Zoned Out? Examining the Effect of Upzoning on Neighborhood Demographic Trends: A Fixed Effects Analysis

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Abstract

Over the past two decades, the New York City government has responded to a growing housing demand and need for affordable housing by upzoning certain neighborhoods to allow higher-density residential development. While upzoning creates new housing units, there is concern that it accelerates displacement through the influx of White residents. Whether upzoning materially changes a neighborhood's demographic composition is crucial to understanding the policy's outcomes and unintended consequences. We examine demographic changes before and after city-initiated upzonings occurring between 2000 and 2007 with a focus on the White population. Our research uses a fixed effects regression model to compare upzoned census tracts with census tracts that were not upzoned but had a similar demographic makeup and historic trends in the period preceding the upzoning. We find that large upzonings are associated with a five to nine percentage point increase in the share of White people, while smaller upzonings had no significant impact. Although we do not claim that displacement has taken place per se, we find that the new housing units created by an upzoning become predominantly occupied by White and Asian residents.

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1. Introduction

Since the 2010 Census, New York City's population has grown by 270,000 people, bringing the overall population to 8,440,000 (NYC DCP, 2020a). In light of this population increase, the city has had to find ways to meet these housing needs, particularly housing that is affordable to low- and moderate-income households. One tool used by the New York City Department of City Planning ("DCP") to meet this demand is to change land use regulations by initiating neighborhood-wide upzonings. An *upzoning* allows developers to build taller buildings with more units, thereby creating denser city blocks.

The rationale for upzoning is that loosening zoning regulations will increase the availability of housing, thereby decreasing the price of housing overall and making it more affordable. This is the premise on which housing policy in New York City is centered. Indeed, it is supported by both economic theory a considerable body of empirical research which indicates that less restrictive land use regulation is associated with more construction and lower prices (Been, Ellen, & O'Regan, 2019; Charles, 2019). But in the face of seemingly insatiable demand and rising housing prices over the last two decades, housing advocates and community members remain skeptical of the efficacy of this policy. In addition to their conviction that new development does not serve middle and low-income households, supply skeptics believe that upzoning fuels the displacement of people of color (Newman & Wyly, 2006).

This paper seeks to address the question of who benefits from upzonings and what the broader effects of such land use policies are on vulnerable communities. It is a question that is frequently raised but rarely definitively answered. Specifically, we focus on how upzoning impacts neighborhood racial demographics. Whether upzoning materially changes a neighborhood's demographic composition is crucial to understanding the policy's results and unintended consequences.

The limited literature that exists on density and racial demographics focuses on the relationship between density restrictions and segregation. Research has found that more stringent restrictions on density are associated with greater segregation in large U.S. metro areas (Rothwell & Massey, 2009), and smaller minority populations in individual jurisdictions (Pendall 2000; Quingly, & Rosenthal, 2004). Each of these papers are cross-sectional and therefore cannot prove causation, thus demonstrating the difficulty of studying the changing racial composition of neighborhoods. There is also a body of quantitative research that examines how zoning regulation impacts real estate markets (See Lees, Freemark, Glaeser and Hackworth).

The challenges of empirical research on this subject mean that much of the literature pertaining specifically to our research is qualitative. Our findings are in line with sociologists and other urban thinkers in observing an influx of White residents as a common part of the gentrification process (See Angotti & Morse, 2016 and Freeman & Braconi, 2004 as notable New York City examples). In New York City, racially disparate impacts from upzonings are the subject of protests (Newman & Wyly, 2006), legal action (Kromrei & Small, 2019), and legislative proposals (William, 2019), all of which point to the need for greater empirical inquiry of this topic.

Several research papers, though not academic, explore the impact of zoning changes using descriptive statistics. For example, Churches United For Fair Housing (2019), a grassroots community organization, used descriptive statistics to examined the demographic change that occurred following two controversial Bloomberg-era rezonings in Park Slope and Greenpoint-Williamsburg. Using descriptive statistics only, this study found that the latino and Black population decreased following up zonings, while the White population increased significantly. Goldberg (2011), studied Bloomberg-era rezonings similar to ours using descriptive statistics, which suggested that the White population in hybrid and upzoned areas increased substantially in comparison to the citywide figures, which show a decrease in White population. A paper by Yunda and Jiao (2019) used a similar regression analysis to ours to study the demographic

impacts of designating areas of New York City as Special Purpose Districts and Historic Districts. Yunda & Jiao's results suggest that designating an area with these special types of preservationist zoning had little impact on the racial composition of the neighborhoods.

In an effort to expand the econometric literature on the demographic impacts of upzoning, we analyze 12 city-initiated upzonings that took place between 2000 and 2007. We use a fixed effects regression model that includes the use of Propensity Score Matching ("PSM") to construct a comparison group with similar demographic trends as the treatment group before the treatment group was upzoned.

Analyzing the rezonings that took place in the earlier part of the 2000s, and acknowledging that ample time has passed for their effects to materialize, we find that concerns around gentrification and an influx of White residents following an upzoning are warranted. Upzonings that occurred between 2000 and 2007 were associated with a five to nine percentage point increase in the share of White people in that area, an increase that is particularly notable given the stagnation of White population growth in the city over the same period. Still, we caution against conflating an influx of White people with displacement because this paper examines changes in the net population only. A study focused on displacement would require a more sophisticated methodology. Still, we observe a strong likelihood that many of the new housing units are occupied by new White or Asian residents.

The following sections outline the data and method used for making these conclusions, followed by a discussion of the results and limitations of our findings.

2. Data & Method

2.1. General Approach

Our research examines how upzoning impacts the racial and ethnic makeup of neighborhoods. Using a fixed effects regression model, upzoned census tracts are compared to non-upzoned census tracts with similar demographic trends in the period preceding the upzoning.

We examine demographic changes between 1990 and 2018 using data from the U.S. Decennial Census and American Community Survey ("ACS"). The treatment group includes 12 city-initiated neighborhood rezonings impacting 19 census tracts that were upzoned between 2000 and 2007. Limiting ourselves to upzonings that occurred between 2000 and 2007 was strategic. Choosing upzonings that occurred after 1999 allowed us to have a clear idea of demographic trends before upzonings occurred using data from the 1990 and 2000 censuses. This was important for constructing a suitable comparison group. Acknowledging the fact that development and demographic change is a lengthy process, restricting the study to rezonings occurring before 2008 gave at least ten years for impacts to materialize. The comparison group was constructed using a PSM technique and contains 19 census tracts with similar demographic trends to the treatment group in the period preceding upzoning (1990 to 2000).

The following sections describe the data, treatment and comparison group creation, and our analysis approach.

2.2 Demographic and Socioeconomic Data

Demographic and socioeconomic data for all census tracts in New York City between 1990 and 2018 was collected from two different but related sources to form a longitudinal dataset. The source of the demographic and socioeconomic data was the U.S. Decennial Census and the ACS, both published by the

U.S. Census Bureau. Data was collected for four time periods. Three time periods from the U.S. Decennial Census (1990, 2000 and 2010) and a 2018 population estimate from the ACS (U.S. Census., 2020). The 2018 estimate is a 5-year estimate covering 2014 to 2018. The Decennial Census is a near perfect population count, whereas the ACS estimate is less accurate but is the most accurate population estimate available. This longitudinal data was used to understand how populations of different races have changed over time.

All census tract boundaries were standardized to 2010 census tract boundaries and any census tracts where the U.S. Census Bureau was unable to collect sufficient information were excluded from the dataset. Collectively, these changes effect less than 5 percent of the total number of census tracts in New York City.

A complicating factor is that over time, the U.S. Census Bureau has changed the options for recording race and ethnic group in population estimation. Our study standardizes and amalgamates race and ethnicity categories to form five mutually exclusive categories that collectively include 100 percent of the population. The categories are: White (non-Hispanic), Hispanic, African American (non-Hispanic), Asian (non-Hispanic), Other (all other races or those identifying as more than one race). For brevity, these will be referred to throughout as: White, Hispanic, Black, Asian, other.

2.3 Zoning Change Data

Changes to zoning is the other data input for our analysis. A dataset of zoning amendments is maintained by DCP via the Zoning Application Portal (NYC DCP, 2020b). Between 2000 and 2007 there were approximately 4,500 zoning changes (known as zoning text amendments) completed in New York City. Detailed information about each can be downloaded from the Zoning Application Portal, including year of implementation, details about the applicant, the approval process, what zoning change was made, and spatial boundary data.

2.4 Treatment Group Identification

The treatment group includes census tracts that have been subject to a city-initiating upzoning. How this treatment group was defined and selected is outlined below, but ultimately the process resulted in the identification of 19 census tracts that were upzoned between 2000 and 2007.

Unfortunately, the publicly available dataset of zoning text amendments does not explicitly identify two key components of our analysis: (1) whether a rezoning was city-initiated, and (2) the type of rezoning that took place (upzoning, downzoning, contextual-zoning, or hybrid)[1]. Although zoning changes are often described as city-initiated upzonings in common urban planning parlance, the official DCP dataset does not use this terminology because these words are politically charged. The process for identifying city-initiated upzonings was a two-step process of firstly identifying city-initiated zoning changes and then identifying upzonings within that subset.

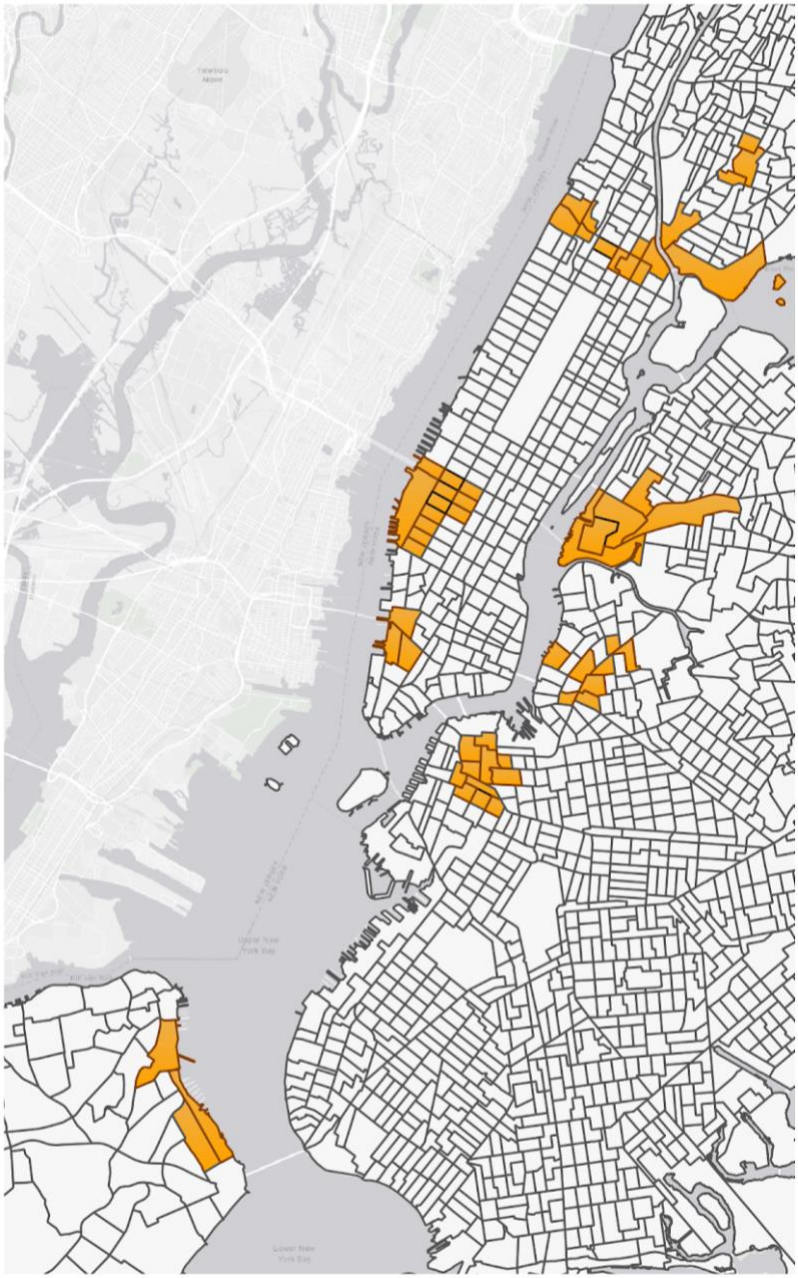
City-initiated zoning changes were identified by selecting only zoning amendments where the applicant's name was a city agency or city affiliated entity like New York City Economic Development Corporation. This process isolated 107 city-initiated zoning amendments. 32 of these zoning amendments were

1 An upzoning allows developers to build taller buildings, as opposed to a downzoning or contextual-only zoning, which decreases or maintains housing density, and a hybrid zoning change wherein some streets may be upzoned while simultaneously downzoning other streets in the same neighborhood.

removed because they only impacted a single building and this study is focused on neighborhood level changes, leaving 75 zonings remaining.

The second step of identifying which of the remaining 75 rezonings could be categorized as upzonings required some professional judgment and review of the actual zoning code change. For the purpose of this paper, an upzoning classification was awarded when there was an unambiguous increase in residential density permitted and no reduction in residential density permitted. As an additional check, we cross-referenced the results from our treatment selection process with another study (Goldberg, 2011) and found that the same upzonings were identified. The 12 city-initiated upzonings included in our study are listed and mapped below:

Figure 1: Areas rezoned in New York City between 2000 and 2007



We obtained our treatment group by mapping these upzonings onto census tracts. One challenge for the study is that the geographic boundaries of rezonings do not perfectly match census tract boundaries (or any other existing boundaries). However, this is also an opportunity because it allows us to examine how census tracts that were largely upzoned differed from census tracts that had only a small portion upzoned. To that end, the area of a census tract that was upzoned was recorded, as was the area of a census tract that had other zoning changes made to it, such as a downzoning. We devised the following protocol to determine how a census tract would be considered in our analysis.

- A census tract was classed as *upzoned* if 10 percent or more of the area of the census tract was upzoned between 2000 and 2007.
- A census tract was classed as having a *small upzoning* if 10 percent to 30 percent of the area of the census tract was upzoned between 2000 and 2007.
- A census tract was classed as having a *large upzoning* if 31 percent to 100 percent of the area of the census tract was upzoned between 2000 and 2007.

The process resulted in our treatment group of 19 census tracts that were upzoned between 2000 and 2007, with 9 small upzonings and 10 large upzonings.

2.5 Comparison Group Identification

The comparison group of 19 census tracts was selected using a PSM technique. Where previous research on the impact of upzonings on demographic trends ended at observing descriptive statistics of the treatment group, our study attempts to examine whether similar demographic changes would have occurred regardless of the upzoning by examining trends in similar census tracts that were not upzoned.

Constructing an appropriate counterfactual group was one of the main research design challenges. As mentioned briefly in the introduction, the city identifies land areas ripe for upzoning based on a set of criteria that are not consistent or clear, but generally relate to the belief that the neighborhood's population growth potential is being constrained by zoning restrictions. Comparison group selection is challenging because upzonings are not random occurrences. The ideal comparison would be neighborhoods that were earmarked for upzoning but the upzoning was never enacted because of some chance event. Unfortunately, such occurrences are rare, meaning that there was insufficient data to conduct a comparison. We also considered constructing a comparison group using census tracts adjacent to the treatment census tracts because they may be similar but determined that the risk of spillover effects from the upzoning was too great. Instead, we select our comparison group using a PSM technique, matching census tracts that were upzoned to census tracts that were not upzoned but had similar demographic makeup and historic trends in the period preceding upzoning. Our comparison group was constructed using the following steps.

This process began with a dataset of all census tracts in New York City from which we strategically removed tracts that were inappropriate for the comparison group. Firstly, census tracts with very small populations were removed to ensure percentage shifts in population were not the results of a small numbers of people[2]. Secondly, all census tracts that had a non-upzoning zoning change were removed. This was done to ensure an upzoned area was not being compared to an area that experienced a different zoning change. The remaining dataset of potential census tracts therefore only included areas that had no zoning changes or a zoning change that impacted less than 10 percent of the census tract. After excluding these census tracts, 1,617 tracts remained for us to construct a possible comparison.

Having constructed a basic dataset of possible census tracts for our comparison group, we selected the 19

2 Census Tracts with fewer than 200 people or fewer than 25 White people were removed.

most suitable using the PSM method. Each treatment census tract was matched to a comparison census tract based on how similar their demographic trends were in the period before the upzoning occurred. Specifically, we matched based on the probability of having similar pre-trends in the outcome we were interested in, i.e., the variation of White population. How well the treatment and comparison group match will be discussed in the summary statistics below. Additionally, we verified that the comparison group census tracts had no major zoning changes between 2008 and 2018 that might make them inappropriate for comparison group status.

2.6. Summary Statistics

2.6.1 City-wide demographic trends

The backdrop of our research is a city with a growing population and substantial shifts in racial composition. We see in the tables and figures below that population growth is being driven by Hispanics and Asians. The citywide White population decreased dramatically by 12 percent between 1990 and 2000 and has seen little movement since. Together, this means the share of White people relative to non-White people is decreasing over time. We also observe a decrease in the Black population in 2018 as compared to 1990, with numbers declining most prominently between 2000 and 2010, when New York City lost 10 percent of its Black population. Most of this population change can be taken at face value and attributed to changing migration patterns, but some is a result of changes in how individuals self-identify and how race and ethnicity questions asked in the census have changed over time. These shifting citywide trends highlight the need for the inclusion of a comparison group and time-base fixed effects in our analysis to help disentangle what demographic changes occurred because of citywide trends as opposed to an upzoning.

Table 1: Population of NYC (#)

Population category	1990	2000	2010	2018
White	3,177,817	2,801,992	2,722,904	2,713,930
Black	1,874,006	1,952,947	1,861,295	1,853,055
Hispanic	1,737,551	2,161,531	2,336,076	2,457,137
Asian	496,193	781,735	1,028,119	1,167,421
Other	34,721	310,061	226,739	252,170
Total	7,320,288	8,008,266	8,175,133	8,443,713

Table 2: Percent Distribution (%)

Race	1990	2000	2010	2018
White	43.1	35	33.3	32.1
Black	25.6	24.4	22.8	21.95
Hispanic	23.7	27	28.6	29.1
Asian	6.8	9.8	12.6	13.9
Other	0.47	3.85	2.8	2.95
Total	100	100	100	100

Figure 2: Population of NYC over time

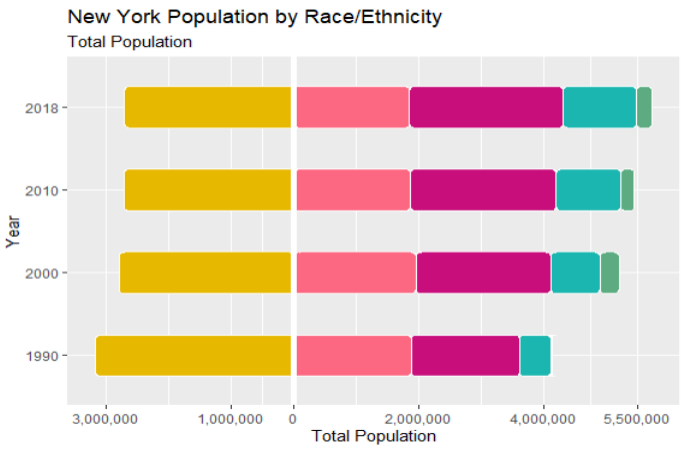
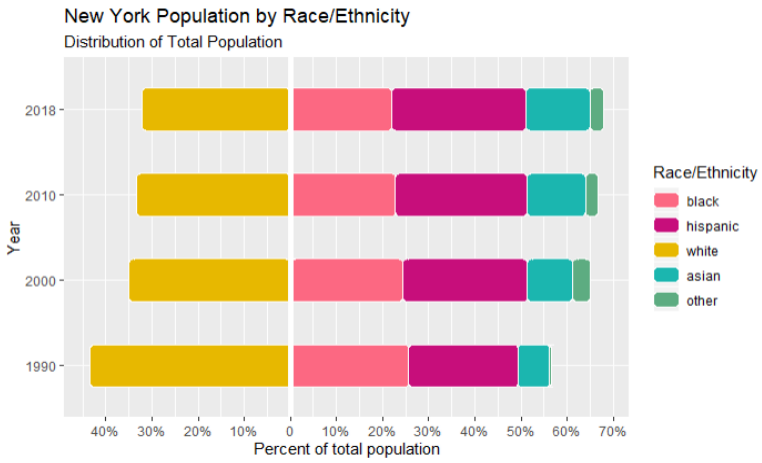


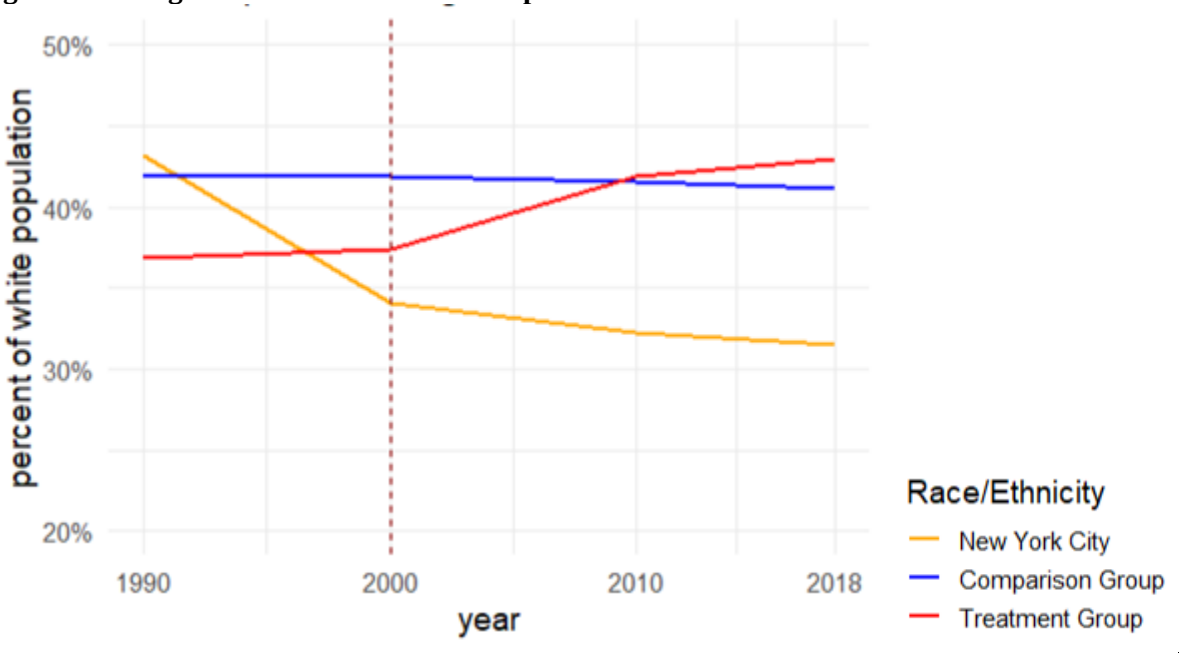
Figure 3: Population distribution over time



2.6.2 Treatment and Control Group Demographic Trends

As Figure 4 and Table 3 show, demographic trends before upzoning were similar for the treatment and comparison group, but markedly different after the upzoning and relative to New York City as a whole. It is clear that census tracts in the treatment group are unlike an average census tract in NYC with respect to our variable of interest. This further confirms the non-random nature of upzoning. Census tracts that were upzoned were remarkably stable with respect to the White population in the decade before being upzoned. In contrast, the White share was dropping dramatically across the due to a mixture of White flight and an influx of non-White immigrants (Roberts, 2011).

Figure 4: Change in the Share of White People



With respect to demographic trends before upzoning occurred, the comparison group had similar pre-intervention variation in White population compared to the treatment group. This is unsurprising given that the comparison group was matched to the treatment group based on this variable across this time period. This means that the 'parallel trends' assumption holds for pre-trends.

After the intervention, the trajectory of the treatment and comparison group differ, with the White population growing in the treatment group while the share in the comparison group is relatively stable. This aligns with our hypothesis that the White population increases following an upzoning and will be investigated further using regression analysis.

Table 3 presents the demographic trends shown graphically in Figure 4, along with some other neighborhood characteristics. Beyond the demographic trends already discussed, the percentage of the population renting remains similar between the treatment and comparison group. Household income is similar before the intervention, but after the intervention incomes in the treatment group significantly outpace the comparison group which supports the narrative that upzoning is often associated with an influx of wealthier households.

Table 3: Descriptive Statistics for Treatment and Comparison Group

	(1) Treatment Group	(2) Comparison Group
White Population (%)		
1990	36.9	41.9
2000	37.4	41.9
2010	41.9	41.6
2018	43.0	41.1
Renters (%)		
1990	81.2	81.5
2000	80.1	78.6
2010	72.7	74.8
2018	73.0	72.5
Household Income ($)		
1990	26,973	28,300
2000	40,688	43,239
2010	63,147	59,282
2018	100,329	78,772

2.7 Analytic Approach

We use a fixed effects regression methodology to assess the relationship between occurrences of upzoning and higher percentages of White residents in New York City. Because some census tracts in our study were upzoned (treatment census tracts) and some were not (comparison census tracts), our empirical strategy compares the changes in the share of White population within treatment census tracts with the contemporaneous changes in the share of White population in the control census tracts. Our primary dependent variable is the percentage of the population that was White in a given census tract and year.

Our study includes census tract fixed effects and time fixed effects. The census tract fixed effect controls for all unobserved census tract specific factors that were time invariant and potentially correlated with White population percentage, such as the immigrant history of a census tract before 1990. The time fixed effect controls for unobserved factors that vary from year-to-year but are consistent across census tracts and may be correlated with White population percentage. For example, this controls for city-wide rent increases that are uniform across census tracts. Fixed effect models do not eliminate bias from time-varying covariates that are inconsistent across census tracts.

Our model specifications took the following basic functional form:

$$Equation\ (A) \qquad White\_var_{it} = \beta_0 + \beta_1 * upzoned_{it} + \beta_2 * X_{it} + CT_i + T_t + \varepsilon_{it}$$

Where $White\_var_{it}$ is the percentage of population that is White for census tract i in year t

And where $upzoned_{it}$ is a dummy variable for the occurrence of a upzoning in census tract i in year t

And where X_{it} is a variable for persistent and time-varying census tract covariates such as percentage of renters for census tract i in year t

And where CT_i is a vector of census tract dummy variables

And where T_t is a vector of year dummy variables

And ε_{it} is an error term that includes other unobserved variables and random error

In addition to examining the effects of upzoning as a simple dummy variable, we conduct a test that differentiates small and large upzonings by creating two new dummy variables. We hypothesize that zoning changes that impacted a larger land area might have a greater impact than smaller zoning changes. We also test other dependent variables, examining not just the impact on the percent of White people, but also the absolute change in White population.

The relevance and impact of different covariates, represented by X in Equation (A), is a challenging point for our research. We collected data about education, income, rent prices, percentage renters and the number of homes for each census tract for each year[3]. Two methodological issues arise. First, to what extent are these variables already accounted for in our fixed effects? Second, all of these covariates, except percentage renter, were significantly correlated with both the treatment and the outcome of interest at a statistically significant level of five percent. For example, upzonings were strongly associated with increasing rental prices, but increasing rent was also strongly associated with percentage White, meaning including median rent price as a covariate would distort the true impact of the upzoning due to multicollinearity. Given this, only one regression specification (Table 5 - Model 6) includes all available covariates.

3. Results

3.1 Percent White

Table 4 presents coefficients and standard errors from OLS and fixed-effect regression models of the percentage of the population that is White. Six different model specifications are outlined in Table 4. Each specification adds a layer of complexity, with Model 1 presenting the most parsimonious empirical specification and Model 6 the most complex. Models 4 and 5 are the specifications which we believe are most accurate; finding that large upzonings are associated with a statistically significant increase in the share of White residents.

Model (1) is a simple regression using dummy variables for census tracts that were upzoned. We use this simple model as a reference point. We observe that upzoned areas tend to be slightly more White than other areas but not to a statistically significant level. In Model (2), we add census tract fixed effects. These fixed effects capture differences within the census tracts that are constant across time. Adding census tract fixed effects triggers a positive and large jump in association between upzoning and White percentage that is statistically significant. Model (3) maintains census tract fixed effects and adds time fixed effects. This captures all differences within census tracts that are constant across time and captures all differences in year-to-year changes that remain constant across census tracts. Adding time fixed effects

[3] For regressions purposes and to avoid issues of scale between different census tracts, the following definitions were adopted for each variable: (1) *Education* is defined as percentage of population with bachelor's degree or higher. (2) *Income* is defined as logarithm of median household income. (3) *Rent price* is defined as median gross rent. (4) Renters is defined as percentage of households renting.

has little impact, but marginally strengthens the association. Model (4) is the same as Model (3) but controls for the proportion of renters in each census tracts. The intuition behind including the proportion of renters is that renters are most vulnerable to real estate activities associated with upzoning. Adding percent renter renders the impact of upzoning no longer statistically significant but still strongly positive. Model (5) is the same as Model (4) but divides the independent variable into two sub groups pertaining to the size of the upzoning. Unsurprisingly, small upzonings, where 10 to 30 percent of the area of the census tract was upzoned between 2000 and 2007 are observed to be less impactful than large upzonings, where 31 to 100 percent of the census tract was upzoned. As discussed in the *Analytic Approach* section, Model (6) is the same as Model (5) but adds in all the covariates collected. Model (6) added a number of additional covariates that were correlated with the treatment and the outcome of interest. This reduced the magnitude and statistical significance of the impact of upzoning but broadly maintains the same conclusions as Model (5).

Table 4: Percentage White: Results of Ordinary Least Squares (OLS) and FE Regressions

	(1)	(2)	(3)	(4)	(5)	(6)
Upzoned	2.297	5.283*	5.815*	5.533		
	(4.048)	(2.875)	(3.285)	(3.292)		
Upzoned Small					1.608	-0.134
					(4.282)	(3.405)
Upzoned Large					9.026**	5.497*
					(3.965)	(2.887)
2000			0.290	-0.0843	-0.111	-5.023***
			(1.429)	(1.511)	(1.520)	(1.670)
2010			-0.560	-1.826	-1.916	-7.924***
			(1.732)	(2.082)	(2.086)	(2.654)
2018			-0.215	-1.669	-1.773	-12.300***
			(2.219)	(2.429)	(2.404)	(3.672)
Renter (%)				-0.186	-0.199	-0.093
				(0.151)	(0.144)	(0.131)
Income (Log)						8.180*
						(4.264)
Rent ($)						-0.001
						(0.003)
Household (#)						-0.005*
						(0.003)
Bachelor degree (%)						0.370***
						(0.092)
Observations		152	152	152	152	152
R-squared	0.001	0.083	0.084	0.105	0.146	0.366
Number of idx		38	38	38	38	38
Census Tract FE		YES	YES	YES	YES	YES
Year FE			YES	YES	YES	YES

Clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Models (4) and (5) yielded the most meaningful results. Model (4) demonstrated that on average, an upzoning is associated with a 5.5 percentage point increase in the percentage of White people in that area, but not to a statistically significant degree. Based on our descriptive statistics, this observation was in line with our expectations. Model (5) demonstrated that the geographic size of the upzoning is important. We

found that a large upzoning was associated with a nine percentage point increase in the percentage of White people in that area. This observation is statistically significant at the five percent level.

3.2 Absolute Changes in Population

The absolute change in population is a complementary metric which is important for understanding whether we observe the displacement of non-White residents. In this section we use Model Specification (5) from the previous section but change the dependent variable measure to absolute population change rather than percent distribution. Table 6 outlines the results using different racial groups for different specifications.

We find that upzoning a census tract is associated with an increase in population for that census tract. This is unsurprising given that accommodating additional population growth is an explicit goal of upzonings. Large upzonings are associated with a statistically significant increase in population, whereas census tracts with a small upzoning see a positive but statistically *insignificant* increase. The exact increase shown in Table 6 is unimportant given that census tracts vary in size.

It is important to note the relative population change by race/ethnicity which is dominated by White and Asian population groups. For large rezonings, the vast majority of population growth associated with upzoning is driven by White and Asian population groups to statistically significant degrees. Populations identifying as Black or 'other' have small and statistically *insignificant* increases in population. Finally, the Hispanic population change is negative and statistically *insignificant*. To see no (or potentially negative) population change for Hispanics is particularly noteworthy given that Hispanics are the fastest growing population group citywide.

Drawing decisive conclusions about displacement from this data would be inappropriate for a number of reasons. First, our results for Blacks and Hispanics are not statistically significant meaning we cannot say displacement occurred, but equally we cannot rule out that it did not occur. Secondly, even if we had statistically significant results for these groups, a small net change in population is an imperfect measure of displacement. It is imperfect because within racial groups, poor families can be displaced by wealthy families of the same race. In addition, one would need a more sophisticated methodology that includes eviction data or is able to track individuals rather than populations. Regardless, the results in Table 6 flag that upzoning is likely leading to unequal opportunities across sub-populations. Specifically, it signals that new units are being filled by Whites and Asians at higher rates than what the city is experiencing overall.

[Continued on next page]

Table 5: Population change: Results of Fixed-Effects Regressions

				Sub-categories of non-white			
	(1) Total	(2) White	(3) Non-white	(4) Black	(5) Hispanic	(6) Asian	(7) Other
Upzoned Small	81	113	-32	185	-163	-51	-3
	(330)	(219)	(315)	(138)	(164)	(90)	(18)
Upzoned Large	833**	570***	263	133	-164	246*	47
	(391)	(196)	(324)	(114)	(197)	(138)	(31)
Renter (%)	-7	-1	-6	-1	-1	-2	-2*
	(14)	(8)	(13)	(6)	(6)	(4)	(1)
Observations	152	152	152	152	152	152	152
R-squared	0.329	0.320	0.154	0.099	0.072	0.445	0.404
Number of idx	38	38	38	38	38	38	38
Census Tract FE	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES

Clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

3.3 Limitations

The complexity of cities and the ability to attribute causality beyond this study warrants a discussion of the numerous limitations of this paper.

A major threat to internal validity is the small sample size. City-initiated upzonings are major undertakings and occur infrequently. In addition, we had to constrain ourselves to a narrow time period in order to have sufficient data before and after the intervention. Together, these factors meant that our dataset was small, at only 19 census tracts and 12 upzonings, perhaps not enough to draw strong conclusions. Additionally, the small number of clusters may bias standard errors making them too small.

Another major threat to internal validity was the quality of our comparison group as an accurate counterfactual estimate. For reasons described in greater detail in *2. Data & Methods,* it is hard to place full confidence in our counterfactual even when the parallel trends assumption is met. The methodology used by the government to select areas for upzoning is opaque and definitely non-random, making the construction of a suitable counterfactual difficult.

Our study suffered from a number of measurement issues with the primary independent and dependent variables. Firstly, not all upzonings are alike. The intensity of upzoning can vary, for example, one upzoning might permit a building height increase of one story across a neighborhood, whereas another might allow a three story increase. Additionally, some upzonings come with add-on features negotiated through a political process or community benefit agreements, for example, a new playground or public amenity might be promised as part of the negotiation. Our study treated all upzonings equally, with the exception of model specification (5) and (6) which differentiated between upzonings based on land area covered. However, lot coverage is only one way of measuring how large or intense an upzoning is. Additionally, in order to simplify our analysis, we assumed that the approval year of the upzoning was unimportant (as long as it was within the 2000 to 2007 time band).

With respect to the measurement issues for the dependent variable, our measurement of demographic change partially relied on the 2018 ACS, which is known to have a margin of error. A re-run of the analysis when the 2020 census data is released would be ideal.

We believe the external validity of this study may be limited by the location and timing of the study. New York City's housing market and population is unlike many other places in the United States. The city has a high number of non-White residents and a high density, high demand, high price housing market which collectively creates social and economic forces that might not be as strong in other places. Moreover, with New York City residents mostly renting, they are perhaps more mobile than other places with higher home ownership rates. An association between upzoning and an influx of White residents may not be transferable to other places in the United States, especially those where wealthy White people favor low density suburbs.

Additionally, examining upzonings that occurred just before the financial crisis of 2007–08 muddies the degree to which these results are transferable to upzonings today. The financial crisis of 2007–08 had a significant impact on peoples' livelihoods and also shook real estate markets. Although we do account for time-based events that were constant across census tracts, the degree to which the financial crisis of 2007–08 is fully accounted for in those fixed effects is unknown and likely not fully captured. Other land use and housing-related policies, such as mandatory inclusionary zoning and others have also been introduced after the upzonings we study, which also make our results less generalizable.

4. Conclusion

Over the past two decades, the New York City government has used upzoning as the primary tool to respond to growing housing demand and the need for affordable housing. Analyzing the rezonings that took place in the earlier part of the 2000s, we find that concerns around gentrification and an influx of White residents following an upzoning are warranted. We find that upzonings that occurred between 2000 and 2007 are associated with a five to nine percentage point increase in the share of White people in that area. This influx is particularly notable given stagnation of White population growth in the city over the same period. We observe a strong likelihood that new housing units created by upzoning become occupied by mainly White or Asian residents. However, definitive conclusions on displacement require a more sophisticated methodology than the net change in population used in this paper. Eviction data or data that tracts individuals rather than populations would be more insightful for the subject of displacement. Finally, given the social and economic complexity of cities and the limitations of our methodology we conclude that these results should be treated as exploratory and may only be applicable to upzonings in New York City.

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