.3 (2019): 517–544. Web

Pfeffer, Fabian T. “Growing Wealth Gaps in Education.” Demography 55.3 (2018): 1033–1068. Web.

Benabou, Roland. “Heterogeneity, Stratification, and Growth: Macroeconomic Implications of Community Structure and School Finance.” The American economic review 86.3 (1996): 584–609. Print.

Warikoo, Natasha. “What Meritocracy Means to Its Winners: Admissions, Race, and Inequality at Elite Universities in the United States and Britain.” Social sciences (Basel) 7.8 (2018): 131–. Web.

Sprietsma, Maresa. “Regional School Choice and School Selectivity: How Do They Relate to Student Performance? Evidence from PISA 2003.” The European journal of comparative economics : EJCE 5.2 (2008): 133–156. Print.

Schwartz, Barry. “Top Colleges Should Select Randomly From a Pool of ‘Good Enough.’” The Chronicle of higher education 51.25 (2005): B.20–. Print.

Wang, Shanshan, and Dong Yang. “The Effects of Poverty Stereotype Threat on Inhibition Ability in Individuals from Different Income-level Families.” Brain and behavior 10.12 (2020): e01770–n/a. Web.

Heberle, Amy E, and Alice S Carter. “Young Children’s Stereotype Endorsement About People in Poverty: Age and Economic Status Effects.” Children and youth services review 108 (2020): 104605–. Web.

Najdowski, Cynthia J, Bette L Bottoms, and Phillip Atiba Goff. “Stereotype Threat and Racial Differences in Citizens’ Experiences of Police Encounters.” Law and human behavior 39.5 (2015): 463–477. Web.

Welch, Kelly. “Black Criminal Stereotypes and Racial Profiling.” Journal of contemporary criminal justice 23.3 (2007): 276–288. Web.

Dukes, Kristin Nicole, and Sarah E Gaither. “Black Racial Stereotypes and Victim Blaming: Implications for Media Coverage and Criminal Proceedings in Cases of Police Violence Against Racial and Ethnic Minorities.” Journal of social issues 73.4 (2017): 789–807. Web.

Croizet, Jean-Claude, and Theresa Claire. “Extending the Concept of Stereotype Threat to Social Class: The Intellectual Underperformance of Students from Low Socioeconomic Backgrounds.” Personality & social psychology bulletin 24.6 (1998): 588–594. Web.

Spencer, Bettina, and Emanuele Castano. “Social Class Is Dead. Long Live Social Class! Stereotype Threat Among Low Socioeconomic Status Individuals.” Social justice research 20.4 (2007): 418–432. Web.

Chetty, Raj, Friedman, John, Saez, Emmanuel, Turner, Nicholas, Yagan, Danny. “Mobility Report Cards: The Role of Colleges in Intergenerational Mobility.” The Equal of Opportunity Project. Retrieved May 9, 2017

Alba, Richard, Jennifer Sloan, and Jessica Sperling. 2011. ‘‘The Integration Imperative: The Children of Low-status Immigrants in the Schools of Wealthy Societies.’’ Annual Review of Sociology 37(1)

Diehr, Aaron J, and Justin T McDaniel. “Lack of Community-Oriented Policing Practices Partially Mediates the Relationship Between Racial Residential Segregation and ‘black-on-Black’ Homicide Rates.” Preventive medicine 112 (2018): 179–184. Web.

Dahl, Gordon B, and Lance Lochner. “The Impact of Family Income on Child Achievement: Evidence from the Earned Income Tax Credit.” The American economic review 102.5 (2012): 1927–1956. Web.

Akee, Randall K Q et al. “Parents’ Incomes and Children’s Outcomes: A Quasi-Experiment.” American economic journal. Applied economics 2.1 (2010): 86–115. Web.

Ryan Marchetti, Randal H Wilson, and Mardis Dunham. “Academic Achievement and Extracurricular School Activities of At-Risk High School Students.” Educational research quarterly 39.4 (2016): 3–. Print.

Greenwald, Rob, Larry V Hedges, and Richard D Laine. “The Effect of School Resources on Student Achievement.” Review of educational research 66.3 (1996): 361–396. Web.

Nina C. Chien, and Rashmita S. Mistry. “Geographic Variations in Cost of Living: Associations With Family and Child Well-Being.” Child development 84.1 (2013): 209–225. Web.

Gigliotti, Philip, and Lucy C Sorensen. “Educational Resources and Student Achievement: Evidence from the Save Harmless Provision in New York State.” Economics of education review 66 (2018): 167–182. Web.

Vinopal, Morrissey. “Neighborhood Disadvantage and Children’s Cognitive Skill Trajectories.” Children and youth services review 116 (2020): 105231–105231. Web

Gilbert C. Gee, and Devon C. Payne-Sturges. “Environmental Health Disparities: A Framework Integrating Psychosocial and Environmental Concepts.” Environmental health perspectives 112.17 (2004): 1645–1653. Web.

Brenner, Allison B et al. “The Physiological Expression of Living in Disadvantaged Neighborhoods for Youth.” Journal of youth and adolescence 42.6 (2013): 792–806. Web.