

# **Affordable Housing and Its Impact on Economic Diversity of New York City Neighborhoods**

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by  
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# **ABSTRACT**

The study analyses the effectiveness of affordable housing as a policy tool to increase neighborhood economic diversity in New York City from 1990 to 2015. Due to limited time and data availability, it assesses neighborhood economic diversity mainly based on household income and educational attainment diversity index calculated from US census and American Community Service data.

Affordable housing is the major tool adopted by local governments to improve affordability and economic diversity. In Mayor de Blasio's new affordable housing plan, increase neighborhood economic diversity by creating more affordable units has been listed as one of the main goals. However, few previous studies discussed and verified the effectiveness of affordable housing as a tool to increase economic diversity other than its impact on neighborhood. The study, under such context, aims to examine the justification and effectiveness of this policy goal by exploring whether past affordable housing units increase led to economic diversity improvement in New York City neighborhoods.

The regression analysis results of the study reveal that from 1991-2000, proportion of new affordable housing units have a statistically significant relationship with changes in economic diversity. This relationship is weakened in the later 15 years. It is also a highly volatile relationship that can be easily affected by affordable housing program types, gentrification and many other factors.

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## **ii. LIST OF ABBREVIATIONS**

**AMI** Area Median Income

**MIH** Mandatory Inclusionary Housing

**ACS** American Community Survey

**NTA** Neighborhood Tabulation Areas

**DOF** New York City Department of Finance

**HUD** U.S. Department of Housing and Urban Development

**NYCHA** New York City Housing Authority

# CHAPTER 1: INTRODUCTION

## 1.1. Background

New York City's affordability crisis has reached a tipping point. The crisis is caused by several reasons including insufficient affordable units supply, renter wages stagnation and continuous rent increase in the past 20 years. As a result, many New Yorkers currently have limited options for housing with unaffordable high rent. The mismatch between demand for, and the supply of, housing is one of the major cause of the crisis. It stems from the fact that for the first time in decades, more people are moving to or staying in the City than leaving. It was under such context, where Housing New York was released by Bill de Blasio to address the issue. In this plan, except for the main goal to create more affordable housing units, increase economic diversity has also been listed as a main goal to achieve.

Economic diversity has never been strictly defined. It is generally seen as the combined diversity of a various variables including income, race and educational attainment. Although practical impact vary from local conditions, in the long run, higher economic diversity is expected to generate more development opportunities, sustainable growth and other benefits based on previous studies, which will be discussed in the literature review. Based on that ideology, there's a growing trend of increasing neighborhood economic diversity by creating more affordable housing units, including New York City. By adopting this methodology, local governments hope that when address the affordability of a certain neighborhood, higher proportion of lower income groups can remain without being displaced.

But the logic flaws in two aspects. First, although previous studies can prove affordable housing's impact on several neighborhood characteristics, whether that impact leads to economic



diversity increase has never been theoretically and practically supported well in any related studies. Second, while increasing affordability, more development opportunities are also normally introduced to neighborhoods which drive up the housing rental price and living cost. This is especially the case for project-based affordable housing created through policy like MIH that mandates affordable housing as part of rezoning and brings in many new development that could potentially gentrify the neighborhood. As MIH has become the main approach of New York City in providing sufficient affordable units in recent years, the effectiveness of maintaining economic diversity through affordable housing is even more at doubt.

The study mainly tackles the first logic flaw by conducting the regression analysis of New York City neighborhoods economic diversity, supplementing to the existing research. Although it cannot identify to what extent variables that are not included in the controlled variables (proportion of existing affordable housing units, homeownership rate and median gross rent percentage increase) affect neighborhood economic diversity, it evaluates the statistical relationship between the affordable housing and neighborhood economic diversity. It also presents policy recommendation that can potentially address the second logic flaw.

## **1.2. Research Question**

The main research question of this thesis is how effective affordable housing is as a tool in improving neighborhood economic diversity in New York City. The main research question can be broken down into several sub-questions:

1. What is the definition of affordable housing?
2. How to measure neighborhood economic diversity?

3. What geographic study unit does the thesis focus on?
4. How to quantify the effectiveness of affordable housing in improving economic diversity?

For data analysis, affordable housing is defined as affordable housing units under a certain type of subsidized housing programs in New York City including NYCHA Public Housing, 421-a Tax Incentive Program or Inclusionary Zoning etc. Both existing new construction and preservation programs are considered for the time period from 1991 to 2015. In addition to that, the thesis also reviews affordable housing related literatures within or outside the New York City context, which sees affordable housing as a broader and diverse concept that can vary from different region and time periods.

So far, there's no generally accepted standard for measuring neighborhood economic diversity. A variety of factors such as gentrification and displacement, of which the data are hard to collect, also increase the difficulty in measuring neighborhood economic diversity more objectively. The majority of past studies interpret economic diversity as an aggregated diversity of several characteristics including income, education, race and others depending on study purposes. In this study, due to time and data availability, neighborhood economic diversity is the weighted sum of income diversity and educational attainment diversity. Shannon diversity index is adopted for calculating diversity based on previous similar studies' approaches, which will be discussed later in the methodology chapter.

The study area of this thesis is New York City and its five boroughs in general. Specifically, for the data analysis, diversity and affordable housing units change calculation are based on census tracts categorized by neighborhoods defined in the Neighborhood Tabulation Code.

Census tract boundaries of several neighborhoods changed throughout the three study period. That change is considered in the analysis process and adjusted to the latest boundary definition.

The effectiveness of affordable housing as a tool is relatively difficult to concretize. To evaluate that, the study first identify the impact affordable housing have on economic diversity over all study periods through regression analysis. The higher the increase in economic diversity caused by one new affordable housing unit, the better the effectiveness.

By answering the above four sub-questions through the thesis analysis, the main research question can be addressed.

# **CHAPTER 2: LITERATURE REVIEW**

## **2.1. Affordable Housing**

The definition of affordable housing varies a lot from the region, demographics and other factors. In general, it refers to housing created to assist families who cannot afford appropriate housing under their current incomes and to protect them from financial difficulty or low housing quality. It is also called public or social housing in a lot of areas, indicating the difference in target groups or program features in addition to address affordability. (Milligan et al, 2004) Indeed, the embedded difference in government power, economic development or existing policy goal and implementation all lead to various definition of affordability and approach of affordable housing supply, either public or private.

In United States, instead of formulating a generally accepted standard for affordable housing, literature centers around the importance of affordable housing, housing policy and program implementation, as well as their impact on the corresponding policy area. This is partially because of the political structure of United States. Each level of government has relatively high independency and flexibility in power structure and policy implementations are mostly completed by local governments. (Katz, Turner, 2003) This structural feature is also shown in the operation of public housing, one of the largest housing program at federal level. Although it is funded by federal government, it is managed by local housing authorities.

Scholars first argue the importance of affordable housing from the perspective that unhealthy neighborhoods and unaffordable housings lower residents' living quality including education, incomes etc. (Bratt 2002; Dunn 2000) If low-income households concentrate in one area, the negative impact of affordable housing insufficiency will be more intense and persistent (Galster

2005). Besides, high density of low-income families often leads to racial or ethnic minorities' concentration (Briggs, 2005; Katz 2006.) Thus, the demand and necessity of supplying more affordable housing is high for such neighborhoods. It is believed that affordable housing can significantly increase the racial and economic diversity in neighborhoods. (Katz, Turner, 2003)

Discussion regarding the policy implementation focuses relatively more on local level challenges. The housing crisis has been increasingly aggravating in the past few years across United States while the more diversified population, changing housing demand and other factors even complicated the situation. Besides, various characteristics and demand of each community necessitate an analysis that being conducted at local level. For a high cost and diverse city like New York, challenges for providing sufficient affordable housing supply are as follow.

First, complicated zoning codes, high land costs and difficulty in finding sufficient financing limit affordable housing development altogether. (Cowan 2006.) Although this issue might be slightly addressed through the mandatory inclusionary housing program which mandates affordable housing creation in rezoning development, the problem of funding remains. Second, public opposition can also slow down affordable housing development. (Koebel et al. 2004; Stein 1992). Together with the governmental structural issues, these limitations can significant delay affordable housing policies and plans implementation. (Pendall 1999; Stein 1996.)

Both positive and negative voices appeared among the discussion revolving the impact of affordable housing on the implementation area. Under most circumstances, affordable housing have been effective in addressing existing affordability crisis as well as introducing more development opportunities in the area. Due to the complexity of the affordable housing program's nature, however, many concerns are also brought up including the ambiguity of affordability definition as well as the potential gentrification caused by increasing development

in a city like a New York City where serious poverty concentration and segregation already existed. Currently, most of the affordable housing programs categorize their target residents by income level. Study reveals that a fixed standard cannot reflect other potential factors such as household size, income-to-rent ratios' impact on low-income households. That explains the extensive mismatch of affordable housing target income level and actual mean low-income level around city neighborhoods.

## **2.2. Affordable Housing's Neighborhood Impact**

Affordable housing's potential impact on economic diversity can be caused by affordable housing itself and its neighborhood impact. By adding new affordable housing units in a neighborhood, it immediately brings in or maintains a certain income group with different educational attainment levels that the newly-added affordable units target. As a result, the original distribution of household income and educational attainment changes. This is particularly the case when there's a big difference between the affordable housing target income group level and the original dominant income group in a neighborhood.

Previous studies conclude that housing can influence neighborhoods as it is a significant component of a neighborhood's overall character as well as location or social-economic characteristics. Affordable housing, as part of a neighborhood's housing stock, is expected to have different impact because of its unique feature which targets income groups that cannot actually afford it and are mostly occupied by relatively poor people (Freeman and Botein, 2002).

Rothenberg and Glaster identified that affordable housing has significant impact on property values, poverty concentration, racial transition and crime rate. They analyze affordable housing's

potential impact on property values based on a three types of sub-market assumption. Analysis result suggests that the biggest impact is achieved when subsidized housing are built in rich neighborhoods. As the lower quality and lower income residents of subsidized housing in such neighborhoods is considered as deleterious effect on property values. In the medium-quality market, the impact is relatively ambiguous, no obvious effect is expected as the housing quality is mostly align with the neighborhood level. Finally, for subsidized housing built in low-quality market, the impact is also ambiguous. Although the housing quality should be better than the neighborhood average level, the impact of tenants are relatively hard to estimate (Rothenberg and Glaster, 1991).

Affordable housing's impact on concentrating poor is obvious. Freeman and Botein point that as the property values of affordable housing declines enough to be truly enough, it eventually concentrates more poor people. It also stigmatizes surrounding neighborhoods and causes non-poor residents leaving the neighborhoods (Freeman and Botein, 2002). Besides, Wilson, in the neighborhood effect thesis, suggests that poverty concentration might also be resulted from the neighborhood effects. The theory of neighborhood effects is that individual behaviors will be influenced by the attitudes of individuals of surrounding neighborhoods. Therefore, affordable housing and the poor residents it attracts might discourage non-poor residents from the surrounding neighborhoods which further leads to poverty concentration. Affordable housing also have impact on racial transition in similar way as normally white people have higher income as found out by Casey and Goering respectively. They conclude that white people are likely to leave the neighborhoods with poverty concentration. Neighborhoods will then be dominated by lower income groups who are mostly black and Latinos. (Casey 1992; Goering 1994) Affordable housing are also associated to higher crime rate as people that are disproportionately identified in

street crime are also disproportionately represented in affordable housing residents, such as poor black and Latino people (Sampson and Wilson 1995). Besides that, unofficial residents as well as the poor people that poor affordable housing residents that are more likely to know, also raise increased suspect on higher crime rate. Physical features of affordable housing units might also have an impact on crime. Affordable housing units are sometimes set aside from market-rate residential development which might form the impression for potential criminals that they are good protector for crime conducting. Project-based affordable housing, according to previous empirical study, also has a high spillover effect to surrounding neighborhoods in terms of crime.

Assumptions that affordable housing's negative impact on neighborhood leads to economic diversity decline should not be made. The literature only suggests that diversity change can be caused which includes both increase and decrease. It should also be emphasized that economic diversity change doesn't equal to changes in all groups simultaneously. Changes in any household income or education attainment group can lead to changes in economic diversity.

### **2.3. Economic Diversity**

Previous literature that directly address local level economic diversity are relatively rare. It is partially due to the vague definition of economic diversity as well as the historical emphasis on social diversity in related neighborhood studies.

Although the focus on economic diversity in community planning and affordable housing development are relatively new, studies on social diversity started early due to the widely spread segregation and poverty concentration in United States. More diverse social-mixing has long been seen as a beneficial goal for neighborhoods as it contributes to more equitable distribution



of resources. (Briggs, 2005). In addition, mixed social groups are seen as the path towards more peaceful and stable society. It is also important for higher level of public engagement as higher homogeneity is more likely to cause decline in community's motivation for public engagement. (Oliver, 2001). The reasons for low social diversity were mostly studied regarding race and ethnicity in past literature. That part of literature is not reviewed in this thesis. Race still matters significantly for a diverse city like New York City that has a long history of segregation. But the aim of the thesis is to study more variables that haven't been analyzed in deep in terms of evaluating neighborhood diversity.

Previous studies on income diversity suggest that the more homogenous neighborhoods are, the more concentrated the wealth or poverty in there. (Hardman & Ioannides, 2004) Based on analysis conducted at national level, there's high proportion of existing stable neighborhoods with diverse income. (Talen, 2006) Such neighborhoods also share common characteristics like more diverse ownership types and housing values. (Galster, 2005)

Existing literature mostly study economic diversity at a regional level. It is believed that higher economic diversity at regional level can create high stability and growth to the region. (Siegel, 1995) Although NYU Furman Center published a short study regarding the affordable strategies that New York City can adopt in order to maintain economic diversity, it mentions that no empirical analysis has been conducted so far to verify the effectiveness of such strategies. (NYU Furman Center, 2016).

## **2.4. New York City Affordable Housing**

The development of any new housing program and policy will build on the city's legacy. It is important to review New York City's past policies of housing to understand the focus at different stages and how does that influence New York City and different from other cities.

New York City has always been a pioneer in addressing affordability crisis and formulating housing policy. That motivation roots in the long-term segregation and inequality exist in this largest metropolis in the world. (Bloom & Lasner, 2015) Back in 1920s, affordable housing were believed by most leaders more as the responsibility of private investors. As dominant low-income housing were provided by private sector, government's role in such development was disapproved and it somehow led to some extent of tension between private and public sector. Situation significantly changed with the foundation of NYCHA in 1934 together with the offer of long-term and low-interest loan for public housing after the 1937 Federal Housing Act. NYCHA was greatly involved in the tenants' selection for those public housing in order to stabilize the economic diversity throughout future development. Public housing first revealed its flaws after World War II while NYCHA failed to offer housing for residents that were displaced because of the new affordable housing units that drove local rental price up. Mitchell-Lama was introduced to the city at this point to support limited-dividend development. (Bloom & Lasner, 2015) Section 8 and Housing Voucher followed around 1970s under Community Development Act. It marked the beginning of a new era where private investment were leveraged again in affordable housing development. However, public housing, which is the program the city used to largely relied on to maintain affordability at governmental level was never reinvested by the federal government due the deficiency fall within the system itself.

After 1980s, local government played a significant active role in developing affordable housing cooperating with private developers, symbolized with the release of the Ten Year Plan for Housing by Mayor Koch. The plan proposed to build 100,000 units for low-income residents and families within 5 years then was extended after 3 years. (Koch, 1985) The plan is meaningful as the development is first mainly funded by the city supplementing by state and federal sources.

Based on Furman Center's analysis on the final deliverable of the plan, the improvement that affordable housing units brought to surrounding neighborhoods are obvious. This is also the stage while neighborhood revitalization first became part of the main focus of the housing policy other than address affordability itself. Building on the efforts made through the Ten Year Plan for Housing implementation, the city was able to develop a variety of creative and effective approaches in increasing affordability. But the ever-changing environment, less city-owned land as well as insufficient capital are all demanding more innovation in housing policy formulation ever since.

## **CHAPTER 3: METHODOLOGY**

### **3.1. Data Overview**

There are three main data sources for this thesis: NYU Furman Center Subsidized Housing Database, US Census and American Community Survey. American Community Survey 5-Year Estimates is used instead of US Census data for year 2010 and 2015 as household income data for each census tract are not available in Census 2010.

NYU Furman Center Subsidized Housing Database, based on CoreData.nyc is a property level database that contains multiple categories of information of a certain property that is located in New York City. All registered residential properties has at least one active housing subsidy record. The database mostly covers multi-family housing. Furman Center collects most of the data by acquiring them from a lot of government sources including HUD, NYCDOF, and NYCHA etc. In this study, census tract, units count and the affordable program start year are the three attributes that are used to identify corresponding neighborhood and units changes in certain time period. Some properties' unit counts are unsubsidized units included and some detailed affordable period dates are missing due to limited data availability. These are the major drawbacks of Furman Center Subsidized Housing database. That said, it is still the only data source with the most comprehensive and updated data on New York City's affordable housing properties.

Decennial Census is the census of United States released on a 10-year basis from 1970. It used to consist both a long form and a short form collecting personal information like age, sex as well as other information such as housing characteristics, employment status. From 2010, the survey is streamlined and only includes the short form as the data collected from the long form are all

reported in ACS. The educational attainment and household income census data of 1990 and 2000 are used in the thesis to calculate diversity changes in New York City neighborhoods.

ACS is an annual survey that collects data in the same way as the census long form. ACS reflects estimated result as it covers only a sample of individuals and housing units. This leads to very high uncertainty in data accuracy. To avoid that as much as possible, the 5-year estimates is used in the study for its larger sample and longer period. Although census relatively has a higher accuracy than ACS because of the sample size, it cannot reveal fully accurate and most updated demographics because of its 10-year long period. The educational attainment and household income data of 2006-2010 5-Year Estimates and 2011-2015 5-Year Estimates are used in the data analysis.

NTA code is another dataset that was adopted in the data analysis in addition to the three other main data sources. It was originally created to project populations at a small area level. The minimum population for each geographic unit is 15,000 as population size is associated with projection accuracy. It contains some neighborhood boundary combinations instead of following the original boundary of all the neighborhoods. NTA code has been helpful in offering a compromised geographic units measurement between community districts and census tracts for data analysis. The application of NTA in the study enables diversity and affordable housing units changes calculation at neighborhood level by matching with census tracts in Subsidized Housing Database, US Census as well as ACS. The match for each study period is adjusted based on census tract boundary changes occurred in the entire study period.

### 3.2. Methodological Approach

The overall methodology of the thesis is one adopted by the majority of quantitative neighborhood related studies that explore the relationship between different variables by descriptive statistics and regression analysis. For the calculation of diversity, the thesis refers to the method adopted by Galster and Booza for identifying bipolar neighborhoods, which is entropy index. Diversity groups are divided respectively for household income and educational attainment. Based on the original grouping in census data, which ranges from less than \$10,000 to more than \$150,000, income groups are defined as below.

<b>Income Groups</b>
Less than \$25,000
\$25,000 to \$50,000
\$50,000 to \$75,000
\$75,000 to \$100,000
\$100,000 to \$125,000
\$125,000 to \$150,000
More than \$150,000

**Table 3.2.1: Definition of Income Groups**

It is not defined by the percentage of median household income but is divided by a \$25,000 break for each group. This is because unlike family, household generally has a higher variation of number of members. It makes the median of household income of a certain number of members not applicable. Besides, the household income data is not categorized by household member quantity. The income in each year are all inflation adjusted based on 2015. For educational attainment, the definition of groups are as below.

<b>Educational attainment Groups</b>
Less than High School Degree
High School Graduate
Associate Degree/Some College
Bachelor Degree
Graduate Degree (Master, PhD and other professional degrees)

**Table 3.2.2: Definition of Educational Attainment**

Groupings of educational attainment mostly follow the original groupings in the census data. Master, Phd and other professional degrees are combined as one group since it is unrealistic to expect number of residents with a certain type of professional degree will equal to all the others in any case. Calculate the three professional degrees as independent category will significantly decrease the diversity level.

Shannon's Index of Diversity is adopted for diversity index calculation as one of the most fundamental and concise diversity index. It reflects the diversity ( $H'$ ) based on frequency observations in each group. The higher the number is, the more equal the number is in each group. Simpson index is considered for calculating educational attainment as it is ordinal variable. However, to maintain the consistency between the diversity of each variable, Shannon index is adopted for diversity calculation of both variables.

Shannon index is generally defined as:

$$H' = \log n - \frac{1}{n} \sum_{i=1}^k n_i \log n_i$$

In the formula,  $n_i$  is the number of observations for all present elements in the  $i^{\text{th}}$  of  $k$  (non-empty) categories.  $\sum_{i=1}^k n_i$  calculates the size of all present elements in each neighborhood.

Evenness ( $J'$ ) is used to better illustrate the diversity level in the later analysis. The formula is shown as below:

$$J' = H' / H_{max}$$

$H_{max}$ , which is the maximum number of the diversity of a group of  $k$  categories, is calculated as:

$$H_{max} = \log k$$

The evenness ranges from 0-1. The closer it is to 1, the higher the diversity of a certain neighborhood is. The base for logarithm is 10 in the analysis of this thesis. Economic Diversity, is calculated based on the weight of the  $H_{max}$  of each diversity to the sum, 0.55 and 0.45 respectively for income and educational attainment.

The study includes both multivariate and multiple variable regression. Multivariate regression is used as there are more than one dependent variable and it allows the study to explore the statistically significance of a specific independent variable's coefficient over different equation. Multiple variable regression is adopted specifically for economic diversity as the it is the weighted sum of household income diversity and educational attainment diversity, which makes it highly correlated to the other two and thus cannot be included as a dependent variable as part of the multivariate regression.

Below is a list of all the dependent and independent variables with detailed information. Proportion of existing affordable housing units, homeownership rate changes and median gross rent percentage increase are added as independent variables in addition to the proportion of new affordable units as controlled variables considering their potential impact on economic diversity too base on the literature.



<b>Variables</b>	<b>Variables Name in Summary Output</b>	<b>Definition</b>	<b>Category</b>
Changes in Household Income Diversity	income	Change in household income diversity between each study period	Multivariate Regression Dependent Variables
Changes in Educational Attainment Diversity	edu	Change in educational attainment diversity between each study period	
Changes in Economic Diversity	eco	Change in economic diversity between each study period	Multiple Variable Regression Variable
Proportion of New Affordable Housing Units	ah	Increase in affordable housing units during each study period divided by the total number of housing units at the end of each study period	Independent Variables
Proportion of Existing Affordable Housing Units	eah	Number of existing affordable housing units at the beginning of each study period divided by the total number of housing units at the end of each study period	
Homeownership rate change	ho	Homeownership rate changes during each study period	
Median Gross Rent Percentage Increase		rent	Increase in median gross rent over each study period divided by the previous year's median gross rent

**Table 3.2.3: Regression Analysis Variables Summary**

Specifically, if affordable housing units increase can actually cause increase in economic diversity, neighborhoods with higher proportion of affordable housing at the beginning of each study period might have lower diversity increase as it is already more diverse. Homeownership rate is also considered as compared to renters, homeowners are less encouraged to move but stay, which might result in less impact on the diversity spectrum caused by affordable housing. Median gross rent is added as another controlled variable, in contrast, because of the possibility that rent increase can drive renters out, which cause diversity changes other than affordable housing itself.

# CHAPTER 4: FINDINGS

## 4.1. Descriptive Analysis

In this part, the overall trend of each variable’s change is reviewed and analyzed. The result will be discussed together with the regression analysis result in order to develop an overarching understanding of affordable housing units increase’s impact on New York City’s neighborhood economic diversity.

### 4.1.1. Affordable Housing Units

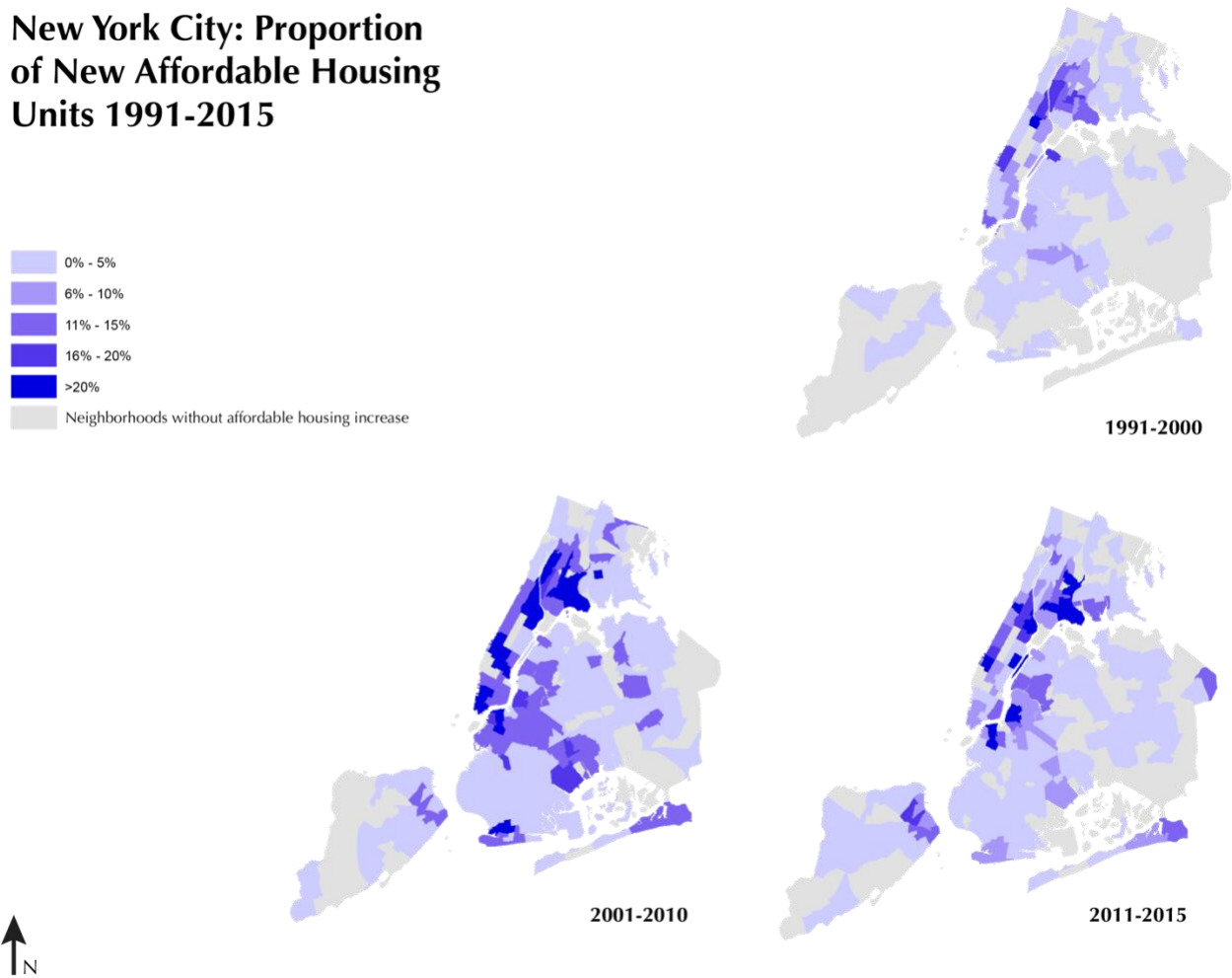
Affordable housing units significantly increased from 2001-2015 compared to 1991-2000. The increase from the 2011-2015 5-year period surpassed half of the total increase between 2001 and 2010, suggesting that this increase trend has been constantly growing in the past few years.

Year	1991-2000(N=116)	2001-2010(N=170)	2011-2015(N=155)
Mean	564	1368	984
Median	277	630	478
Sum	65410	232664	152570

**Table 4.1.1: Summary of Affordable Housing Units Increase in New York City, 1991-2015 (NYU Furman Center Subsidized Housing Database)**

Specifically, the average number of newly added affordable housing units in each neighborhood during 2001-2010 it’s almost 3 times higher than that number during 1991-2000. The relatively high median for 2001-2010 suggests that high increase in new units happened in more than half of the neighborhoods during that period. During 2011-2015, the median is 478, around 80% of that of 2001-2010, indicating that there’s a growing trend in affordable housing development in recent years.

## New York City: Proportion of New Affordable Housing Units 1991-2015



**Figure 4.1.1: Affordable Housing Units Increase Comparison by Percentage in New York City from 1991-2015 (Furman Center Subsidized Housing Database, NYC Open Data)**

The map above illustrates the overall geographic distribution of the proportion of affordable housing units increase in New York City. The grey parts represent areas with no new affordable housing units. Before 2000, neighborhoods with high proportion of new affordable housing units concentrate in Manhattan and Bronx. Between 2001 and 2010, development greatly expanded to Brooklyn and Queens. Number of neighborhoods with a proportion higher than 10% also doubled. Between 2011 and 2015, neighborhoods with new affordable developments are similar

as 2001-2010, but the high proportion areas mostly concentrate in the waterfront of Brooklyn and Queens as well as Bronx.

### 4.1.2. Neighborhood Economic Diversity

To better illustrate the diversity of a neighborhood, diversity are all marked in their evenness  $J$ , calculated by  $H_0/H_{max}$ . It measures the ratio of each diversity to the maximum of diversity. The closer the evenness to 1, the higher diversity the neighborhood has.

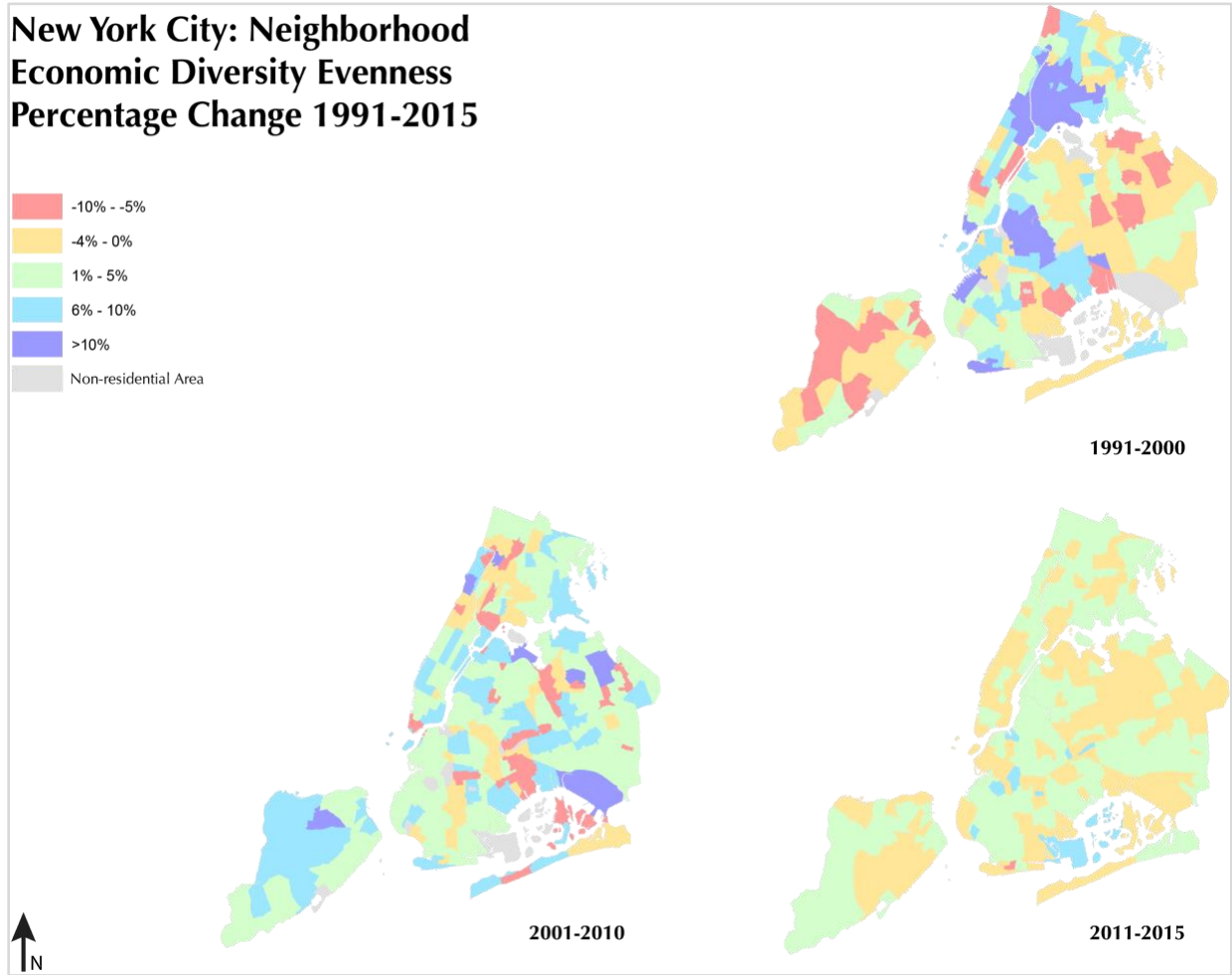
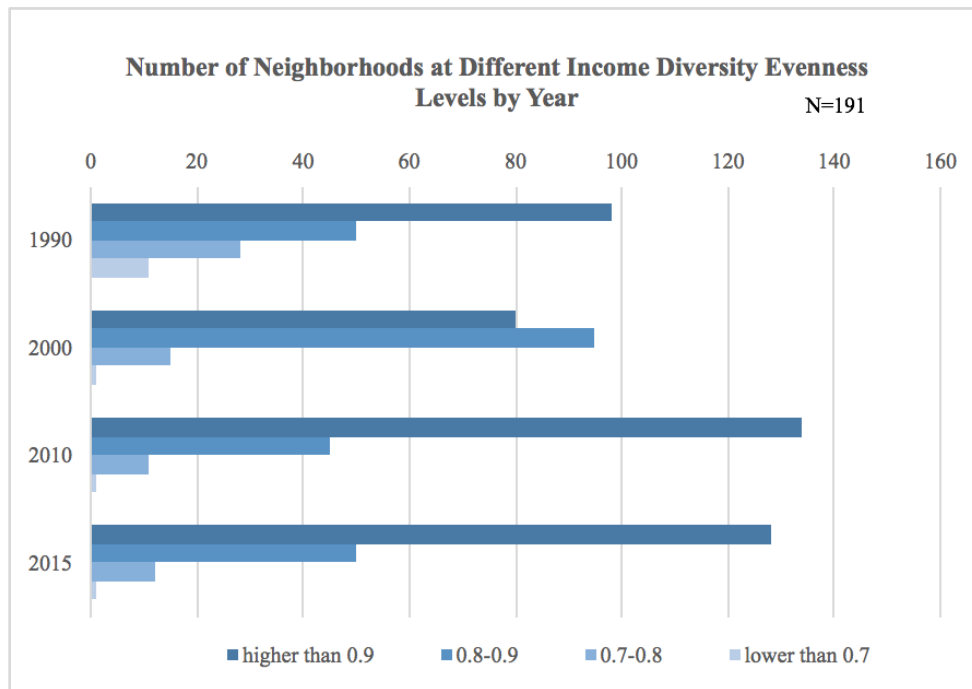


Figure 4.1.2: Number of Neighborhoods by Income Diversity Evenness (US Census 1990/2000; ACS 5-Year Estimate 2006-2010/2011-2015)

The map shows the geographic distribution of neighborhood economic diversity evenness percentage change. Percentage increase or decrease higher than 5% mostly happened between 1991 and 2010. From 2011-2015, most neighborhoods in New York City have relatively stable diversity evenness with changes within 5%. Between 1991 and 2000, neighborhoods with the highest decrease mostly concentrate in Queens and Staten Island while the ones with the highest increase concentrate in Bronx. Changes happened between 2001 and 2015 are relatively equally distributed compared to 1991-2000.

1. Income Diversity



**Figure 4.1.3: Number of Neighborhoods by Income Diversity Evenness (US Census 1990/2000; ACS 5-Year Estimate 2006-2010/2011-2015)**

The chart above shows an obvious increase in neighborhoods with diversity evenness higher than 0.9 from 2000-2015. Neighborhood with the lowest evenness level, in contrast, decreased from more than 15 to around 2. There's a slight decrease in neighborhood with the evenness higher than 0.9, but the total number is still higher than 120, around 63% of all neighborhood.

The table below contains a descriptive analysis of the changes in each year’s income diversity evenness.

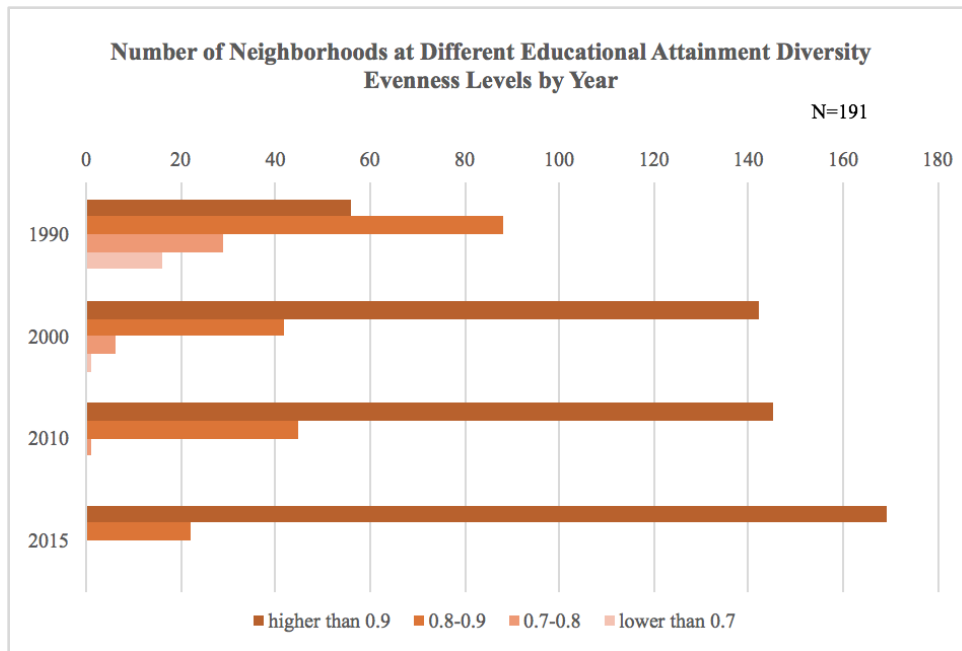
Year	1991-2000	2001-2010	2011-2015
Mean	0.01	-0.03	-0.01
Median	-0.01	0.04	-0.01
Highest Decrease	-0.2	-0.2	-0.06
Highest Increase	0.32	0.21	0.05

**Table 4.1.2: Summary of Income Diversity Evenness Changes in New York City, 1990-2010 (US Census 1990/2000; ACS 5-Year Estimate 2006-2010)**

During 1991 and 2000, the overall income diversity evenness in New York City’s improves by 0.01 on average even with a negative median around -0.01. From 2000-2010, the mean of the whole city decreases by around 0.03. The highest decrease also reaches 0.2, which happens in Manhattanville. From 2011-2015, the mean declines around 0.01, slightly lower than 2001-2010. The highest decrease happens in West Brighton which is around 0.06.

## 2. Educational attainment Diversity

Similar to income diversity, educational attainment diversity of the city greatly improved since 1990. The increase mostly happened between 1991-2000 and 2011-2015. Neighborhoods with education diversity evenness higher than 0.9 increases around 100 in the past 25 years. Number of neighborhoods with the lowest diversity level also decreased to 0 from 1990 to 2000. Only around 10% of the neighborhoods have an educational attainment diversity evenness lower than 0.9.



**Figure 4.1.4: Number of Neighborhoods by Education Diversity Evenness (US Census 1990/2000; ACS 5-Year Estimate 2006-2010; 2011-2015)**

The table below contains the details of each year’s change.

Year	1991-2000	2001-2010	2011-2015
Mean	0.07	0.0003	0.01
Median	0.06	-0.002	0.01
Highest Decrease	-0.05	-0.14	-0.07
Highest Increase	0.32	0.06	0.07

**Table 4.1.3: Summary of Income Diversity Evenness Changes in New York City, 1990-2010 (US Census 1990/2000; ACS 5-Year Estimate 2006-2010)**

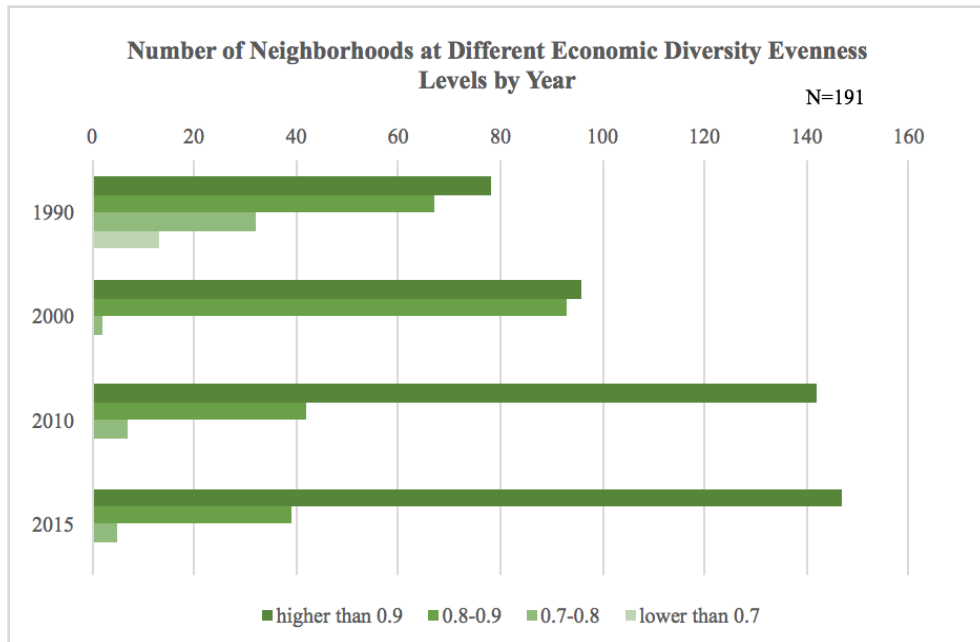
It is clearly presented in the table that the educational attainment diversity increases on average in the past 25 years. Between 1991 and 2000, the highest increase among all study periods occurred in Longwood. Although the evenness increases on average between 2001 and 2010, half of the neighborhoods actually have a decrease higher than 0.002 in evenness. From 2011-2015, the mean and median remain increasing though at a slightly lower rate. The highest



decrease within this period occurs in Manhattanville while the highest decrease is in Marble Hill-Inwood.

### 3. Neighborhood Economic Diversity

Neighborhood Economic Diversity, as previously described, it is the sum of weighted income diversity and educational attainment diversity.



**Figure 4.1.5: Number of Neighborhoods by Economic Diversity Evenness (US Census 1990/2000; ACS 5-Year Estimate 2006-2010; 2011-2015)**

The chart reveals that neighborhood economic diversity increased a lot from 1990 to 2015. Neighborhoods with economic diversity evenness higher than 0.9 almost doubled from 80 to 145. The increase mostly happened between 1991 and 2010. There's almost no change in the neighborhood number of each evenness level from 2011-2015. By 2015, neighborhoods with the highest economic diversity evenness account for about 75% of the total number. In the table below, detailed of economic diversity evenness changes in the past 20 years are illustrated.

Year	1991-2000	2001-2010	2011-2015
Mean	0.04	0.02	0.003
Median	0.02	0.02	0.003
Highest Decrease	-0.12	-0.09	-0.04
Highest Increase	0.30	0.12	0.05

**Table 4.1.4: Summary of Income Diversity Evenness Changes in New York City, 1990-2010 (US Census 1990/2000; ACS 5-Year Estimate 2006-2010)**

Although the evenness keeps increasing in the past 25 years on average, the number during each study period is decreasing. The average increase from 2011-2015 is only 0.003, decreased by around 85% compared to the previous decade. The highest increase appeared between 1991 and 2000, which is in Mott Haven-Port Morris. The highest decrease appeared in the same period, which is in Wseteriegh.

Generally speaking, all three diversity of New York City improved significantly mostly between 1991 and 2010. It is noticeable that the economic diversity didn't improve much between 2011 and 2015 even with the growing rate of new affordable housing units in the same period. The observation based on the descriptive statistics still need to be analyzed and explained in the regression analysis below.

## **4.2. Regression Analysis**

Regression analysis is conducted between three dependent variables and four independent variable. Dependent variables include income diversity changes, education diversity changes and economic diversity changes. Independent variables include the proportion of affordable housing units increase, the proportion of existing affordable housing units, homeownership rate change

and rent increase rate. Multivariate regression is conducted for income diversity changes and education diversity changes while multiple variable regression is conducted for income diversity changes. That is because the income diversity is calculated based on the weights of both income diversity and education diversity which makes it high correlated to those two and cannot be included in the same multivariate regression. The regression analysis covers three study periods including 1991-2000, 2001-2010 and 2011-2015. It enables observation of statistically relationship between different variables over different time periods based on the descriptive analysis. All regression analysis are conducted at a 95% confidence level based on the null hypothesis that there is no statistically significant relationship between each dependent variable and independent variable.

#### 4.2.1. 1990-2000

Variables	W(p=0.0000)		P(p=0.0000)		L(p=0.0000)		R(p=0.0000)	
	Statistics	P-value	Statistics	P-value	Statistics	P-value	Statistics	P-value
ah	0.7877	0.0000	0.2123	0.0000	0.2695	0.0000	0.2695	0.0000
eah	0.9858	0.4610	0.0141	0.4610	0.0143	0.4610	0.0143	0.4610
ho	0.8669	0.0025	0.1031	0.0025	0.1150	0.0025	0.1150	0.0025
rent	0.8619	0.0003	0.1381	0.0003	0.1603	0.0003	0.1603	0.0003

**Table 4.2.1: Multivariate Regression Model Test Summary Output, 1990-2000 (US Census 1990/2000; ACS)**

As it is shown above, the multivariate regression model of 1990 is statistically significant regardless of the multivariate criteria as all the p-values are close to 0. The multivariate tests for each variable also indicate that they are mostly statistically significant except for the proportion of existing affordable housing units. As no matter which test method is used, all of the p-values are under 0.05.

Variables	Income (p=0.0000)		Education(p=0.0000)	
	Coefficient	P-value	Coefficient	P-value
ah	0.8120	0.0000	0.3217	0.0000
eah	0.0144	0.6570	0.0220	0.2270
ho	0.2047	0.0080	-0.0152	0.7230
rent	0.1213	0.0010	0.0827	0.0000
_cons	0.0157	0.2050	0.0437	0.0000

**Table 4.2.2: Multivariate Regression Summary Output, 1990-2000 (US Census 1990/2000; ACS)**

The result suggests that the model for each dependent variable is statistically significant as p-values for both models are close to 0. The relationship between proportion of affordable housing units and both diversity are statistically insignificant with both p-values higher than 0.05. The regression result of education diversity change and homeownership rate is also not statistically significant as the p-value is 0.7230, higher than 0.05. Among all the independent variables, affordable housing increase proportion has the highest coefficient with income diversity and education diversity changes. One percent increase in new affordable housing's proportion leads to around 0.008 increase in the income diversity and 0.003 increase in the education attainment diversity. Increase in median gross rent rate change and homeownership rate change both cause increase in income and education attainment diversity despite to a lower extent.

Multivariate regression also allows us to test the overall statistical significance of the coefficients of affordable housing increase proportion over both equations as well as the specific statistical significance for the difference between each coefficient.

Hypothesis 1	[income]ah = 0
Hypothesis 2	[edu]ah = 0
Result	p-value = 0.0000

**Table 4.2.3: Variable 'ah' Coefficient Statistical Significance Test Output**

The null hypothesis for this test is the coefficient for variable affordable housing increase proportion is 0 for both equation. As the p-value is 0, it suggests that coefficients for affordable housing increase proportion are statistically significant for both equations.

Hypothesis	[income]ah = [edu]ah = 0
Result	p-value = 0.0002

**Table 4.2.4: Variable ‘ah’ Coefficient Difference Significance Test Output**

In the test above, we assume that the coefficient for affordable housing increase proportion in both income diversity and education attainment diversity regression is the same. The p-value is almost 0, indicating that the coefficient in each formula is significantly different.

Variables	Economic(p=0.0000; R <sup>2</sup> =0.39)	
	Coefficient	P-value
ah	0.5914	0.0000
eah	0.0178	0.4490
ho	0.1058	0.0025
rent	0.1040	0.0003
_cons	0.2831	0.0089

**Table 4.2.5: Multiple Variable Regression Summary Output, 1991-2000 (US Census 1990/2000; ACS)**

The multiple variable regression reveals the relationship between economic diversity and all the variables. The model is statistically significant with a p-value close to while around 39% of the data can be explained by the model. Specifically, coefficients for all independent variables are statistically significant except for proportion of existing affordable housing. One percent increase in affordable housing proportion causes about 0.006 increase in economic diversity.

### 4.2.2. 2000-2010

Variables	W(p=0.0107)		P(p=0.0116)		L(p=0.0099)		R(p=0.0015)	
	Statistics	P-value	Statistics	P-value	Statistics	P-value	Statistics	P-value
ah	0.9863	0.3184	0.0137	0.3184	0.1040	0.3184	0.0139	0.3184
eah	0.9841	0.3603	0.0159	0.3603	0.0162	0.3603	0.0162	0.3603
ho	0.9223	0.0012	0.0777	0.0012	0.0139	0.0012	0.0842	0.0012
rent	0.9948	0.6494	0.0052	0.6494	0.0842	0.6494	0.0052	0.6494

**Table 4.3.1: Multivariate Regression Model Test Summary Output, 2001-2010 (US Census 2000; ACS 5-Year Estimate 2006-2010)**

The test result above indicates that the multivariate regression model is statistically significant under all four multivariate criteria with all the p-values under 0.05. However, among the four independent variables, only the test for homeownership is statistically significant. (p=0.0012)

Variables	Income (p=0.0022)		Education(p=0.7336)	
	Coefficient	P-value	Coefficient	P-value
ah	-0.0386	0.2170	-0.0060	0.5840
eah	-0.0339	0.1240	0.0068	0.0077
ho	0.2131	0.0080	-0.0072	0.7220
rent	0.0109	0.5830	-0.0060	0.3870
_cons	0.0075	0.4150	0.0020	0.5160

**Table 4.3.2: Multivariate Regression Summary Output, 2001-2010 (US Census 2000; ACS 5-Year Estimate 2006-2010)**

The multivariate regression result shows that the regression equation for income diversity is statistically significant while it is not for education attainment diversity. In the income equation, only the coefficient for homeownership rate change is statistically significant, which is around 0.21. As the coefficients for the proportion of new affordable units are statistically insignificant in both equation, test for the specific variable is not conducted.

Variables	Economic(p=0.0015; R <sup>2</sup> =0.09)	
	Coefficient	P-value
ah	-0.0239	0.1510
eah	-0.0156	0.1860
ho	0.1140	0.0000
rent	0.0030	0.7560
_cons	0.0050	0.3020

**Table 4.3.3: Multiple Variable Regression Summary Output, 2001-2010 (US Census 2000; ACS 5-Year Estimate 2006-2010)**

The multiple variable regression model for economic diversity is statistically significant. (p=0.0015) Same as the multivariate regression model for income diversity, only the coefficient for homeownership rate change is statistically significant, which is around 0.11.

### 4.2.3. 2011-2015

Variables	W(p=0.0000)		P(p=0.0000)		L(p=0.0000)		R(p=0.0000)	
	Statistics	P-value	Statistics	P-value	Statistics	P-value	Statistics	P-value
ah	0.9963	0.7590	0.0037	0.7590	0.0037	0.7590	0.0037	0.7590
eah	0.9877	0.3966	0.0123	0.3966	0.0125	0.3966	0.0125	0.3966
ho	0.9033	0.0005	0.0967	0.0005	0.0037	0.0005	0.1070	0.0005
rent	0.8769	0.0001	0.1070	0.0001	0.0037	0.0001	0.1403	0.0001

**Table 4.4.1: Multivariate Regression Model Test Summary Output, 2011-2015 (ACS 5-Year Estimate 2006-2010; 2011-2015)**

The multivariate test reveals that the model is statistically significant as p-values for all four criteria are around 0. The test of each variable shows that the models for both proportion of new affordable units and existing affordable units are not statistically significant.

(p=0.7590;p=0.3966)

Variables	Income (p=0.1003)		Education(p=0.0000)	
	Coefficient	P-value	Coefficient	P-value
ah	0.0101	0.4590	0.0021	0.8700
eah	-0.0030	0.5110	0.0047	0.2750
ho	0.0348	0.3470	-0.1300	0.0000
rent	0.0140	0.0250	-0.0214	0.0000
cons	-0.0057	0.0010	0.0108	0.0000

**Table 4.4.2: Multivariate Regression Summary Output, 2011-2015 (ACS 5-Year Estimate 2006-2010; 2011-2015)**

The multivariate regression result details suggest that the educational attainment diversity equation is statistically significant while the income diversity equation is not. In the educational attainment diversity model, coefficients for both homeownership rate change and median rent increase rate are statistically significant. The coefficient for the proportion of new affordable housing and existing affordable housing units are statistically insignificant. (p=0.87;p=0.27)

Variables	Economic(p=0.4740; R <sup>2</sup> =0.02)	
	Coefficient	P-value
ah	0.0065	0.5180
eah	0.0005	0.8920
ho	-0.0394	0.1510
rent	-0.0019	0.6770
cons	0.0018	0.1360

**Table 4.4.3: Multiple Variable Regression Summary Output, 2011-2015 (ACS 5-Year Estimate 2006-2010; 2011-2015)**

The multiple variable regression result suggests that the model itself is not statistically significant. (p=0.4740)

### 4.3. Discussion

The regression result indicates that coefficients of the proportion of new affordable housing units for each diversity are only statistically significant between 1991-2000 . The highest coefficient is for income diversity which is around 0.812. During 2001-2010, only the coefficients of homeownership rate for income diversity and economic diversity are significant. The overall significance for both the income diversity and economic diversity suggests that relationship exists between all the independent variables and dependent variables despite statistically significance for each independent variable cannot be identified based on the current sample. From 2011-2015, only the educational attainment regression model is statistically significant. It is the only period where there's completely no statistically relationship between proportion of new affordable housing units and each diversity. Overall, the statistically significance of the relationship between proportion of new affordable housing units and each diversity fades throughout the entire study period. This result aligns with the descriptive observation that increase in each diversity is slight between 2011 and 2015 regardless of the high increase in new affordable units. Similarly for rent increase rate and homeownership rate,



statistically significance is only found with one dependent variable, a great contrast with the result of 1991-2000. Proportion of existing affordable housing, however, have completely no statistically significant relationship with any dependent variable during any study period. This trend of decreasing statistical significance leads to two major predictions.

1. Non-affordable housing related factors complicate the relationship between economic diversity and other neighborhood characteristics.

As previously discussed, other variables such as gentrification also have impact on neighborhoods, which leads to change in diversity. The growing trend of gentrification in recent years caused expansive displacement in many neighborhoods. Displacement directly led to the lost of certain income group that cannot afford the increased rent, which change the previous diversity level. This change is separate from the one that affordable housing can cause and it's relatively not seen before 2000.

Manhattanville is a great example for the impact from gentrification on economic diversity. From 2000 to 2010, there are 815 new units added in this neighborhood while the economic diversity dropped around 0.08, one of the highest decrease among all neighborhoods. The mixed-use development coming with Columbia's new campus has gentrified the neighborhood even more when it was already gentrifying. The neighborhood has seen remarkably rent increase in the past few years. It directly leads to the displacement of many residents, who lived there for years and moved to Washington Heights or Bronx instead. Although housing, especially affordable housing development are included in the mixed-use development plan, it fails to address the affordability crisis of the residents that are most likely to be displaced. Other relatively higher level businesses which replaced the original local businesses might vibrate the

commercial activity of the area, but they also drove up the living cost and lead to potentially displacement.

Therefore, the original positive relationship between affordable housing units and economic diversity, as shown between 1991 and 2000, is immediately affected and altered.

2. Affordable housing related factors alter the relationship between affordable housing and economic diversity.

Affordable housing related factors such as the program type, implementation and scale can also affect neighborhood and thus change neighborhood economic diversity. This can be shown in West Brighton which sees a decrease in economic diversity evenness around 0.04 from 2011-2015, the highest decrease during that period. The diversity in West Brighton has been decreasing since 2001. One of the main reasons for that, regardless of the approximate 1,300 units added during that period, is the high crime rate of the neighborhood which naturally discourage residents from staying in the neighborhood.

Most of the new affordable units in this neighborhood are project-based housing. Compared to tax credit, project-based housing incentives affirm and encourage private capital's existence in neighborhoods. This is particularly the case for mandatory inclusionary housing in which affordable housing is mandated as part of rezoning plans that normally include large portion of market-rate housing. Once implemented in low-income neighborhoods, the market-rate housing together with the commercial opportunities come with the rezoning that can potentially raise the living cost will lead to diversity change for sure. Besides the above two situations, in general, changes caused by other factors can greatly vary from each neighborhood because of its difference in previous dominant income group or commercial environment.

The regression also illustrates how homeownership and rent affect income and educational attainment diversity during 2001-2015. Both are affordable housing related factors as discussed in the literature review. Specifically, during 2001-2010, 1 percent increase in homeownership can cause around 0.0002 increase in income diversity evenness. Homeownership might have higher significance in increasing income diversity during that period as it stabilizes homeowners of different income level. In contrast, rental affordable housing normally target a specific range of low or medium income group.

During 2011-2015, 1 percent increase in homeownership rate causes around 0.0001 decrease in educational diversity while 1 percent increase in median gross rent percentage increase causes a decrease about 0.00002. Considering the high possibility for people with master degree or lower to seek for rental housing, it is understandable that neighborhoods with rent and homeownership increase will discourage them from staying there.

Proportion of existing affordable housing units, which is assumed as one possible factor for affecting neighborhood economic diversity level, has no statistically significant relationship with any dependent variable during any study period based on the regression result, suggesting that the original number of affordable housing units in a certain neighborhood has no impact on the changes of its diversity in the future.

Neighborhood economic diversity is a volatile variable that many predictable or unpredictable factors can influence it in different ways. Different scales of affordable housing units development may also alter the existing economic dynamics remarkably and impact economic diversity in ways that are relatively hard to quantify. In conclusion, result of 1991-2000 suggests that with fewer involvement from other factors, affordable housing units increase impact in increasing neighborhood economic diversity is clear. However, with the growing impact from

other variables as well as the natural difference rooted in each neighborhood, that statistically significant relationship is weakened. On the other side, homeownership and rent can cause changes in income and educational attainment diversity respectively during 2001-2015. Based on that, to prove setting increase neighborhood economic diversity as a goal of develop more affordable units is not feasible and justified under New York City's current context. The outcome varies from neighborhoods and can be affected by many other factors. To achieve that policy goal, supplemental policies are essential and will be discussed in the later chapter.

#### **4.4. Limitation**

Main shortcomings threaten the validity of the findings of this thesis are listed below.

1. Failure to include other potential variables that affect neighborhood economic diversity

Although the thesis only tests the statistical relationship between affordable housing units and neighborhood economic diversity, many other factors can potentially influence economic diversity simultaneously such as neighborhood density. The thesis addresses this issue partially by discussing some of them such as gentrification, proportion of existing affordable housing in both regression analysis and discussion. However, many of those factors are invisible while the impact on economic diversity is unpredictable and difficult to quantify based on existing literature and cases. Therefore, part of the relationships identified between tested variables might not exactly reflect the relationship between them caused by changes in housing data number.

2. Lack of uniform definition and calculation of neighborhood economic diversity

So far, there's no commonly accepted definition of neighborhood economic diversity. The thesis defines and calculates it as weighted neighborhood income diversity and educational attainment diversity. It analyses income and education diversity as independent variables essentially.

However, variable that be considered as part of the overall economic diversity also affect each other internally. The thesis's approach thus relatively lacks consideration of the interaction between different variables.

### 3. Inaccuracy caused by data and study period selection

Due to the limitation of the data and methodology, study time period of the thesis will be limited to 1990 - 2015. It cannot reflect the latest and historical relationship between each variable over the study period. Another major issue of the study period is that changes occurred within 5 years cannot be reflected. The short-term impact newly-added affordable housing units have on neighborhood economic diversity is as important as long-term impact for study. But it is missing from this thesis's analysis. Besides, the accuracy of the regression analysis declines due to the default deficiency of the Furman Center Subsidized Housing Database, as some of the units counted include unsubsidized housing.

### 4. Geographic boundaries differ from real-life interpretation

The thesis strictly match census tracts with the neighborhood defined in NTA. Nevertheless, the neighborhoods defined by NTA differ from the practical site boundary for many affordable housing units development. It significantly lowers the validity of the thesis analysis result for application in future development, as the impact affordable housing units have on diversity can vary even by the change of boundaries.

# **CHAPTER 5: CONCLUSION**

## **5.1. Planning Implication**

The idea of this thesis originates from the policy goal stated in Housing, New York proposed by Mayor de Blasio. The analysis and findings caters to broader audience and can be applied to different policy scale.

First, for the Housing, New York plan and housing policy makers in New York City, the thesis offers policymakers a more thorough understanding of the practical impact affordable housing can have on neighborhoods and an overview of possible adjustments to the current housing plan. It can also lead to adjustment of current policies as well as adoption of other measures in the future based on the new understanding of the potential policy impact. This thesis fill up the blank on neighborhood economic diversity in policy-making and integrates the housing policy framework of the city.

In addition, for other high-cost cities like New York City that urgently need more affordable housing, scale of the economic effect that affordable housing can have on neighborhoods reflected in this thesis can be helpful to draw on for future.

The thesis is also useful for planning scholars that will potentially study neighborhood economic diversity. Literature of neighborhood economic diversity and affordable housing as a tool to improve that has been historically rare to find. Based on the thesis's findings, a new perspective of seeing the problem can be developed. It can also be good foundation for future related analysis that explore deeper within the interactions between different variable that are not covered in this thesis.

General public, especially residents in neighborhoods with high rate of affordable housing development can also benefit from reading this thesis to develop a better understanding of the existing scenario. The thesis also contributes to for rational public engagement in the planning as many people who are actively involved in affordable housing development related public events don't have a thorough understanding of the situation.

## **5.2. Recommendations**

It can be concluded from both the literature and discussion that, affordable housing's effectiveness in increasing neighborhood economic diversity that was verified in late 1980 and 90s was gradually weakening and disappearing because of the increasingly complicated social-economic environment as well as the failure to formulate a comprehensive policy framework to fit that. The recommendations, based on that, will mainly focus on policy framework improvement and supplementary policy or programs from three perspectives including affordable housing, tenants and neighborhood. It will also touch on possible solution to improve the current methodology of the thesis.

First, more efforts should be put into formulating flexible standard of current affordable housing programs to cater to more low-income groups. As previously discussed, displacement is one of the most likely factor that weakens affordable housing's impact on neighborhood economic diversity. The relatively fixed standard of affordable housing programs such as MIH fails to serve the lowest income group at a lot of times which leads to displacement. Although several options are offered within the program, it is still implemented based on an inflexible citywide standard that doesn't fit the demand of many historically poverty concentrated neighborhoods such as East New York. Tools such as property tax break and housing subsidies

should be incorporated more in order to diversify the program operation thus enables affordable housing to satisfy a larger range of income groups.

Second, to control the increasing displacement, protection mechanism should be reinforced for tenants that can be potentially displaced or have been already displaced,. Wider range of rent regulations should be formulated and enforced at landlords preventing infinite rent increase. Anti-harassment ordinance should also be enacted in order to protect tenants from being pressured or evicted when rent increase. Specifically, for residents that have already been replaced, preference should be given for existing affordable housing to protect them from being further replaced.

In addition to the policy recommendation, methodology recommendation are also given based on the limitations. One the major limitation of this analysis is that some variables that could potentially affect neighborhood economic diversity are extremely difficult to quantify such as displacement. More studies should be conducted in terms of tracking the flowing population caused by displacement and quantify it in a way that can be utilized by neighborhood related analysis. Besides, more literature are needed to define economic diversity more specifically including what else factors can be or should be included other than income and education as well as the proportion of each in calculating it.

### **5.3 Summary**

Although affordable housing is frequently used as a tool to improve neighborhood economic diversity, its actual effectiveness to achieve that goal left at doubt without sufficient support from existing literature or comprehensive analysis. Mayor de Blasio's housing plan, which sets increase neighborhood economic diversity as a main goal, brings the question up again. By



collecting and analyzing data on affordable housing units and neighborhood income diversity, the thesis examines the effectiveness of affordable housing as a tool to increase neighborhood income diversity. The justification and feasibility for setting increase neighborhood income diversity can thus be discussed based on that.

The descriptive and regression analysis reveal that from 1990-2000, affordable housing units increase effectively increase economic diversity. But from 2001-2015, that effectiveness disappears. Statistically significant relationship are only identified between educational attainment diversity and rent as well as income diversity and homeownership rate. This change possibly results from the impact of other factors on economic diversity either related or not related to affordable housing. The average education diversity increased in New York City regardless of the changes in affordable housing. In general, affordable housing had more impact on neighborhood income diversity than educational attainment diversity.

Based on the analysis findings, the relationship between affordable housing and neighborhood economic diversity is highly changeable and varies a lot because of many identifiable or non-identifiable factors that cannot be all measured or quantified. The city's policy goal to improve neighborhood economic diversity through more affordable units cannot be verified and need adjustments and supplements. Policy recommendations discussed in this thesis should be considered into future housing plans. The effectiveness of affordable housing in improving neighborhood economic diversity is never denied, but appropriate implementation and supplemental policies are necessary and are absent from the current housing framework of New York City.

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