MEASURING GENTRIFICATION IN NEW YORK CITY 2000-2015

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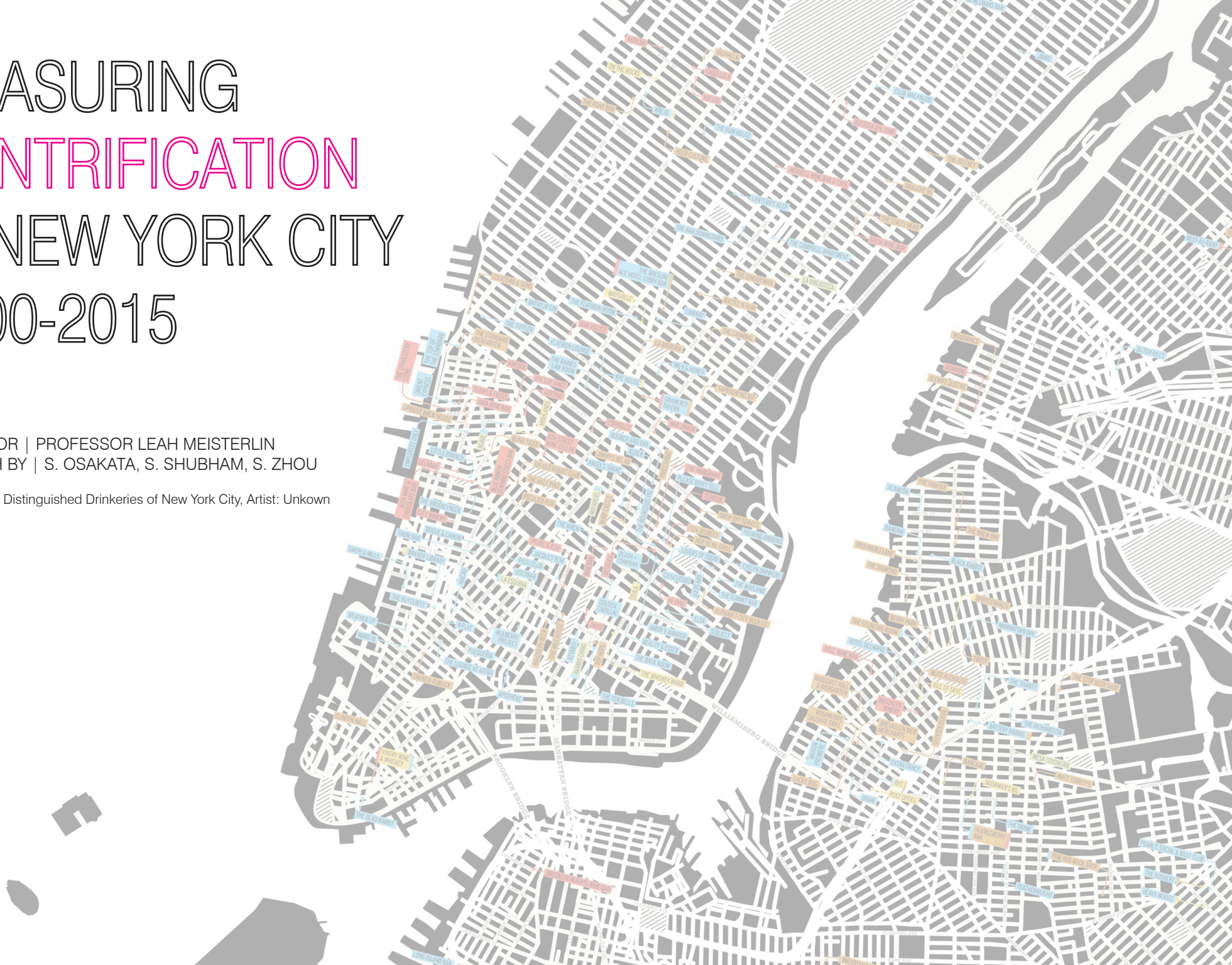
Cover Art: The Distinguished Drinkeries of New York City, Artist: Unkown



CONTENTS

INTRODUCTION

Assessing the patterns in gentrification based on demographic and spatial measures in New York City for the year 2000-2015.

Reserch questions:

- How the results are different by using demographic and spatial measures?
- Which neighborhoods have gentrified during 2000-2015?

This study was conducted to answer the above stated question by understanding the effects of demographic parameters (termed as aspatial method in this study) and parameters describing the built environment (termed as spatial method). Scholars have used multiple parameters to measure gentrification in the past which include socio-demographic characteristics, however, there has been limited research on the effect of built environment.

The built environment is critical in determining the urban fabric of the city. The influence can include access to opportunities, social infrastructure and location for economic transactions. The research using a wide range of tools as provided by ArcGIS formulates a model which predicts the areas within New York City that are gentrified. The results for the time period 2000-2015, will be calculated based on the model described in the following sections.

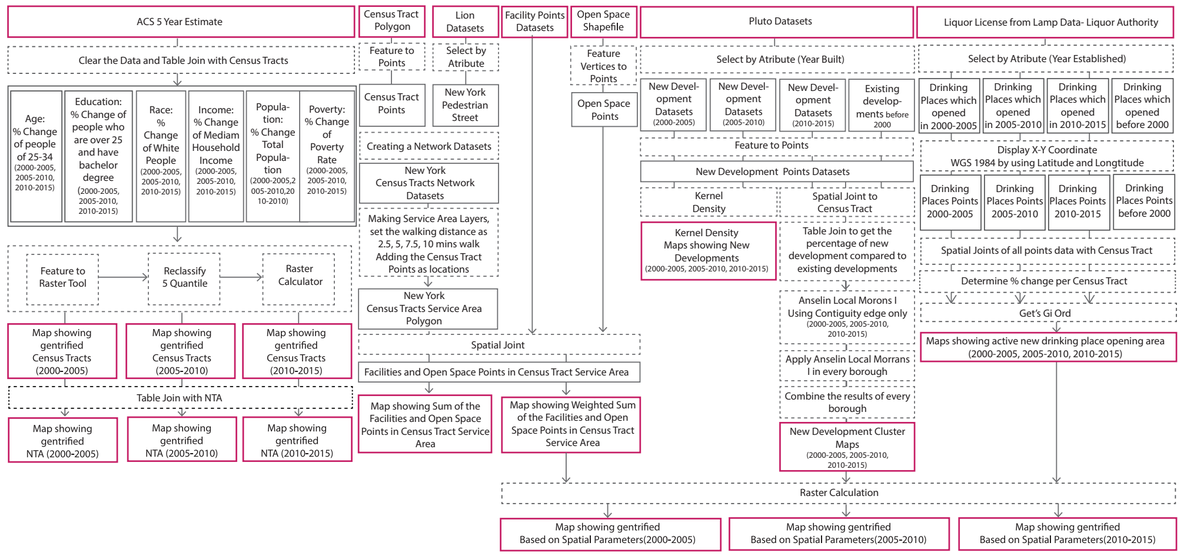
METHODOLOGY

The term “gentrification” is understood as simultaneous changes of parameters related to demography and built environment over a period of time. The time periods investigated here are 2000-2005, 2005-2010, and 2010-2015.

The parameters are characterized into aspatial (demographic) and spatial parameters and individual and combined effect of these parameters are visualized. Aspatial (demographic) parameters include changes in income, poverty, race, age, education and population. On the other hand, spatial parameters are defined in this research as those that are based on locations of a census tract with respect to an entity of built environment, such as services, new developments and business that possess liquor licenses.

The study identifies gentrified census tracts based on these parameters and calculates the percentage of overlapped census tracts to analyze parameters which have a more significant relationship with gentrification. Based on this analysis, weighted score for each parameter is decided and combined maps are created to identify gentrified areas in a more comprehensive manner.

The ultimate goal of the research is to understand how aspatial (demographic) and spatial parameters of census tracts explain the gentrification of neighborhoods containing them in New York City.



THE METHODS

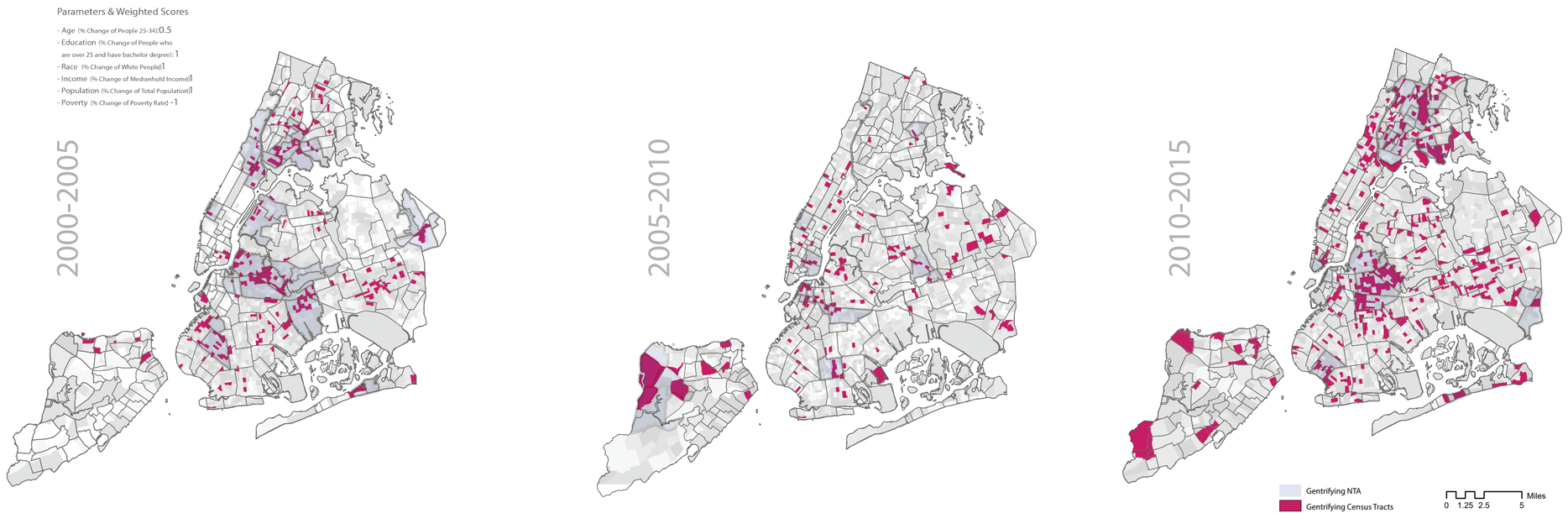
Demographic parameters

The first analysis was conducted for the aspatial (demographic) parameters. The parameters chosen were the most commonly-used measures of gentrification in the studied prior research. The data used is obtained from the anonymized and aggregated datasets provided by Census Bureau.

The obtained data was joined with shapefiles for census tract for the years 2000, 2005, 2010, and 2015, as released by the Census Bureau and the percentage change in the measures are calculated for every census tract in New York City.

The parameters and weighted scores for each parameters are as follows: Age (Percentage change of people of 25-34): 0.5, Education (Percentage change of people who are over 25 and have bachelor degree) : 1, Race (Percentage change of white people): 1, Income (Percentage change of median household income):1, Population (Percentage change of total population): 1, Poverty (Percentage change of poverty rate): -1. Once the scores were determined, the aggregated scores for the census tracts was calculaed using a raster calculater. This information was transformed into a feature layer and was aggregated within neighborhoods through a spatial join to understand the patterns of gentrification. Neighborhoods with scores belonging to top 20 percentile of the range of the scores were selected and identified as gentrifying.

GENTRIFIED CENSUS TRACTS
BASED ON ASPATIAL PARAMETERS



SPATIAL METHODS

Effects of Level of Services

Once a reference point for gentrification was obtained based on demographic data, the effects of parameters related to built environment were measured on gentrification. Thereafter, the two results were compared.

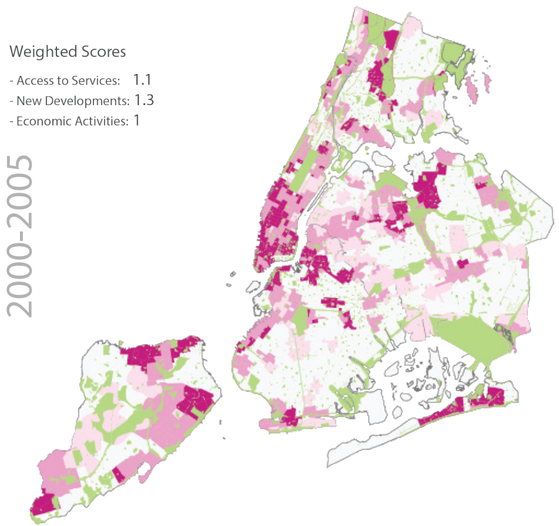
The first method counts the number of the services, such as bus stops, subway station, health center, college or university and parks, within 2.5, 5, 7.5, 10 minutes walking distance from census tract points. This method conducts network analysis to measure walking distance along pedestrian street. The limitation of this method is aggregation since it counts the number of services based on census tract points even though there is a difference within one census tract.

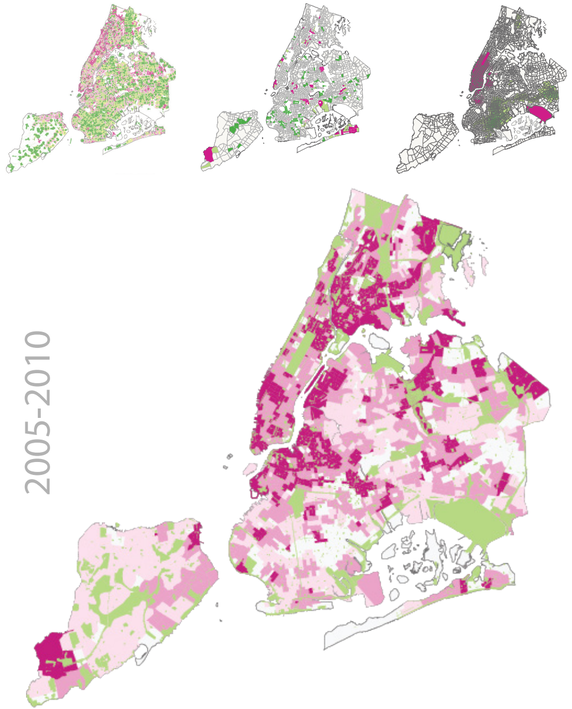
All the analysis w conducted for the three time periods 2000-2005, 2005-2010-, and 2010-2015.

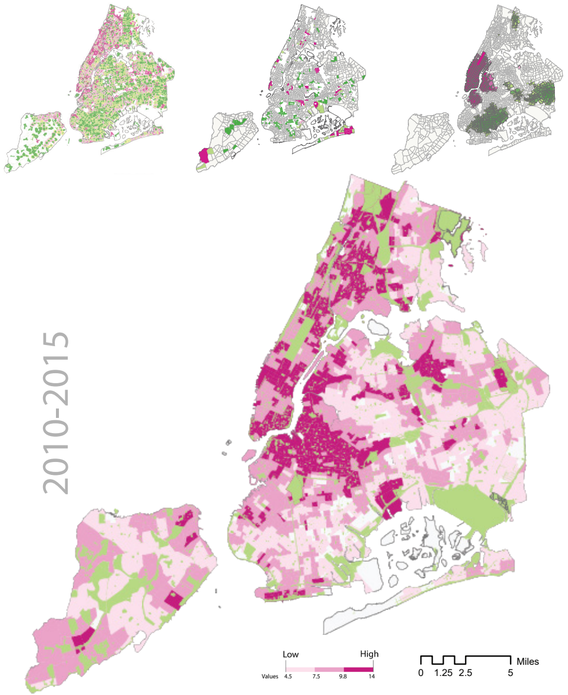
GENTRIFIED CENSUS TRACTS
BASED ON SPATIAL PARAMETERS

Weighted Scores

- Access to Services: 1.1
- New Developments: 1.3
- Economic Activities: 1







Effects of New Development

To assess the effects of new development on gentrification, a secong set of analysis was conducted, wherein the percentage change in the parameter was calculated for the years 2000-05, 2005-10, and 2010-15.

The analysis involved the use of Cluster and Outlier Analysis (Anselin Local Moran's I). The ratio of new developments to existing developments was used to represent the gentrification, instead of the absolute number as it is factored by change.

The percentage change was derived for each census tracts and the relationship of clusters were conceptualized based on the contiguity of edges only. The reason of choosing this relationship is that census tracts are polygons and also we do not need to count the corner polygons.

Number of permutations chosen was 499, which means that the smallest possible pseudo p-value is 0.002. This value was chosen as a default as the results were clearer and more readable.

Further analysis was conducted wherein the Local Moran's I statistics were calculated for each borough in New York City, to better understand the gentrification results in each borough. The results of these clusters were similar to that of clusters when NYC was analysed as a unit, therefore, these results will not be discussed in this report.

Effects of Distribution of Liquor License

The third step was to analyze the economic activities in order to predict gentrification. Herein the distribution of liquor licenses is considered as a proxy for economic activities as the demand for liquor license is generated by cohort that is perceived to characterize gentrification.

To analyse this distribution, point data was accessed from the liquor authority which updates its list quarterly. The percentage change in number of data points was calculated per census tract (by performing a spatial join and observing the counts of point data) for the time periods being assessed.

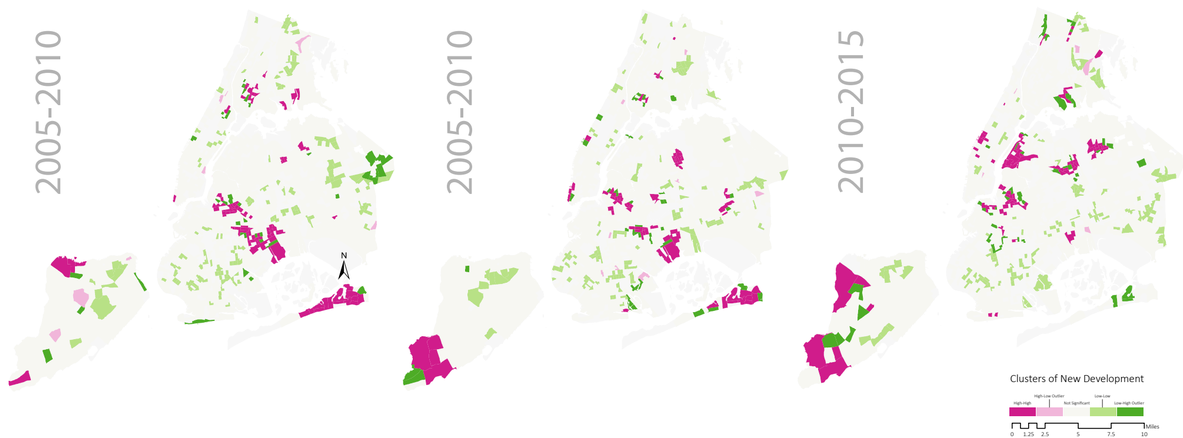
Furthermore, a Hot Spot Analysis (Getis-Ord Gi*) was conducted to understand the clusters in spatial distribution. The parameter contiguity edges only was selected for this analysis as well. This analysis was also conducted borough-wise, however no significant changes were observed in the spatial distribution of clustering.

Weight and Combine

In order to weigh accurately the parameters selected, the three spatial parameters, we calculated individually. Thereafter the decision layers obtained from the analysis were reclassified and a raster calculation was performed (without any weight) to determine the overlap of the combined decision map to the individual parameters. The percentage of census tracts overlapping were understood and based on the degree of overlap, the weight was adjusted.

In this research this process is performed once, however, to procure more accurate estimates of gentrification based on these parameters, the results of each of the process need to be evaluated against the decision layer created in the step before. This iterative process needs to be followed until, the percentage change become constant for the parameters across the timelines being discussed.
There are several limitaions to this study, some of which are discussed in this section. The data collected has been aggregated and anonymized by an external agency over a census tract, therefore, one cannot be sure about the distribution of data within the spatial unit.

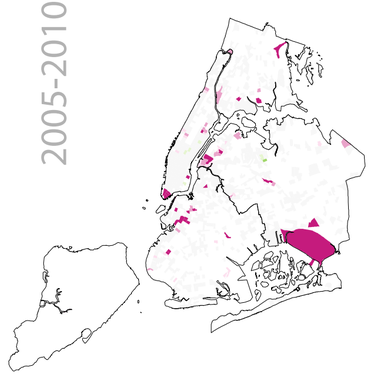
BOROUGH-WISE DISTRIBUTION OF CLUSTERS : NEW DEVELOPMENT



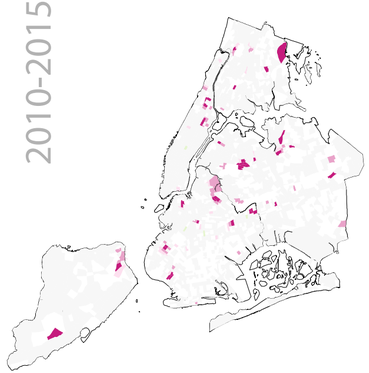
BOROOUGH-WISE DISTRIBUTION OF CLUSTERS : LIQUOR LICENSE

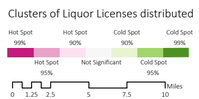
2005-2010

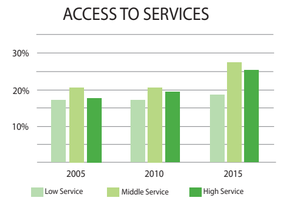
2005-2010

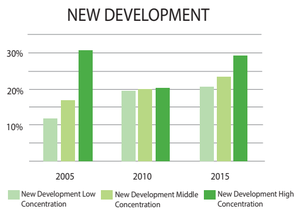


2010-2015









RESULTS

As explained in the methodology, the process of measuring gentrification was performed twice. Firstly, the parameters were equally weighted. Thereafter, understanding the effects of the parameters and upon referencing prior research, the parameters were re-calibrated. Thus, in this section the findings will be discussed in two steps.

Upon conducting the first step (where the parameters were equally weighted), it was observed that there was no correlation between low or high level of service to the number of gentrifying census tracts. However, the number of census tracts seem to increase with an increase in medium level of services.It is stipulated by previous scholars that a high level of service may lead to gentrification (Couture and Handbury, 2015), however, in recent times, areas with high level of service have become financially unattainable (Himmelberg et. al, 2005)..

Furthermore, it was observed that a high number of census tracts that were termed as gentrified, were located close to clusters of high number of new development. This percentage increased drastically from 2005 to 2010, and witnessed a slump from 2010-2015. This result not only explain the trends in gentrification, but also mirrors the effects of the housing bubble.

Lastly, it appeared from the result that there were no correlation between low number of liquor licenses, and number of census tracts they were gentrifying. However, the number of gentrifying census tracts increased in areas where medium or high number of liquor licenses

that were issued. Liquor licenses are viewed as “tangible evidence of gentrification” (Malone 2011). This is reinforced by the results observed in the study.

The spatial and aspatial parameters when viewed independently enabled an understanding of trends of gentrification. Since some parameters seem to affect gentrification more than the the others, the parameters that indicate gentrification as per the study were re-calibrated. The weights upon re-calibration are described in the methodology section. Furthermore, the spatial and aspatial parameters were overlaid using raster calculator to understand the combined effects of both.

The resultant map is shown here, also indicating the neighborhoods that were assessed as gentrified based on the model. Despite choosing carefully the most cited determinants of gentrification, the maps fail to represent the gentrifying census tracts in Brooklyn and overrepresents Staten Island. Staten Island saw tremendous new development in all the three 5 year time-periods. This has attributed a lot to the gentrification score. It is interesting to note that while built environment might not predict the current gentrification accurately, it helps understand what the development pattern will be in the next few years and enables researchers to gauge future development and gentrification.

In this case The current representation of spatial and aspatial indicators do explain few trends in gentrification, however, it does not provide a holistic overview of gentrifying neighborhoods in NYC.

2000-2005

GENTRIFIED CENSUS TRACTS

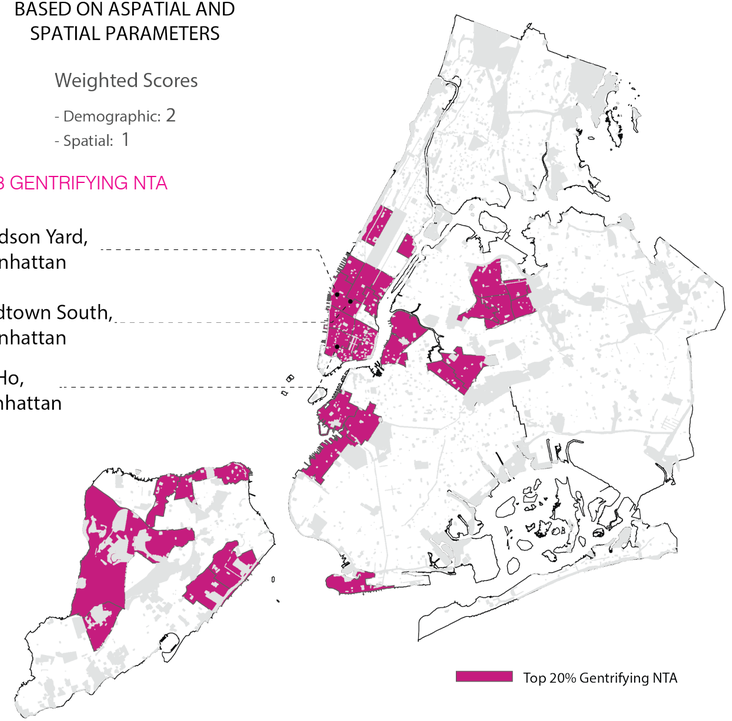
BASED ON ASPATIAL AND SPATIAL PARAMETERS

Weighted Scores

- Demographic: 2
- Spatial: 1

TOP 3 GENTRIFYING NTA

1. Hudson Yard, Manhattan
2. Midtown South, Manhattan
3. SoHo, Manhattan

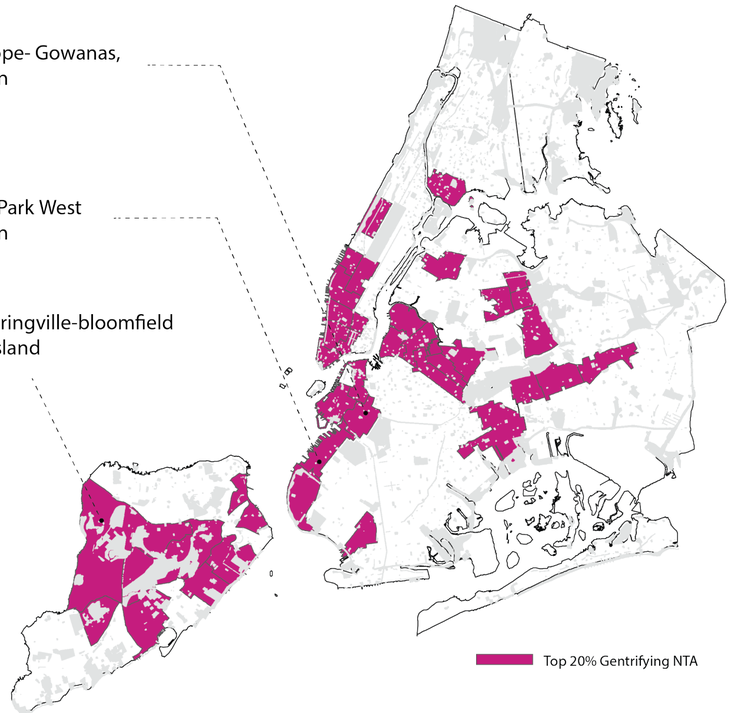


2005-2010

2. Park Slope- Gowanas, Brooklyn

3. Sunset Park West Brooklyn

1. New Springville-bloomfield Staten Island

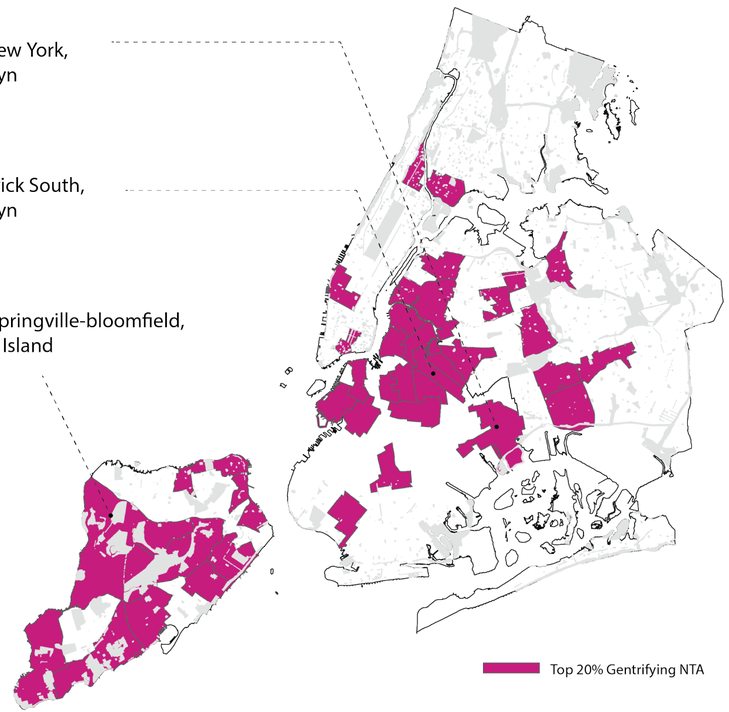


2010-2015

3. East New York, Brooklyn

1. Bushwick South, Brooklyn

2. New Springville-bloomfield, Staten Island



LIMITATIONS

There are several limitaions to this study, some of which are discussed in this section. The data collected has been aggregated and anonymized by an external agency over a census tract, therefore, one cannot be sure about the distribution of data within the spatial unit.

The chosen indicators were determined based on previous scholarship, and while they are expansive, they might not be exhaustive. For different cities, and geographic conditions, different parameters are considered to drive gentrification. Also, only three indicators are used to determine the affects of built environment.

While creating decision layers based on the parameters the *reach* of the amenities and built environment was studied, however, this was not normalized based on the population. Therefore, normalizing the built environment parameters by population could produce better result. In this research, the authors refrained from doing so, as they wanted to research the affects of the parameters in isolation.

Construction of original datasets (by the authority) may also contribute to inaccuracy. While calculating the access to services, walking distance were calculated from vertices of park. This might have disproportionately represented the areas closer to larger parks, especially in Bronx, Brooklyn and Staten Island.

CONCLUSION

For spatial parameters, new development seems to be a useful indicator of gentrification, where higher level of new development is more related to gentrification. However, the levels of service accessibility and low distribution of liquor license show no significant correlation to gentrification.

Comparing aspatial and spatial parameters, the aspatial one is more accurate in measuring gentrification. The possible reasons are that demographic/aspatial data are more adequate in the city scale and that the chosen spatial parameters may not be complete. Generally, in three time periods of 2000-2005, 2005-2010, and 2010-2015, gentrification in New York City is gradually moving from midtown and downtown Manhattan to Brooklyn and Queens.

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