

Gentrification and Education at a Crossroads:  
The Correlation between Neighborhood Change and Student Achievement

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### **Abstract**

This thesis explores the relationship between gentrification and student achievement in New York State. Gentrification, established by Ruth Glass (1964) as a class issue contextualized by urban geographies, has historically been investigated from the perspective of the gentrifier. Much of the early gentrification research has been focused on defining the gentrifier and the factors that cause gentrification to come about. More recently, researchers have begun to turn their attention to the impact on the existing populations where gentrification takes place. However, these efforts are primarily concerned with the impact gentrification has on the accessibility of affordable housing or how it affects the business landscape. The literature on its relationship with education is very scarce.

This thesis involves a quantitative analysis of the relationship between gentrification (as measured by median income, educational attainment, and racial composition) and student achievement (as measured by mean test scores on third grade statewide standardized tests and third grade proficiency rates on statewide standardized tests) in New York from 2006-2012. After a series of bivariate regressions and two multivariate regressions, I find that there is no statistically significant impact of measures of gentrification on math scores and proficiency; the impact of gentrification on English Language Arts scores and proficiency, while statistically significant has no practical influence' and; lastly, over time student achievement is decreasing in New York. Although the findings regarding gentrification are insightful they are limited by both time and space. I suggest that future quantitative research be conducted for longer periods of time with more aspects of the design aimed at isolating the "stayers," those who lived in areas prior to the onset gentrification. Lastly, I urge policymakers in New York to act to reverse the trend of decreasing student achievement.

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## **Chapter 1: Introduction**

### **Context and Significance**

In the summer of 2014, protesters lined up on the busy street of Flatbush Avenue in Brooklyn, New York, inhibiting the construction of a 23-story high-rise luxury condominium. Just a few weeks prior, they had gathered at the steps of City Hall voicing their concerns surrounding the implications of this development project. One protestor Leah Margulies asked of City Hall and the development companies, “our median income is \$41,000 for a family of four—does it make sense to insert a building where studios cost \$1900 [per month]?” (Curbed, 2014). Though they were able to secure a restraining order to halt the construction, a month later, a judge lifted the restraining order allowing for the continued development of the tower.

This story is not unique to Flatbush Avenue. To answer Ms. Margulies question, building studios that cost \$1900 per month makes sense when they are meant to attract new residents who contribute to a steadily increasing median income. In the Williamsburg neighborhood of Brooklyn, NY, the median income range rose from \$25k to \$55k in 1990 to \$53k to \$80k by 2012. The West Harlem/Morningside Heights neighborhood of Manhattan experienced a similar upward trend in median income over the same 22 years. Heat maps created by the United States Census Bureau show that over this same time frame, cities like Oakland, Washington, DC and Philadelphia have seen their median household income increase at similar rates. These changes in median income and the rate of development projects are just two indicators of the larger urban geographical phenomenon of gentrification.

Gentrification, the process by which working class neighborhoods are transformed into upper middle class neighborhoods, is arguably one of the most well studied processes of urban

development and urban policy. Spanning several spheres of social issues, such as demographic composition, housing, and economics, it has drawn numerous researchers over the past four to five decades to examine its characteristics, causes, and, more recently, its impact within these different realms of social policy. While researchers have examined the implications gentrification holds for affordable housing, the business landscape, or the tension it inevitably creates between original residents and newcomers as neighborhoods undergo significant demographic changes, there has been very little done to examine gentrification in relation other equally pertinent public issues.

Originally described by sociologist Ruth Glass as a class issue embedded in the context of urban geographies (Glass, 1964), gentrification has continued to be depicted as a class issue. Issues of class are not without warrant for change, but gentrification as a class issue has not garnered enough public attention to demand that policymakers take an active role in mitigating any consequences of these processes of neighborhood change. In addition to its reputation as a class issue, part of this neglect to address gentrification as an issue of public policy is due to the fact that the process has historically been seen from one perspective: that of the gentrifier. Early research on gentrification was primarily focused on describing the phenomenon and determining the cause of what seemed to be irrational behavior on the part of young wealthy individuals (Kozak 2014). This perspective did not speak to what the impacts of these class-based geographical decisions might be on people and structures of existing working class neighborhoods.

More recent research and discussions have provided two new compelling perspectives on gentrification. The first is the perspective that seeks to fill this gap in the work done to examine the impact of gentrification as it relates to existing working class neighborhoods. Some researchers have examined the social tensions that result from such abrupt demographic changes (Hwang, 2014). Several others have detailed the impact that gentrification has on the housing sphere,

namely its role in the elimination of affordable housing and the displacement of working class and minority individuals (Kozak, 2014). The second perspective has undertaken the investigation of the role of the public sphere in facilitating the advancement of gentrification, as there exist certain policies, or lack thereof, that provide a platform for housing and business development projects to draw young upper class individuals into traditionally working class neighborhoods (Bates, 2013). These two major additions to the gentrification debate have moved the discourse away from its descriptive tradition towards a critical perspective that demands the attention of policymakers.

### **Research Question**

The goal of this thesis is to examine the impact of gentrification on the academic achievement of public school students. I will examine the association between specific indicators of gentrification (median income, racial composition, and education attainment levels) and student achievement (standardized test scores in third grade English Language Arts and Math) in counties across New York State over a period of seven years (2006 through 2012). These three indicators of gentrification capture common themes in the characterization of gentrification: the influx of upper middle class, predominantly white, highly educated individuals. In terms of student achievement, the purpose of using third grade test scores is to capture the impact of the independent variables as much as possible by focusing on students who would have standardized achievement data, but who would also be young enough to not have experienced several years of schooling before gentrification began (Keels, Burdick-Will, & Keene, 2013).

This study makes both theoretical and practical contributions to the literature. First, this study will help expand the growing and changing conception of gentrification as it determines metrics by which to measure gentrification. Secondly, the analysis of gentrification's impact on student performance has not yet been widely studied, allowing this thesis to contribute to an

emergent subset of gentrification studies. Lastly, if I find that these processes are having any impact at all on student achievement in public schools, it will reaffirm claims made by researchers in the housing, economic, and social realms that gentrification is a public issue to be addressed in policy.

### **Roadmap**

The following chapters of this these will provide a more detailed synthesis of salient gentrification research; an overview of the data sources, variables, and methods by which they will be analyzed; the results of this analysis; and final thoughts on the findings and implications for policymakers moving forward. Chapter 2 reviews prior research on gentrification with regard to its evolving definition, the changing perspective of researchers, as well as an overview of the quantitative and qualitative work done with special attention to research that examines the intersection between gentrification and education. Chapter 3 discusses the data methods and sources that will be employed in this thesis. Chapter 4 will include a description and analysis of my results and statistical tests. It will also discuss the relevance, strength, and weaknesses of my findings as well as contextualize them in the broader scope of earlier studies discussed in Chapter 2. Chapter 5 will provide a summary of my findings.



## **Chapter 2: Literature Review**

### **Core Tenets of Gentrification Research**

Glass' idea of gentrification as a class issue that plays out within the context of urban geographies (Glass, 1964) has remained at the root of gentrification studies and research. Over the past several decades, researchers, regardless of the goals of their studies, have continued to define and measure gentrification as a function of class difference and displacement. Since the term's debut in Glass' 1964 piece, researchers have rearticulated her findings. Zukin (1987) defines gentrification as, "the conversion of socially marginal and working-class areas of the central city to middle-class residential use" (Zukin, 2). Atkinson (2000) in a study on displacement in London defines it as, "a process of class succession and displacement in areas broadly characterized by working-class and unskilled households" (Atkinson, 1). Later Baxter (2009), continued in Glass' trend by defining the process as

...the 'upgrading' of geographic space so that it reflects middle class values...gentrification is a gradual process, occurring over years and even decades. It entails middle class households moving into a disinvested, economically-depressed area, buying real properties, renovating them and, by virtue of doing so, increasing property values. The property appreciation in turn increases contract rents and property tax bills, often resulting in a lower class household displacement...(Baxter, 2009)

As recently as 2014, scholars defined gentrification as a process that "traditionally occurs when middle-class families move in and renovate economically depressed, inner-city neighborhoods, which often results in the displacement of the existing, working-class residents" (Kozak, 2014).

That this trend of working class displacement by the middle class ever transpired, and continues to occur, defies neoclassical urban models of the Chicago School. These models predicted a "natural process" whereby consumers would sacrifice distance to urban centers for cheaper land in the surrounding suburbs (Kozak, 2014). Often called the "Back to the City

Movement” this anomaly initiated what is now another prominent aspect of gentrification research: defining the type of middle class individuals who would choose to go against the natural process and occupy these spaces.

This recognition that gentrification is comprised of transformations that encompass both physical changes (i.e. deindustrialization, suburbanization, and the disinvestment in ethnic enclaves and lower class areas of the inner city), as well as social and cultural changes (i.e. the unexpected preferences of the middle class), prompted David Ley to forge the term “the new middle class” (Lees, 2012). Though David Ley’s gentrification research focused primarily on Canadian cities, his findings are applicable to international gentrification trends. In a more recent piece since Ley first posited the term, Ley describes the new middle class using a stage model:

In the model, a lower-middle class of professionals and pre-professionals (students) seeking inexpensive housing in the inner city comprises the first wave of gentrification. The presence of artists among this group has been a strong predictor of subsequent gentrification (Ley, 1996, 2003). Artists gravitate towards central locations with low rents and high degrees of social diversity. Soon after their arrival, they are joined by a broader stratum of social and cultural workers, the ‘cultural new class’ including arts, design and media workers, educators and social and health care workers. Although generally highly educated professionals, this sub-group of the new middle class shares something of the artists’ valuation of bohemian landscapes and urban authenticity (Lloyd, 2006). These residents, in turn, are succeeded in a third stage by increasingly affluent gentrifiers in an ascending economic hierarchy, including corporate lawyers, medical specialists, business people and capitalists (Danyluk & Ley, 2006).

The idea of the new middle class as a progression along a gradient of groups with different characteristics and preferences provide a method of measuring the process of gentrification that is primarily driven by the individual.

The establishment of a widely accepted definition of gentrification and of the general characteristics and demographics of gentrifiers is crucial to research on gentrification, as efforts to measure its beginnings, rate of neighborhood change, or its impact depend on a clear definition of the phenomenon as well as its agents of change. Though it seems that class based explanations of this phenomenon and Ley’s emphasis on the preferences of the gentrifiers suffice, differences in

thought regarding the factors driving middle class preferences as well as the unique role of race in the United States, complicate both the definition of gentrification and theories of its cause.

Due to policies and practices that have historically favored whites over blacks and other people of color in the United States, income and class divisions fall along racial lines. This frequent intersection of race and other social identifiers means that gentrification is not only witnessed and interpreted as a class struggle, but equally as one of color, where neighborhoods with predominantly minority residents become predominantly white in tandem with the class status change of the neighborhoods.

The relationship between race and other social identifiers that have been used to account for gentrification (i.e. class status and income) has prompted several researchers to also include race as a measure of gentrification. Glick (2008) highlights the intersection of class and race as he explores the impact of gentrification by white middle class individuals on Black and Latino homeowners. Hwang (2014) echoes this intersection as she states “gentrification in US cities has been problematic for low-income minorities” (Hwang, 2). Formoso, Weber, & Atkinson (2010) also conflate class and race in their study on the impact of gentrification on children’s well-being:

...before change occurs, the condition of a gentrifying neighborhood is deficient relative to other parts of an urban area in terms of median household income, aggregate property value, and crime, and vacancy rates...these neighborhoods, prior to the change, often were predominantly comprised of ethnic minorities (Formoso, Weber & Atkinson, 2010).

The persistent intersection of race and class in gentrification research suggests that race remains as much a key indicator of gentrification as class and income.

In addition to race, defining gentrification is also complicated by the competing ideas of production-based theories and consumption-based theories of the cause of gentrification. Consumption-based theories reaffirm what Ley has declared as the agent of gentrification: preferences of middle class individuals. Production-based theories, however, point to conditions

created by capitalism as the factor driving investors towards gentrification (Kozak, 2014). Billingham (2013) defines gentrification as “the manifestation of efforts by municipal governments to spur economic development by making their cities more amenable to use by members of the professional classes and by the businesses that employ them.” In this production-based conceptualization of gentrification, rather than individuals and their preferences driving gentrification, conditions created by the government and subsequent economic development drives gentrification.

Given the various social, cultural, and economic factors that contribute to gentrification, any definition or measurement of the process must simultaneously account for categorical indicators, quantitative measures, (i.e. race, class, income), and resolve or control for the possibility that the agent of gentrification could be either individual or structural.

### **Quantifying Student Achievement**

One of the major contributions of this study is its intent to expand the scope of gentrification research to include the potential impact of gentrification on education. An obvious indicator of the quality of education is student achievement. Best practices concerning the measurement of student achievement continue to be contested today, as student achievement is used to characterize school quality, teacher effectiveness, or factors beyond the school setting, like neighborhood safety.

In 2012, the Center for Educator Compensation Reform of the US Department of Education published *Understanding the Basics of Measuring Student Achievement*. This piece outlines broad categories of student achievement measurement models: 1) student attainment, 2) gain, 3) percentile growth, 4) standard value-added, 5) customized value-added, and 6) student learning

objectives (SLOs) (Scott and Miller, 2012). Table 1 below portrays each method as described by the authors:

**Table 1: Methods of Measuring Student Achievement**

(1) Attainment	“Attainment scores reflect student performance on a particular assessment at a single point in time. These measures are easy to compute and widely used in school systems to determine performance related to benchmarks, such as Adequate Yearly Progress (AYP).”
(2) Gain	“...gain measures take a longitudinal approach. Gain in student test scores is the difference between student performance on a post-test and the same group of students’ performance on the corresponding pre-test.”
(3) Percentile Growth	“Student growth percentiles...compare test score growth across groups of academic peers, which are students with similar test score histories in the same grade and subject...percentile growth [ranks] each student’s growth with all other student who have similar student achievement histories.”
(4) Standard Value-Added	“By controlling for prior student test scores, standard models will take into account some of the non-school factors that contribute to student achievement.”
(5) Customized Value Added	“Unlike standard value-added models, customized value-added models may consider the effects of non-school factors that contribute to student achievement in specific states and/or districts...value-added may also take into account many...school and classroom level factors...”
(6) Student Learning Objectives (SLOs)	“...SLOs are goals set by teachers that specify what students will know, or able to perform, after completing a quarter, semester, or school year.”

Source: US Department of Education - Center for Educator Compensation Reform (2012)

Although Scott and Miller describe approaches of assessing student achievement holding educator effectiveness as the independent variable, understanding the different methods available for measuring student achievement are especially relevant to this study, where the intention is to measure the impact of gentrification on student achievement. Having a reliable, quantifiable method of measuring student achievement will allow for a strong analysis. While some approaches, such as gain models, value added, or percentile growth models, might capture the

changes in student achievement over a longer period of time, my research will be conducted in a relatively short period of time and the conditions required of these models (pre- and post-testing of the same group of students, or the ability to compare test growth across academic peers) are not achievable in a shorter period of time. Additionally, these methods are likely to have significant internal validity gaps, as attrition rates may be of concern in gain models, value-added models have come under scrutiny for issues of accurate implementation (Amrein-Beardsley, 2012; Bonk et al, 2012) and teacher portfolios are extremely vulnerable to the personal bias of teachers.

Among research that uses student achievement as a dependent variable, the most common methods for measuring student achievement, regardless of the independent variable, are student test scores. This study will also follow the practice of student achievement measures as it seeks to explore the quantifiable impact of gentrification on student achievement. Test scores provide accessible, quantifiable resources for gauging student achievement that can be incorporated into a quantitative analysis

### **Gentrification and Student Achievement**

From the 1950s to today, researchers have explored the impact of gentrification on the urban housing landscape, examining the implications for affordable housing or the prevalence of high development projects (Kozak, 2014; Billingham, 2013). Research on gentrification has also studied the influence it has on business and the economics of the affected neighborhood. However, there is very little work on the impact gentrification has on neighborhood schools or student achievement specifically. My goal is to ask what this phenomenon means for the students attending schools in areas where there is an influx college educated, middle class individuals. How might their achievement be impacted by these demographic changes in their neighborhood?

The two strands of research on gentrification and education are divided by whether the researchers conduct a qualitative analysis or quantitative analysis. Across the limited work on this topic there are no real common themes or methodologies as the purpose of each researchers work varies significantly.

### Qualitative Research

A prime example of the qualitative research on the intersection of gentrification and education has been conducted by urban sociologist, Judith N. DeSena. DeSena (2009) seeks to study, qualitatively, the impact of gentrifying parents on schools. Her research explored the manifestations of social class distinctions in the Greenpoint neighborhood of Brooklyn, New York in its initial stages of gentrification, i.e. during the period of transition from residents of primarily low-income, working class demographics, to largely middle class residents. Although most research portrays gentrifiers as young, childless individuals, DeSena focuses on gentrifying parents and families. It is this focus on the gentrifying family that leads to her study and conclusions about how the process of gentrification can impact schools in gentrifying neighborhoods. Through a series of interviews aimed at determining how gentrifying families engage with neighborhood schools, she finds that gentrifying parents are more likely than not to seek out education opportunities outside of the neighborhood. This active rejection of neighborhood schools, leads to segregation by social class of children with local schools (DeSena, 2009). Overall, DeSena finds:

The gentry are more accustomed to relative privilege and have made a judgment about what constitutes quality education. Their lower income neighbors accept public schools and believe that their only other choice is to pay tuition...They are largely unaware of the options within the public school system, such as entrance by lottery or applying to specialized schools...and the additional strategies used by their gentry neighbors. These practices result in negative consequences for community cohesion.

These findings are extremely relevant to this study considering that other researchers have suggested gentrification as a means to improve neighborhood schools through the anticipated

advocacy and involvement of gentrifying parents who are dissatisfied with the quality of neighborhood schools (Formoso, Weber, & Atkins, 2010).

Other qualitative work on this area of gentrification suggests that by-products of gentrification, such as improved institutional resources and collective socialization work together to improve children's well-being, a larger umbrella of indicators that includes performance in schools (Formoso, Weber, & Atkins, 2010). This claim rests heavily on the assumption that gentrifying families and original residents interact formally in institutional spaces like the school, or informally.

The possibility that these parents would instead find other options for their children, which DeSena explains by saying it is easier to commute children than leverage their human and social capital to affect change in schools, hold serious implications for the impact of gentrification on student achievement (DeSena, 2009). If gentrifying parents choose to educate their children through avenues other than neighborhood schools, gentrification may give way to an even more segregated schooling landscape than we already have, where even students who live in the same neighborhood will have a schooling experience that is segregated by class, income, and/or race.

DeSena also conducted a study in conjunction with George Ansalone that takes another qualitative look at the impact of gentrification on education. The study expands on her initial findings in her book, and verifies, by means of interviews, that gentrification contributes to the accentuation of between-school tracking (DeSena & Ansalone, 2009). Although the study finds that over time, more than 50 percent of gentry families choose to send their children to schools and education programs outside of their neighborhood, these findings were based on interactions with 21 families in one neighborhood in Brooklyn, NY. The sample size and the specificity of the



location pose significant limitations with regards to external validity and the generalizability of these findings.

### Quantitative Research

Of the already slim pool of research on gentrification and education is a slimmer pool for which the variables of interest and findings are quantified. In Chicago, it was determined that, overall, gentrification has little effect on neighborhood public schools (Keels, Burdick-Will & Keene, 2013). If there is any impact, it may be slightly negative as neighborhoods skew to meet the needs and preferences of higher income residents. For example, as the median income in a neighborhood increased, students experienced a lower than average increase in test scores.

The researchers of this study establish gentrification as their independent variable and third grade standardized test scores as their dependent variable. They measured and defined gentrification using a categorical and linear method. Using Taylor and Puente's work from 2004 on gentrification in Chicago, they determine that a neighborhood has gentrified if:

...during a given decade...it undergoes at least two of the following: 9 percent increase in the percent of residents with a college education, 29 percent consumer price index (CPI)-adjusted increase in average household income, 65 percent CPI-adjusted increase in average home value, or 11 percent increase in CPI-adjusted median rent (Keels, Burdick-Will, & Keene, 2013).

The linear method draws on Griffith's definition of gentrification as the "in-migration of middle- and upper-income households into existing lower income urban neighborhoods and the upgrading of the housing stock therein." By using this linear method, the researchers are able to eliminate the perceived difference between consumption based theories and production-based theories for the occurrence of gentrification. Regardless of whether individuals are driving the change or conditions are created to attract these individuals, the ultimate situation is a change in residents' demographics and housing stock. The rationale for focusing on third grade is based on the

assumption that children in earlier grades are more impacted by the effects of gentrification than older children who would have completed several years of school before the neighborhood was gentrified.

The analysis that is created with these variables is a linear growth model that tests the extent to which the rates of growth in test scores for each school are associated with level of neighborhood change.

Researchers of this study found negligible improvements in student achievement: for reading, a 1 percent increase in the fraction of residents with a bachelor's degree is associated with an annual increase in reading scores 0.002 points higher than Chicago Public Schools average—less than one half of 1 percent of the average growth each year. These insignificant findings extended across subjects. Further, there were high rates of student mobility in Chicago Public Schools. The prevalence of student mobility suggests that even if schools were to improve, the original low-income students would not benefit, as they would no longer reside in neighborhoods with these improved schools.

Though this study concluded with largely insignificant findings, the research design and methodology provides a solid framework for conducting a similar study in counties in New York State.

### **Significance and Implications of this Study**

This study has the potential to make three major contributions to the existing research on gentrification. First, it will contribute to the developing definition of gentrification. By continuing to incorporate race as an equally essential indicator and measure of gentrification in the state of New York, as other researchers have done in other locations, this study may reaffirm the need to

include race, or if it shows race to have an insignificant impact, may suggest the decreasing importance of race as a factor in the process of gentrification.

Secondly, this study will examine associations of changes in student achievement with neighborhood change, and add to the growing knowledge about this relationship. There are three major camps of gentrification research: 1) descriptive studies that dominated most of the initial research, 2) studies that seek to explain the causes of gentrification (consumption- and production-based theories), and 3) studies that examine the impact of gentrification on other sphere social policy. Because the third camp mostly consists of research on housing and displacement, the study on the impact gentrification has on student achievement will diversify the research on impact and foster a more multifaceted analysis of the implications of gentrification.

These potential contributions hold significant implications for policies concerning gentrification. Although a substantial amount of work has been to substantiate gentrification's negative impact on the availability of affordable housing, if this study reveals that there are positive or negative impacts of gentrification on education, policymakers would then have to consider the tradeoffs (or gains) in both the housing and education spheres.

### **Chapter 3: Data and Methods**

#### **Data Sources**

In order to address the general question of the impact of gentrification on student achievement, I will use data from two sources: Student achievement data will be collected from the New York State Department of Education on the standardized test performance of all third-graders attending neighborhood schools in the 63 counties of New York. The standardized test scores include both Math and English Language Arts statewide assessment over a period of 7 years (2006 through 2012). This specific time frame is due to data constraints, but fortunately also allows for the analysis of change in student achievement during the period of the most rapid gentrification in Brooklyn. From 2006 to 2012, several Brooklyn neighborhoods lost significant percentages of Black and Latino residents as interactive maps on the Census Explorer indicate.<sup>1</sup> The intent behind using third grade test scores is consistent with the research conducted in Chicago that determined third grade to be most appropriate given that students will not yet have been conditioned to standardized testing, nor been in the public school system long enough to be biased (Keels et al, 2013).

In terms of quantifying gentrification, I will collect data on demographic and population trends in New York's counties using the United States Census Bureau's American Community Survey. More specifically, I will focus on the educational attainment levels of residents, their household income, and the racial composition of each county. Educational attainment, income, and race will be used. These indicators seem to be the defining characteristics of gentrifying individuals according to the literature on this topic (Atkinson, 2000; Baxter, 2009; Billingham,

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<sup>1</sup> Census Explorer: <http://census.socialexplorer.com/pop-flash/>

2013; DeSena, 2009; Danyluk & Ley, 2006; Formoso, 2010; Glass, 1964; Glick, 2008; Hwang, 2014; Keels et al, 2013; Kozak, 2014; Lees, 2012; & Zukin, 1987).

Ultimately I will be constructing my own data set of New York State that will consist of standardized test scores by county, and the demographic and population trends in the 63 counties from 2006 through 2012.

### **Variables of Interest**

The dependent variable of interest, student achievement will be measured by student test scores on statewide standardized tests. Test scores are given in both raw scores and on a scale of 1 to 4. Scores of 470-680 are below standard (1), scores 661-683 meet basic standard (2), scored 684-706 meet proficiency standard (3), and scores 707-770 exceed proficiency standard (4). This thesis will make use of the percentage breakdown of the categorical scores for each county provided by the New York State Department of Education.

The independent variable of interest is broadly referred to as gentrification, but in this thesis takes the specific form of increased educational attainment levels, increased income levels, and decreasing levels of Black and Latino residents. Each of these indicators will be interpreted as continuous variables, since they are all measured as percentages by the US Census Bureau's America Community Survey. In addition to these independent variables, I will include the poverty rate, unemployment rate, and population density of each county as control variables. Each of these designated control variables are significant confounding variables whose impact should be clarified as each of them is related to student achievement and the other social identifiers I have included in my definition of gentrification.

### **Analysis**

My analysis will include bivariate regressions for each aspect of gentrification, and two separate multivariate regressions that seek to achieve more precise measures of the relationship between each indicator of gentrification and student achievement.

Bivariate Regression:

$$Y_{\kappa\tau} = \beta_0 + \beta_1 N_{\kappa\tau} + \beta_2 (year)_\tau + \varepsilon_{\kappa\tau}$$

In this bivariate regression,  $Y_{\kappa\tau}$  represents the test score in ELA or Math in county  $\kappa$  in year  $\tau$ ,  $N$  represents one of the three gentrification indicators in county  $\kappa$  in year  $\tau$ . This regression will serve as a preliminary measure on the association between the dependent variable (ELA and Math test scores) and each independent measure of gentrification from 2006 to 2012. I also included a dummy year variable to control for time. Since change over time is at the center of my analysis, this variable will be used in regression analyses.

After conducting these bivariate regressions, I will conduct the following two multivariate regressions:

Multivariate Regression #1:

$$Y_{\kappa\tau} = \beta_0 + \beta_1 (edattn)_{\kappa\tau} + \beta_2 (income)_{\kappa\tau} + \beta_3 (race)_{\kappa\tau} + \beta_4 (year)_\tau + \varepsilon_{\kappa\tau}$$

In this regression,  $Y_{\kappa\tau}$  represents the test score in ELA or Math in county  $\kappa$  in year  $\tau$ ,  $(edattn)_{\kappa\tau}$  represents the educational attainment level of residents in county  $\kappa$  in year  $\tau$ ,  $(income)_{\kappa\tau}$  represents the household income in county  $\kappa$  in year  $\tau$ , and  $(race)_{\kappa\tau}$  represents the racial demographics of county  $\kappa$  in year  $\tau$ . This regression allows for the assessment of the relationship between each component of gentrification and student achievement while controlling for the other measures. It also contributes to the growing literature about which aspect of gentrification is most impactful. The findings from this regression will hold implications for policy makers, as this

knowledge on which factors of gentrification most impact student achievement will influence how they address gentrification.

#### Multivariate Regression #2:

$$Y_{\kappa\tau} = \beta_0 + \beta_1(edattn)_{\kappa\tau} + \beta_2(income)_{\kappa\tau} + \beta_3(race)_{\kappa\tau} + \beta_4(poverty)_{\kappa\tau} \\ + \beta_5(unemp)_{\kappa\tau} + \beta_6(pop)_{\kappa\tau} + \beta_1(year)_{\tau} + \varepsilon_{\kappa\tau}$$

In this regression, I will add control variables for the poverty rate, unemployment rate, and the population density of each county  $\kappa$  in year  $\tau$ . Each of these additional controls all have the potential to correlate with the observed test scores as well as the measures of gentrification. Including them in this regression helps to net out the influence of potentially confounding factors.

These regressions serve to increasingly measure the effect of these different aspects of gentrification on counties throughout the state and will help to discern which aspect of gentrification is most relevant regarding student achievement or if the demographic changes associated with gentrification have any impact at all in counties in New York.

#### **Measurement**

The benefit of using data source like the New York State Department of Education is that the data are not self-reported, which eliminates some sources of bias. Both the Census and the NYS Department of Education encompass large populations that build a significant sample size, minimizing noisy data. Using data from the Census Bureau is also beneficial due to the yearly data collection provided by the American Community Survey, which offers a more precise look at the changes in student achievement and neighborhood demographics over time.

My data sources and methods also present significant challenges considering the granularity lost when measuring changes in student achievement and demographics changes at the county level rather than at the district level within the county. The Census Bureau does collect

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demographic information on lower geographic levels than the county, however, that information is only available in five-year aggregates. Since the key aim of this thesis is to examine changes in student achievement within the context of changes in neighborhood demographics, I have chosen to use the county level data, which is provided on a yearly basis.



## **Chapter 4: Results**

### **General Findings**

The impact of gentrification on student achievement is most apparent in the income aspect of gentrification. Of all three measures of gentrification median income consistently had the largest and most statistically significant association with mean ELA scores and ELA proficiency rates. However, the association between median income and these measures of student achievement is positive while other aspects of gentrification (educational attainment and racial demographics) have a negative association with student achievement. Although the median income variable was intended to capture the trends in income as it relates to gentrification, the fact that it has this positive relationship suggests that it may be more representative of the higher scores of new higher income students rather than of higher scores among students who remain in a place that is undergoing gentrification. Unfortunately, my data and methods are not designed in a way that allows me to discern which perspective of median income is being captured. The second most significant aspect of gentrification in relation to student achievement is race, as the percent of Black and Latino residents consistently has a statistically significant impact (also in relation to ELA scores and proficiency).

As control variables are factored in in the progression from bivariate analyses to Model 1 and Model 2, the impact of each aspect of gentrification fluctuates. Relationships between gentrification measures and student achievement appear more significant when student achievement is measured by the percent of students who are proficient. For example, in Table 2, Model 2 shows that a \$10,000 increase in median income would result in a 0.193 increase in mean ELA scores, but in Table 3, that same change is associated with a 0.247 percentage point

**Table 2: Association Between Measures of Gentrification and Reading and Math Test Scores for 39 counties in New York State Over 7 Years (2006 to 2012)**

	Mean English Language Arts Test Score					Mean Mathematics Test Score <sup>o</sup>				
	<i>Bivariate</i>	<i>Bivariate</i>	<i>Bivariate</i>	<i>Model 1</i>	<i>Model 2</i>	<i>Bivariate</i>	<i>Bivariate</i>	<i>Bivariate</i>	<i>Model 1</i>	<i>Model 2</i>
Percent with Bachelor's Degree or Higher	0.102 (0.063)			0.001 (0.051)	0.0 21 (0.051)	1.175 (2.777)			-3.759 (3.590)	-4.372 (3.956)
Median Income		0.215*** (0.037)		0.231*** (0.034)	0.193*** (0.046)		3.594 (1.847)		5.118* (2.372)	3.960 (3.864)
Percent Black or Latino			-0.064* (0.026)	-0.103*** (0.020)	-0.076** (0.024)			0.443 (1.492)	0.470 (1.511)	-2.352 (2.364)
Population					-0.010 (0.007)					1.255* (0.624)
Unemployment Rate					-0.154 (0.119)					7.171 (13.443)
Poverty Rate					-0.110 (0.105)					-4.835 (10.216)
Year	-1.0431*** (0.098)	-1.138***	-0.980*** (0.096)	-1.104*** (0.098)	-0.970*** (0.140)	4.121 (15.669)	3.612	4.293 (15.662)	4.169 (15.581)	5.115 (18.264)
R <sup>2</sup>	0.202	0.423	0.222	0.583	0.596	0.001	0.017	0.000	0.022	0.041
N	39	39	39	39	39	39	39	39	39	39

\* p-value < 0.05      \*\*p-value < 0.01      \*\*\*p-value < 0.001

Source: New York State Department of Education, US Census Bureau – American Community Survey

<sup>o</sup> Mean math scores were unavailable for 2006. These findings reflect 6 years of observation (2007-2012)

increase in ELA proficiency rates. Across the majority regression models, the passage of time maintains a statistically significant negative impact on student achievement. Though the impact on scores and proficiency levels suggests that the aspects of gentrification most relevant to student achievement are the median income and racial composition of the area, the real impact of both aspects is minor.

### **Effect by Subject**

Surprisingly, the effect of gentrification appeared very different depending on the subject. While educational attainment seemed to have a slightly positive association with mean ELA scores, it had a negative association with mean Math scores. The statistical significance of the relationship between mean ELA scores and the percentage of Black and Latino residents was much higher than for mean Math scores. However, as with mean test scores, the percentage of Black and Latino residents had a more statistically significant association with ELA proficiency than it did with Math proficiency. Overall, ELA scores and proficiency rates have more statistically significant results than math scores and proficiency rates, and are therefore referred to more frequently when analyzing the impact of gentrification on student achievement.

### **Effect of Gentrification on Student Achievement as Measured By Mean Test Scores**

Table 2 presents results from the bivariate and multivariate models discussed in Chapter 3, where outcomes are mean test scores in English Language Arts and Mathematics. Through a series of bivariate regressions, I examined the relationship between the three separate measures of gentrification and mean test scores, while controlling for a linear time trend.

These initial bivariate regressions indicate that median income has the greatest impact on test scores (with a coefficient of 0.215) in relation to the other gentrification measures. They also show that a one percent increase in the fraction of residents who hold a Bachelor's degree or

**Table 3: Association Between Measures of Gentrification and Reading and Math Proficiency for 39 Counties in New York State Over 7 Years (2006-2012)**

	English Language Arts Proficiency					Mathematics Proficiency				
	<i>Bivariate</i>	<i>Bivariate</i>	<i>Bivariate</i>	<i>Model 1</i>	<i>Model 2</i>	<i>Bivariate</i>	<i>Bivariate</i>	<i>Bivariate</i>	<i>Model 1</i>	<i>Model 2</i>
Percent with Bachelor's Degree or Higher	0.136 (0.093)			-0.055 (0.066)	-0.058 (0.068)	0.167* (0.069)			-0.074 (0.084)	-0.114 (0.092)
Median Income		0.325*** (0.052)		0.350*** (0.044)	0.247*** (0.066)		0.242*** (0.044)		0.269*** (0.056)	0.198* (0.091)
Percent Black or Latino			-0.146** (0.041)	-0.184*** (0.028)	-0.151*** (0.039)			-0.075 (0.037)	-0.088* (0.036)	-0.085 (0.058)
Population					0.004 (0.010)					2.41x10 <sup>-6</sup>
Unemployment Rate					-0.438* (0.217)					-0.547 (0.336)
Poverty Rate					-0.273 (0.168)					-0.240 (0.242)
Year	-3.036*** (0.200)	-3.183***	-2.934*** (0.197)	-3.108*** (0.193)	-2.707*** (0.250)	-5.446*** (0.335)	-7.422***	-5.369*** (0.336)	-5.497*** (0.316)	-5.025*** (0.388)
R <sup>2</sup>	0.367	0.506	0.418	0.616	0.629	0.616	0.651	0.610	0.660	0.669
N	39	39	39	39	39	39	39	39	39	39

\* p-value < 0.05      \*\*p-value < 0.01      \*\*\*p-value < 0.001

Source: New York State Department of Education, US Census Bureau – American Community Survey

higher to increase mean ELA scores by 0.102 points, and a one percent increase in the fraction of Black and Latino residents to decrease mean ELA scores by 0.064 points. Of these three bivariate relationships, only median income and the fraction of Black and Latino residents are statistically significant. Interestingly, results also illustrate a downward trend in ELA test scores over time. This relationship is much larger than any of the gentrification measures' and it maintains high statistical significance in each bivariate model.

Also in Table 2 are the findings from the first multivariate regression (labeled Model 1). These findings factor in each aspect gentrification while controlling for secular trends in test scores over time. The impact (or lack thereof) of median income increased slightly, while the impact of educational attainment levels (i.e. the percentage of those with a Bachelor's degree or more) decreased significantly. Lastly, the impact of the fraction of Black and Latino residents increased in both magnitude and statistical significance.

Finally, in the second multivariate regression (labeled Model 2), I included several control variables that are highly correlated with the dependent and independent variables. These controls include the total population, the poverty rate, and the unemployment rate. None of these controls proved to be statistically significant in themselves, however, after factoring them in, the magnitude of the percentage Black and Latino residents as well as median income dropped slightly (in comparison to the first multivariate regression). The significance of the percentage of Black and Latino residents also decreased. Given that poverty and unemployment are often racialized, this decrease in the impact of fraction Black and Latino is not unexpected. The racialization of poverty and unemployment are part of the expected correlation between these additional controls and aspects of gentrification and student achievement. In addition to racialized poverty the impact of poverty on student achievement has also been well studied and documented.

### **Effect of Gentrification on Student Achievement as Measured By Proficiency**

In addition to examining the effect of gentrification on mean test scores, I also examined its effect on proficiency in both English Language Arts and Mathematics. These statistical analyses revealed similar results as the mean test score findings. While the bivariate analyses indicated that the percentage of those with a Bachelor's degree or higher might be the most pressing factor, as controls were increasingly introduced, the impact of the percentage of residents with a Bachelor's degree or higher decreased in magnitude. Median income had the largest and most statistically significant impact, with the percentage Black or Latino having the next largest influence (Table 3).

It is important to note that when looking at gentrification's impact on student achievement through the scope of mean test scores, regardless of the statistical significance, the real impact was miniscule. For example, for mean ELA scores, with a mean of approximately 667 and a standard deviation of about 5 (Table 4), increasing or decreasing mean test scores by a fraction of a point is hardly practically significant. The impact on proficiency was similarly small. For example, a one percent increase in Black or Latino residents is associated with a 0.151 decrease in ELA proficiency (Table 3: Model 2). With a mean of ~65.2 and standard deviation of ~10.4 (Table 4), ELA proficiency would only change significantly if there were a drastic change in the racial demographics.

**Table 4: Descriptive Statistics of New York State Over 7 Years (2006-2012)**

Descriptive Statistics		
<i>Variable</i>	<i>Mean</i>	<i>Standard Deviation</i>
Mean ELA Score	667.907	5.954
Mean Math Score <sup>°</sup>	714.538	399.816
ELA Proficiency	65.160	10.441
Math Proficiency	75.118	15.377
Percent with Bachelor's Degree or Higher	28.655	9.650
Median Income (increments of \$1,000s)	54.841	14.357
Percent Black or Latino	17.503	17.749
Total Population (increments of 10,000)	48.078	62.080
Poverty Rate	13.447	4.784
Unemployment Rate	7.851	2.606

N = 39 counties

<sup>°</sup> Mean math scores were unavailable for 2006.

Source: US Census – American Community Survey, New York State Department of Education

## **Chapter 5: Conclusions**

### **The Relationship Between Gentrification and Student Achievement**

The main research question for this thesis was to explore the relationship between gentrification and student achievement. In doing so, this thesis sought to contribute to the growing definition of gentrification as well as to the growing literature on the association between gentrification and student achievement. Given prior research on gentrification itself, I settled on a three-pronged definition of gentrification that consisted of racial demographics, median income, and educational attainment levels. Measuring student achievement by standardized test scores was also motivated by prior literature, which indicated that numerical representations of student achievement were least biased and most generalizable.

A series of multivariate regressions indicated that gentrification has little to no real impact on student achievement. Although income and racial factors appear to have the most impact (Model 2 in Table 2 and Table 3), even these associations are not practically significant given the mean and standard deviation of student test scores (mean: ~668; st. dev.: ~6) or proficiency levels (mean: ~651 st. dev.: ~10) (increases in median income and percentages of Black and Latino residents are associated with changes of less than half a point in test scores and less than half a percentage point in proficiency). Although these results did not completely confirm my working hypothesis that gentrification would have a negative association with student achievement, these regressions did provide some direction for moving forward with gentrification studies, as to which aspect of gentrification might be more pertinent to future research on the subject. The fact that the racial makeup of a county (conditional on equal income and educational attainment levels) was a prominent aspect of gentrification in its relationship with student achievement indicates that race



is not to be discredited. The study of gentrification, though rooted in class-based and racial discourse, has recently tended to place more emphasis on class, but these findings show that race remains relevant.

### **Limitations**

Ideally, future work should be modeled after the Keels et al (2013) study on neighborhood change and student achievement in Chicago. These authors focus on the relationship between gentrification and student performance on a much smaller geographic level (i.e., census tracts) over a longer period of time. While gentrification eventually manifests across an entire county, it starts on much smaller geographic scales (blocks or neighborhoods within a county). These authors were also able to isolate the students whose families remain in neighborhoods where gentrification is occurring. This part of their design addresses the possibility that observed changes in student achievement might be the result of newly arrived students of gentrifying families rather than the students who were there before the change. Additionally, Keels et al (2013) were able to observe the relationship between neighborhood change and student achievement over the span of decades. Due to the fact that my main source, the Census Bureau, did not maintain demographic data on similarly granular geographic levels and did not maintain annual data consistently (the American Community Survey, which provides yearly data just started in 2005), this thesis was limited to county-level observations for seven years. Furthermore, of the 63 counties in the state, only 39 counties had yearly demographic data.

Another significant limitation revealed itself in the analysis stage. Although median income had the largest and most significant impact on student achievement, as stated in Chapter 4, it is not clear whether this impact is of the students' own household income or that of

surrounding gentrifiers. This uncertainty exists for all of variables I used to measure gentrification as there is no way to make this distinction in the design of my data or models of statistical analysis.

While these data constraints presented limitations in certain ways, it also led to the creation of a statewide data set that can be used for future study involving these variables. Also the decision to use county-level data for seven years allowed for a larger, less biased data set than would have been possible if I had attempted to use neighborhoods and census tracts as my level of analysis. In order to address these limitations, this thesis could be continued for at least another three years using data from the American Community Survey to capture the relationship between gentrification and student achievement over ten years.

### **Policy Implications**

Though the intent of this thesis was to determine the effects and policy implications of gentrification as it relates to student achievement, results indicate that a more pressing issue is the decline of student achievement over time in New York. In each regression model, regardless of the number of variables incorporated, results showed that over time student achievement (in mean test scores and proficiency) decreased gradually. These findings hold serious implications for reforming and improving education in New York. The association between education and other socioeconomic indicators such as employment status or income have been well established by social scientists. Therefore, although declining student achievement was an unexpected finding, it nevertheless demands attention from policymakers in the state to implement practices and changes that will reverse these trends.

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