Transit in A Historic Ethnic Enclave

From Chinatown to Southern Brooklyn by Train

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Final Report
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Transit Changes | Background

New York City is famous for its cultural diversity, population density, and round-the-clock transportation networks. The connectivity of the “City that Never Sleeps” has enabled fluid boundaries in communities, allowing them to shift and expand while staying linked through mass transit. Within the city’s diverse populations, ethnic enclaves in particular have a documented history of nimbleness, with many communities moving if and when new transportation developments occur.

Some of these immigrant communities first developed large presences in the city on Manhattan’s Lower East Side. What today is viewed as a series of neighborhoods–including the Lower East Side itself, Chinatown, and Two Bridges–has long been a globally famous melting pot of diverse cultures. At the turn of the twentieth century, the neighborhood was home to a thriving Jewish community hailing from various nations in Eastern Europe. The 1909 opening of the Williamsburg Bridge connected this community to less populated towns with cheaper rents in Brooklyn, stimulating a large exodus from the neighborhood. So pronounced was this departure due to a transit development that newspapers titled the new bridge the “Jewish Highway”[1].

By the mid-twentieth century, the neighborhood had shifted to housing a largely Puerto Rican community in its eastern section and a small Chinese community in its west. This western section–famous today as Manhattan’s Chinatown–was for much of the twentieth century a relatively small, segregated space defined by the legal treatment of Asian-Americans as second class citizens. The period between the Chinese Exclusion Act of 1882 and the Immigration and Nationality Act of 1965 saw extremely limited Chinese immigration to the United States, and scholars have written about the community around Mott Street developing in relative isolation[2]. The passage of the latter act resulted in large waves of immigration from China, with the city’s Chinatown growing dramatically into the area we know today.

Today’s neighborhood lives with these legacies. Thriving markets, overflowing restaurants, and Chinese language street signs concentrate around the Manhattan Bridge, demonstrating the ongoing presence and strength of this ethnic enclave.

1 Deutsch, N., & Casper, M. (2021). A Land Not Sown. In A Fortress in Brooklyn: Race, Real Estate, and the Making of Hasidic Williamsburg (pp. 17–38). Yale University Press. https://doi.org/10.2307/j.ctv1mgmct0.5
2 Yuan, D. Y. (1974). Social Consequences of Recent Changes in the Demographic Structure of New York Chinatown. Phylon (1960-), 35(2), 156–164. https://doi.org/10.2307/274704

Historic Chinatown | Flickr

Historic Lower East Side | Tenement Museum

It was our hunch, however, that this historic landing ground for immigrants has changed in the last twenty years to become less of an ethnic enclave and more of a victim of gentrification. Our study, then, responds to this spatial phenomenon by asking the research question:

How did a major transit development affect the composition, location, and existence of an ethnic enclave on the Lower East Side?

Transit Changes | Background

We consider the relationship of transportation to ethnic enclaves through the lens of a singular service change on subways by the Metropolitan Transit Authority (MTA). In February 2004, the MTA re-opened all four tracks of the Manhattan Bridge with new service patterns. This resulted in the ability to have a one-seat express ride from Chinatown in Manhattan to the Southern Brooklyn neighborhoods of Sunset Park, Bensonhurst, and Dyker Heights. Prior to this change, either the north or south tracks of the Manhattan Bridge had been closed since 1986. The reconstruction work of those eighteen years allowed the MTA to run faster, safer, and more reliable trains on the four tracks servicing the hundred-year old bridge over adjusted routes.

Returning to our hunch, we suspected that this new connection had contributed to a shifting of the Chinese population not unlike the move of the Jewish community one hundred years prior. We knew, anecdotally, that a large Chinese community has settled relatively recently in Sunset Park and its surrounds. We set out to test if this had occurred in relation to increased accessibility to and from the heart of Manhattan's Chinatown on an express train.

It is no doubt a fool's errand to try and use one factor of urban life to understand its broader complexity. Our study, therefore, consists of comparing three means of measuring and defining ethnic communities in order to understand how this transportation event has affected key metrics of life in ethnic enclaves. It looks holistically at a variety of metrics, rather than trying to pin down one as a smoking-gun explainer of complex spatial phenomena. Through comparing a clustering method, a dissimilarity metric, and a multi-modal service area over two decades, the study explores conditions that form, alter, and define ethnic enclaves.

Lastly, we take the ethnic enclave in and near Chinatown as our starting point for these methods as we consider its markets, businesses, and community nodes as magnets for shifted communities easily accessible by train. The historic significance of this location remains pivotal for the diverse communities of New York. For this conceptual framework, we are informed by scholarly work on satellite Chinatowns[1], relying on research in the field to inform the extent of our study.

1 Lin, J. (1998). The Growth of Satellite Chinatowns. In Reconstructing Chinatown: Ethnic Enclave, Global Change (NED-New edition, Vol. 2, pp. 107–120). University of Minnesota Press. http://www.jstor.org/stable/10.5749/j.ctttt26t.9

Methodology | Overview I

Methodology | Overview I

In order to initiate the analysis to answer our research question, we located datasets we determined to contain information relevant to our topic. With that in mind, the study sources racial, ethnicity, place of birth, commuting, and language information from the 2000, 2010, and 2020 decennial censuses. We have pulled this information at the scale of New York City to provide a broader picture of the context of our study zone.

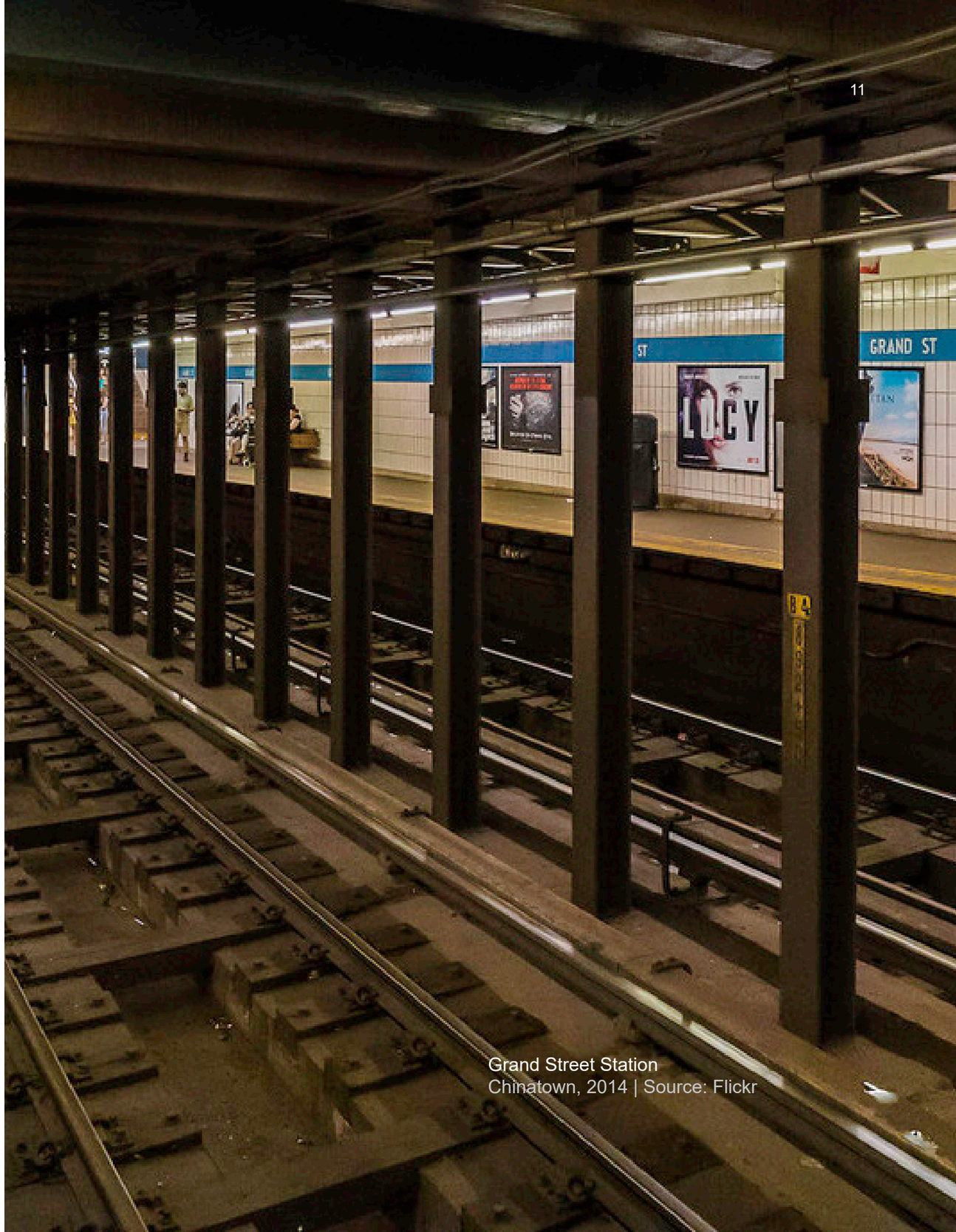
Built-environment information was also gathered with a focus on MapPLUTO datasets, geo-referenced subway lines and stations, street centerlines, and city agency data on public facilities and construction permits. This information was compiled across all three years of our study to fill out the set of conditions studied in the report.

Methodologically, the study first creates uniform hexes with an area that equals half the median block group area used as our fundamental spatial unit. This is partially to rectify the changing decennial census blocks, but also because a uniform spatial unit helps us compare the very different neighborhoods in Lower Manhattan and Southern Brooklyn. Then, within these hexes, we identify clusters of immigrant population at the municipal scale using the **Getis Ord Gi* statistic analysis**.

Next, to draw boundaries of the defined enclaves, the study then calculates measures of evenness from a modified formula from **Duncan's Dissimilarity Index.** This identifies clusters of high similarity by re-applying the Getis Ord Gi* statistic test on the resulting index score.

The boundaries identified in the above steps provide a centroid, which is used as an origin location for a networked study zone. From this point, we created **Multi-Modal Service Areas** for each year examined, limiting the modes to pedestrian and subway mobility.

Finally, with the service areas defined, the study develops metrics using their boundaries to test various built-environment and demographic datasets. This allows us to elaborate on the measurable changes that came with the rerouting of train service. These metrics are compared over the two-decade temporal scope of the report.



Grand Street Station
Chinatown, 2014 | Source: Flickr

Methodology | Clustering + Dissimilarity

To capture the social dimensions, we calculated a similarity index for each hex, which we defined as:

$$S_{index} = x_i / X - y_i / Y$$

where

x_i = Population of foreign born in hex *i*
y_i = Population of native born in hex *i*
X = Population of foreign born in New York
Y = Population of native born in New York

This is a measure of evenness that is modified from **Duncan's Dissimilarity Index**; the greater the value of S indicates that there is a higher potential of an encounter with foreign born individual in this particular hex than the rest of the city and a lower potential of an encounter with native born individual than the rest of the city.

After calculating this index for all block groups, we needed to identify areas in which this attribute is spatially clustered, so we conducted a hot-spot analysis using the Getis-Ord Gi* spatial statistic tool. We chose to conceptualize the spatial relationship of an enclave as inverse distance, as it captures the impedance of a neighborhood experience; one's experience of an overall neighborhood is more influenced by features immediately around them and that degree of influence decreases as the features become more distant. Finally, we selected groups of hexes in the Lower East Side-Chinatown-Two Bridges area identified as hot spots with a confidence level above 95%. The extent of that polygon became the boundary of our enclaves. These boundaries, and their related centroids, form the basis upon which we constructed our networked study area later on.

However, beyond just defining the boundaries, we are more concerned with the demographic makeup within these enclaves and how they have changed over time. As the measure of evenness is concerned with the relative proportion of foreign born to native-born individuals, we needed to conduct another analysis that looks just at where concentrations of the immigrant population are. Using the same conceptualization of spatial relationships, we applied the Getis-Ord Gi* spatial statistic tool on the percentage of the population of foreign-born individuals in each block group.

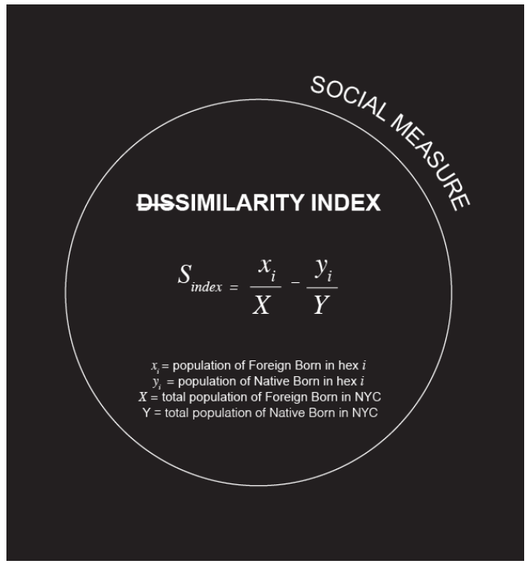


Diagram | Dissimilarity Index

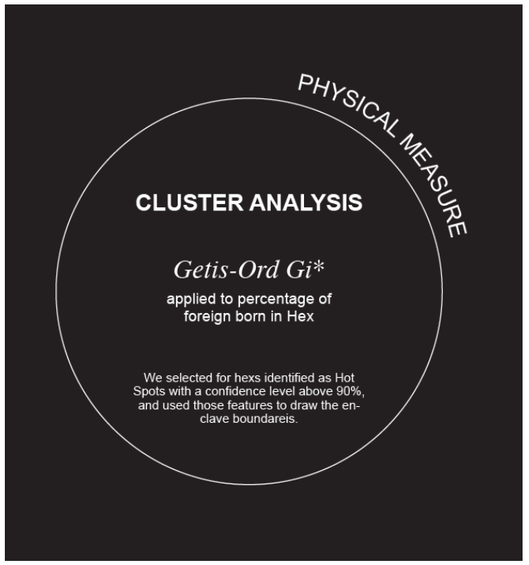


Diagram | Cluster Analysis

We did this for all three decennial years. It became immediately apparent that there has been a moving, shrinking, and disintegration of the immigrant enclave in the Chinatown-LES-Two Bridges area over the past two decades. Simultaneously, there is an evident, if gradual, increase in clusters of immigrant populations along the D Line in the Sunset Park-Bensonhurst-Dyker Heights area. The figures on the following three pages share these results graphically and identify high confidence clusters in each of our study zones.

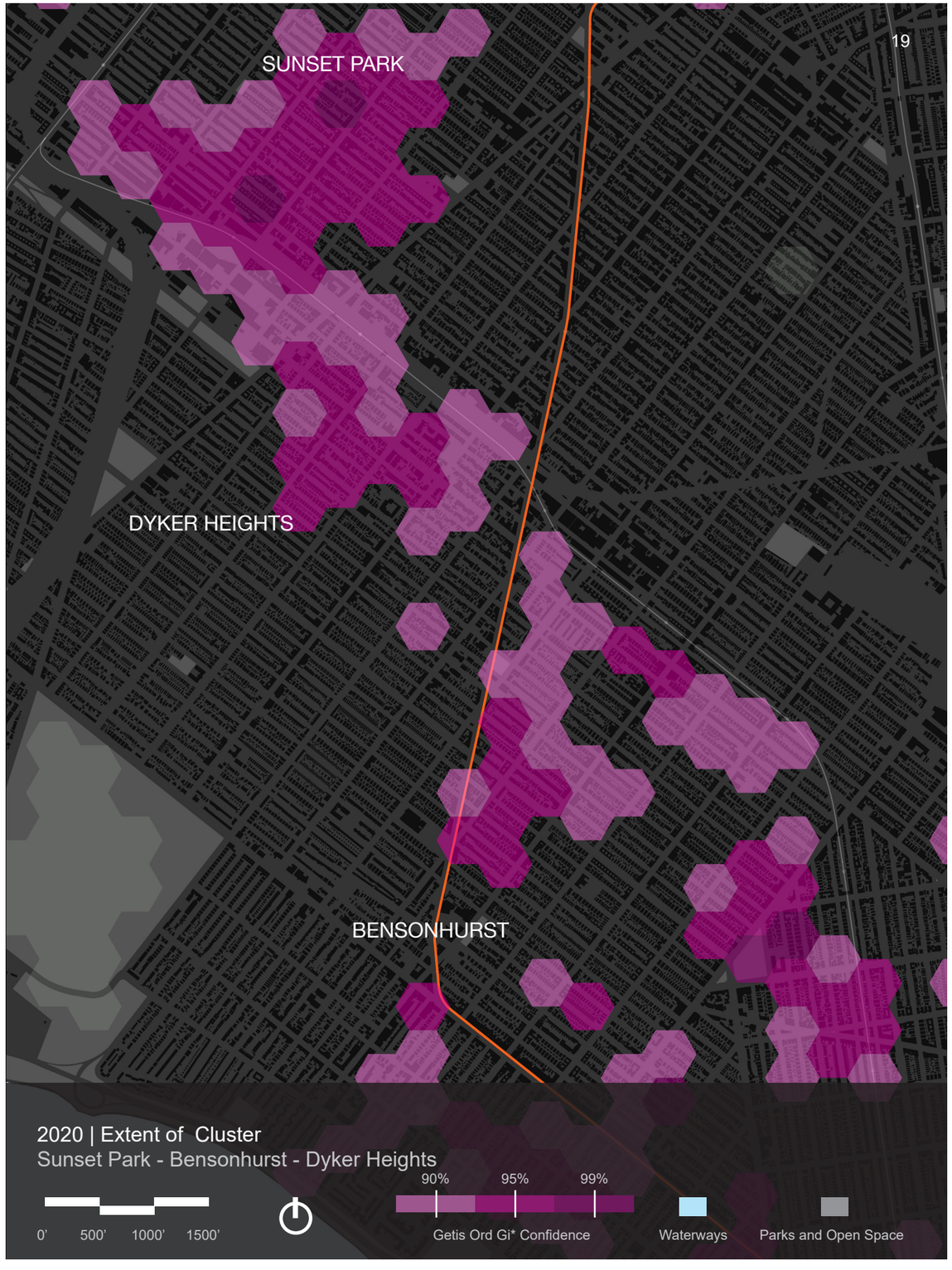

LOWER EAST SIDE
CHINATOWN
TWO BRIDGES
MANHATTAN BRIDGE
2000 | Extent of Cluster
Chinatown - LES - Two Bridges
0' 500' 1000' 1500'
90% 95% 99%
Getis Ord Gi* Confidence
Waterways
Parks and Open Space


SUNSET PARK
DYKER HEIGHTS
BENSONHURST
2000 | Extent of Cluster
Sunset Park - Bensonhurst - Dyker Heights
0' 500' 1000' 1500'
90% 95% 99%
Getis Ord Gi* Confidence
Waterways
Parks and Open Space


LOWER EAST SIDE
CHINATOWN
TWO BRIDGES
MANHATTAN BRIDGE
2010 | Extent of Cluster
Chinatown - LES - Two Bridges
0' 500' 1000' 1500'
90% 95% 99%
Getis Ord Gi* Confidence
Waterways
Parks and Open Space


SUNSET PARK
DYKER HEIGHTS
BENSONHURST
2010 | Extent of Cluster
Sunset Park - Bensonhurst - Dyker Heights
0' 500' 1000' 1500'
90% 95% 99%
Getis Ord Gi* Confidence
Waterways
Parks and Open Space


LOWER EAST SIDE
CHINATOWN
TWO BRIDGES
MANHATTAN BRIDGE
2020 | Extent of Cluster
Chinatown - LES - Two Bridges
0’ 500’ 1000’ 1500’
90% 95% 99%
Getis Ord Gi* Confidence
Waterways
Parks and Open Space


SUNSET PARK
DYKER HEIGHTS
BENSONHURST
2020 | Extent of Cluster
Sunset Park - Bensonhurst - Dyker Heights
0’ 500’ 1000’ 1500’
90% 95% 99%
Getis Ord Gi* Confidence
Waterways
Parks and Open Space

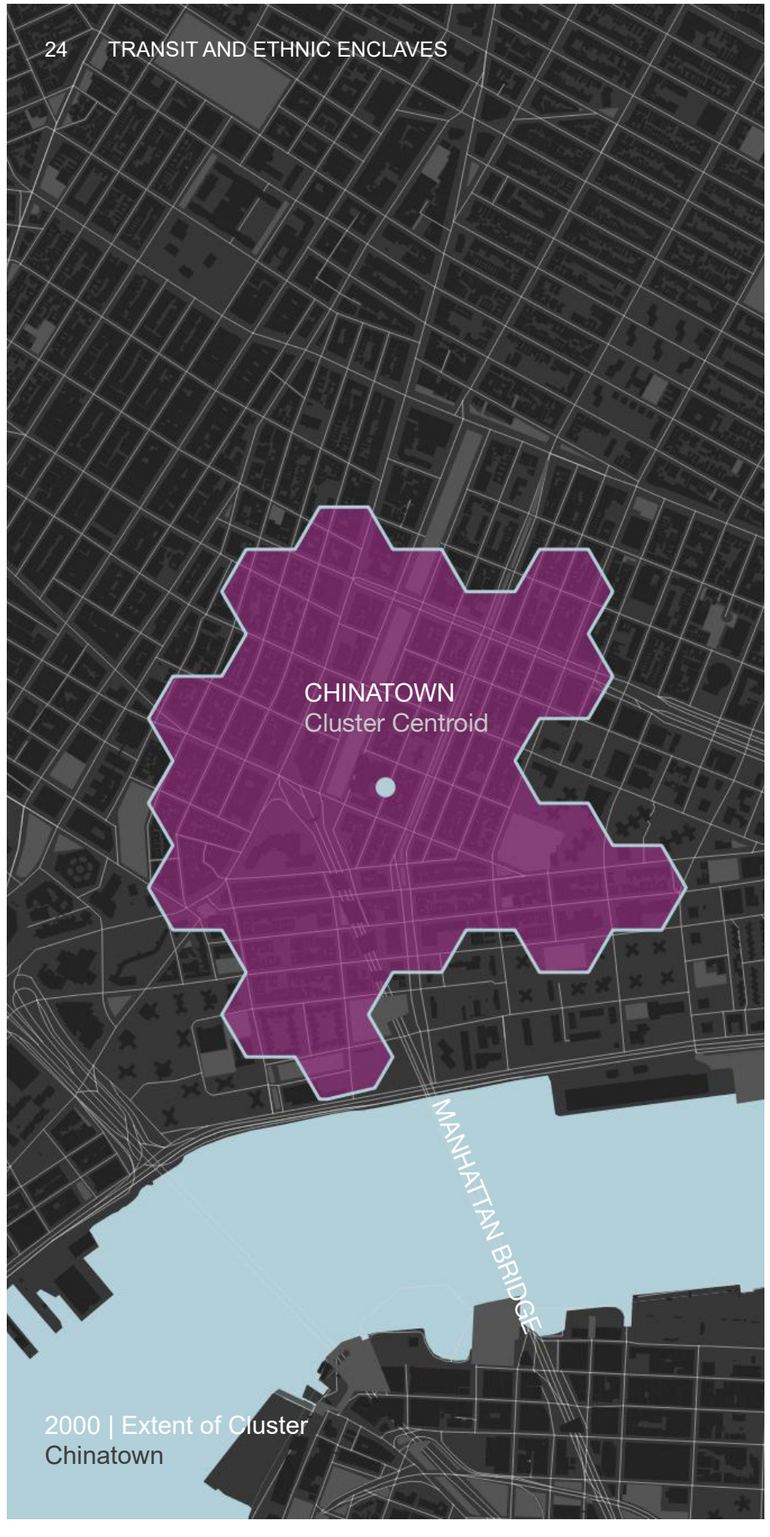
Methodology | Overview II

Methodology | Overview II

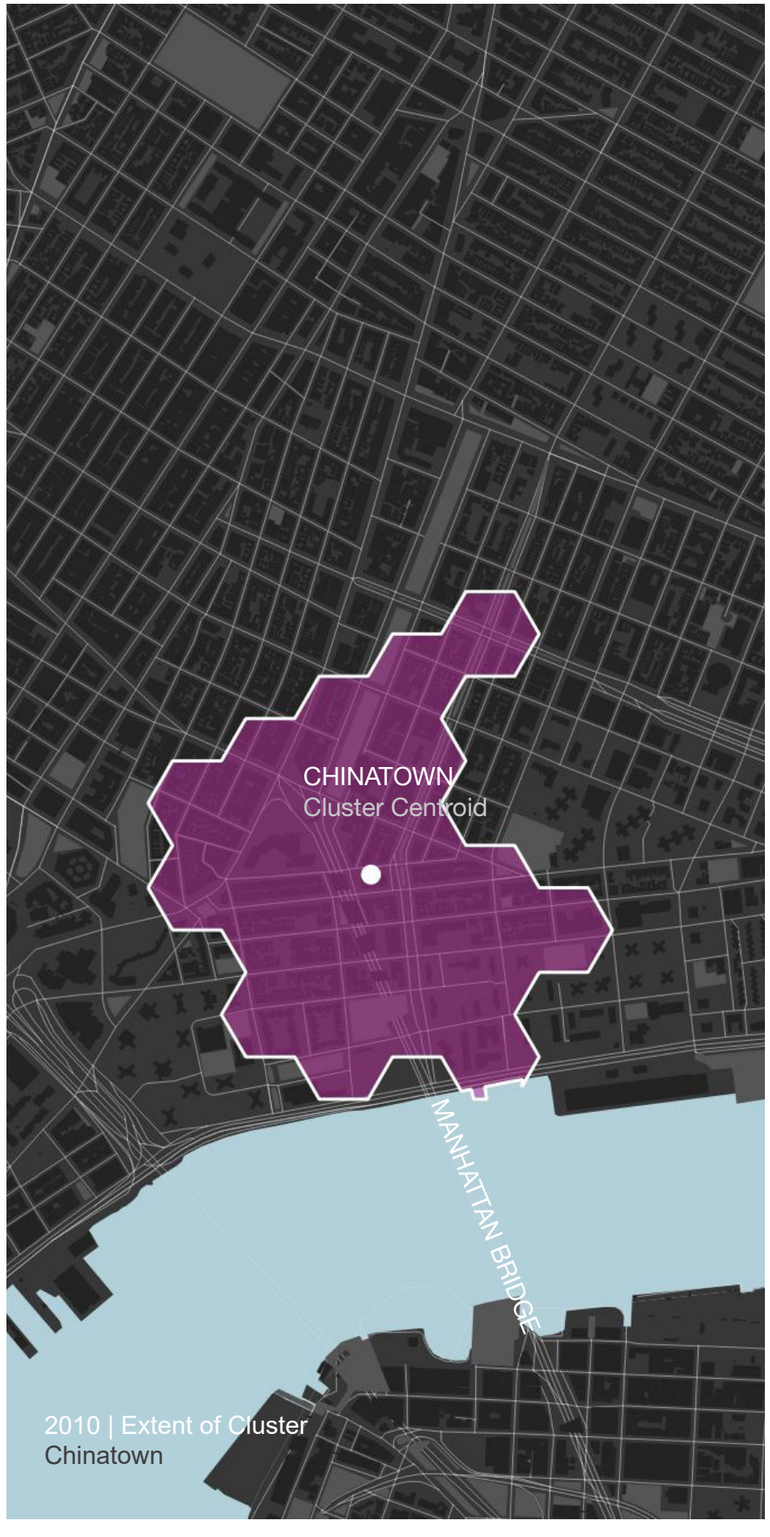
As the aim of the research is to investigate how the service change impacted immigrant enclaves, we were curious to see what changes occurred not only within the enclave boundaries but within its networked area. This was a relevant measure due to Chinatown's accessibility not only from those living within the enclave but to those outside of the enclave. We therefore defined the study zone within which we investigated the change to be the service area reachable within 30 minutes from the centroid of the enclaves by any combination of subway and pedestrian travel.

To establish these study zones for the three decennial years, we needed to build three distinct multi-modal networks, primarily charting the change from before and after the re-routing of trains on the Manhattan Bridge. We built the network using street center-lines, subway lines (one for before and one for after), and subway station walkway geometries that connect the street and subway networks at subway stations. Differing costs in minutes were specified for the different modes – an average walking speed of 3.0 miles per hour was used, while subways were modeled using the average train speed of 17.4 miles per hour.

Using these network datasets, we then calculated a 30-minute service area for each decennial using the centroid of the enclaves as the origin point. This created three distinct study zones in which to study a variety of metrics on urban life, assisting us in determining how the changed subway service has impacted the Lower East Side-Chinatown-Two Bridges area and its networked surrounds.

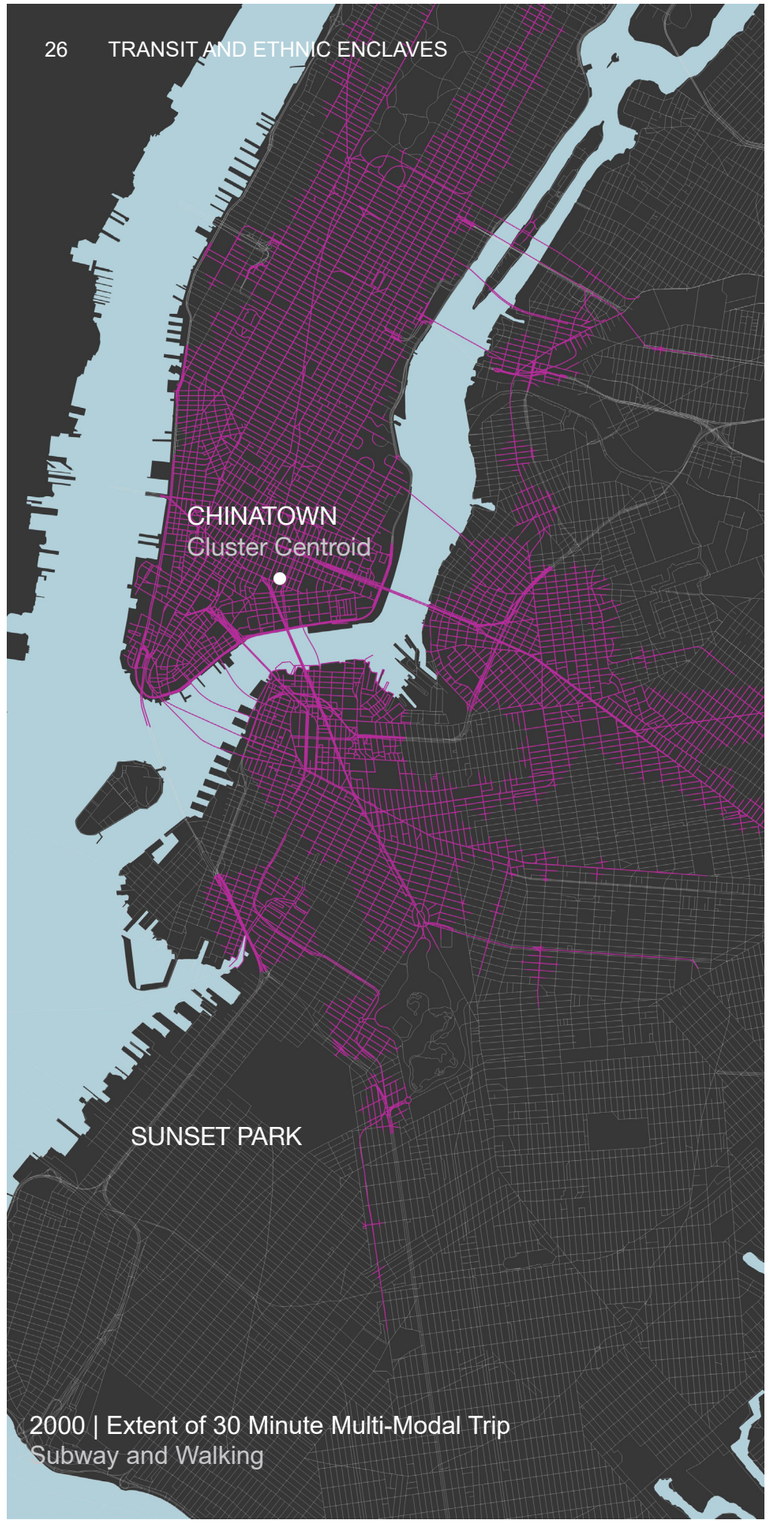


2000 | Extent of Cluster
Chinatown

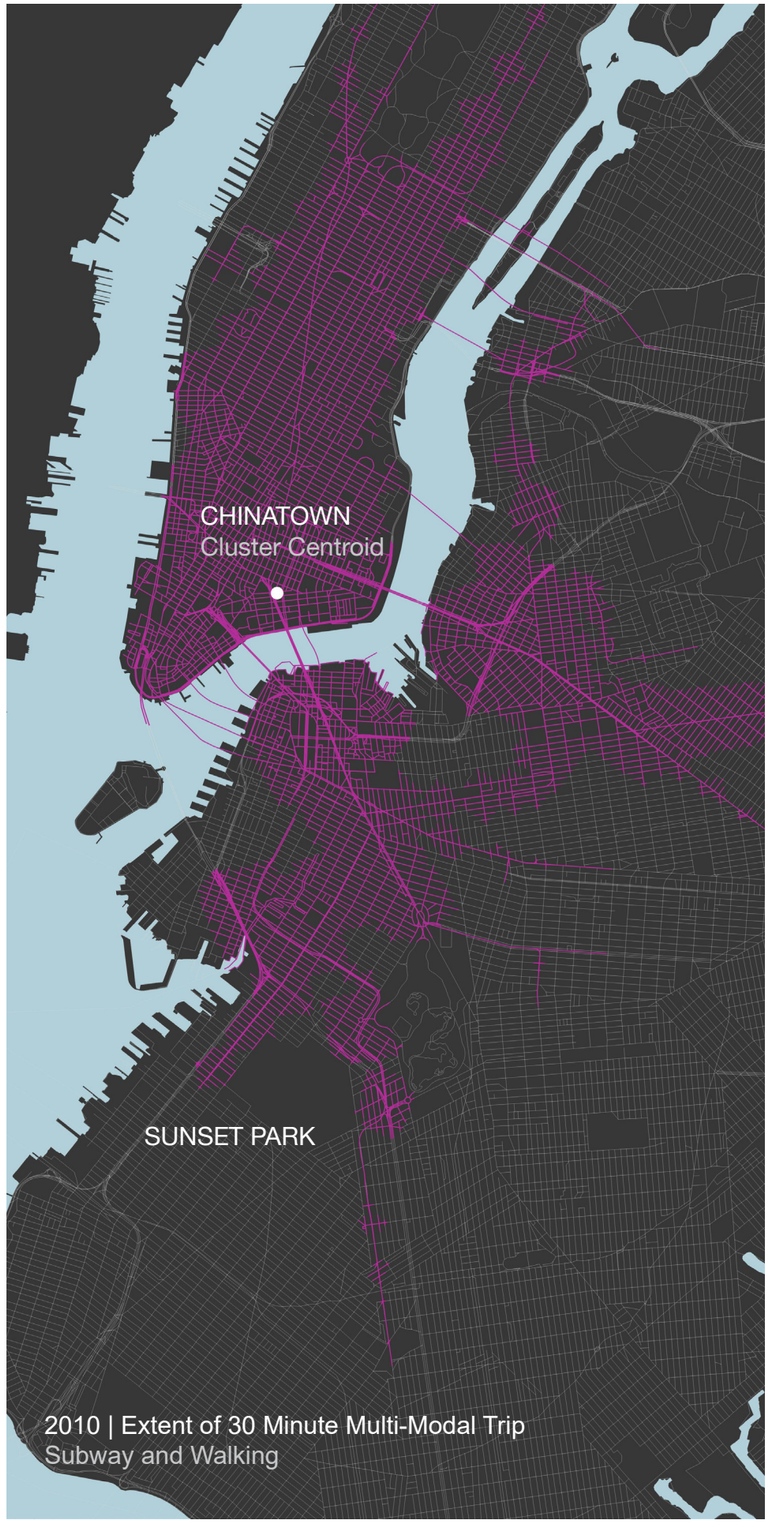


2010 | Extent of Cluster
Chinatown

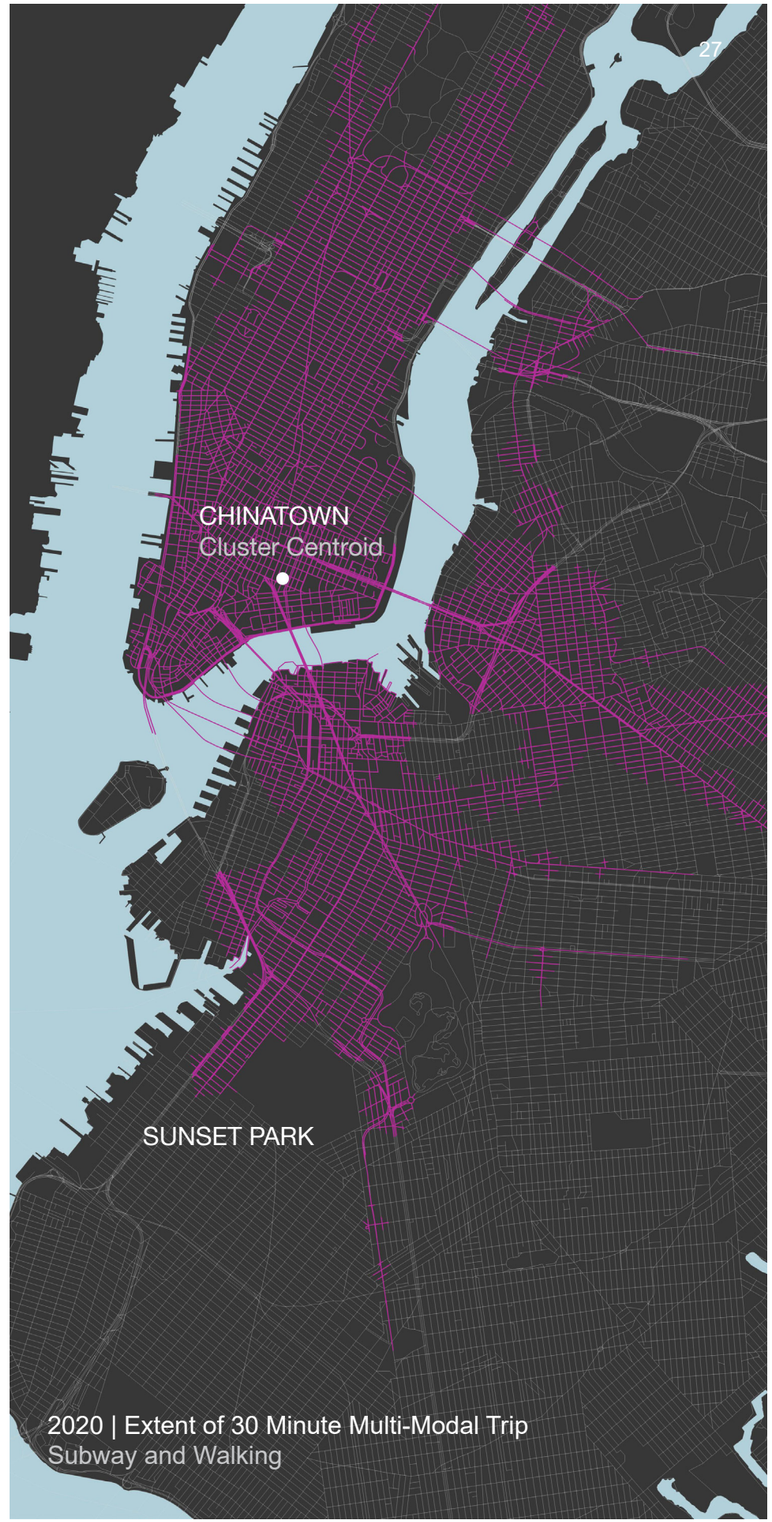
2020 | Extent of Cluster
Chinatown



2000 | Extent of 30 Minute Multi-Modal Trip
Subway and Walking



2010 | Extent of 30 Minute Multi-Modal Trip
Subway and Walking



2020 | Extent of 30 Minute Multi-Modal Trip
Subway and Walking

Analysis | Metrics

Metrics | Overview

The literature surrounding ethnic enclaves and their creation, transformation and deterioration in cities highlights primarily social and economic factors. In order to aid our analysis of the study area, we created metrics informed by these precedents.

Scholars have examined how property ownership, commercial density, and other built environment considerations influence or are influenced by social factors in immigrant enclaves. Filip Stabrowski studies how the social relations of landed property played an important role in one ethnic enclave in New York City. In his case study on Polish migration to Greenpoint in the late 19th century[1], he details how networks of migratory chains were created to provide secure housing and access to social resources for new Polish immigrants. The physical proximity to other Polish immigrants in the area made joining the neighborhood a sensible strategy for access to housing and work opportunities.

These factors do not by any means singularly determine ethnic enclave formation or the other elements of ethnic enclave development. Rather, the study deploys specific factors to show the complex relationship between ethnic enclaves and the neighborhoods they live and work in. At times the studies detail the transformation of ethnic enclaves occurring through demographic shifts, where people from outside the ethnic group move into the area, resulting in diversity in residents and businesses. Or, when the ethnic groups shrink but businesses remain, leading to diversification in residents but not businesses.

We draw on his and other conceptions of the ethnic enclave as a space borne out of specific built environment and demographic conditions. At right, we have focused on a list of these metrics in these two spaces for which there is readily available data on New York City in the three temporal points of our study.

Of course, ethnic enclaves could and have been operationalized using different approaches than the one we outline here. We are proposing here that our exploratory approach, limited by data available within the scope of this project, offers one of many possible views on what matters within and around ethnic enclaves.

1 Stabrowski, Filip. “Social Relations of Landed Property: Gentrification of a Polish Enclave” Wiley Online Library, 11 Jan. 2018, https://onlinelibrary.wiley.com/doi/abs/10.1111/ajes.12216.

	METRIC	2000	2010	2020
BUILT ENVIRONMENT	Property Value			
	Arithmetic Average	$0.85 million	$1.43 million	$2.65 million
	Construction Permits			
	Overall Count	345,050	542,116	757,746
	Residential Units			
	Percent Measure	87.3%	83.4%	86.0%
	Mixed Commercial			
	Percent Measure	15.8%	17.11%	20.1%
	Public Amenities			
	Density Measure	600 people	1324 people	375 people
	Connectivity			
	Size of Service Area	28.2 sq mi	26.3 sq mi	28.5 sq mi
DEMOGRAPHIC	Immigrant Residents			
	Percentage Measure	26.9%	26.2%	24.9%
	Non-English Speakers			
	Percentage Measure	30.2%	28.5%	25.0%
	Commute Length			
	Arithmetic Average	34.0 mins	33.0 mins	36.1 mins

2000

2010

2020

$0.85 million

$1.43 million

$2.65 million

Property Value

Property value was measured to understand affordability in our service zone. An arithmetic mean (average) of assessed property value was calculated for each study year. Property value increased dramatically over time surrounding our Lower East Side-Chinatown-Two Bridges cluster, particularly in the period between 2010-2020.

DATA SOURCE: MapPLUTO Datasets from 2003, 2010, and 2020.

2000

2010

2020

345,050

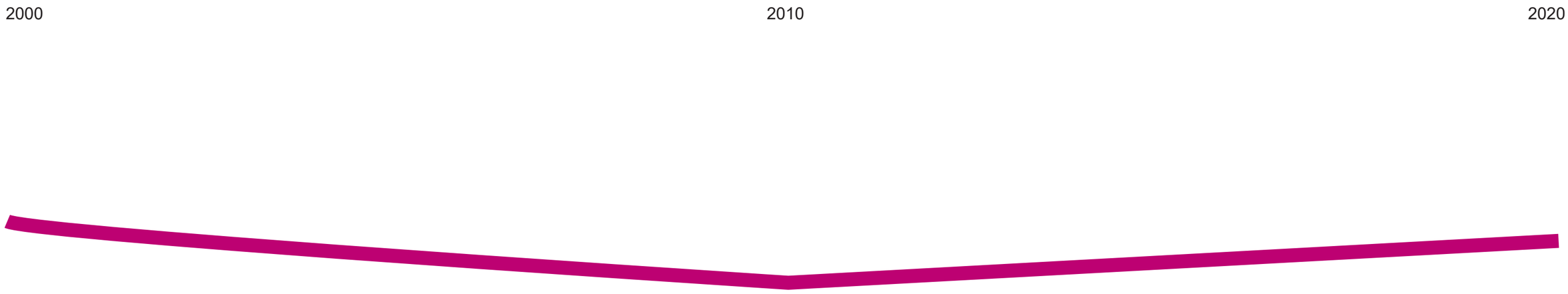
542,116

757,746

Construction Permits

Construct permits were measured to estimate development activity in our service zone. A simple count was calculated for each study year. The number of active permits indicated a steep increase in development, renovation, or other construction activity over the twenty year period. This suggests an increase in the rate of displacement or change over time.

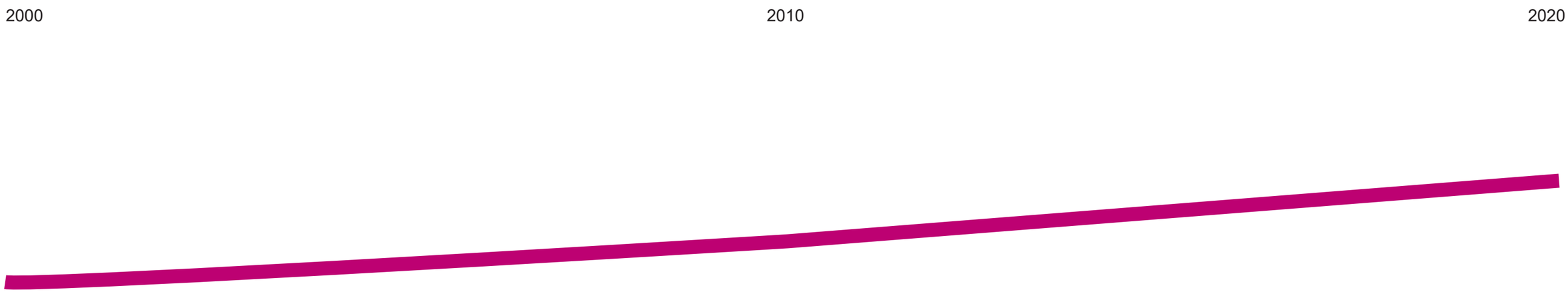
DATA SOURCE: City of New York Department of Buildings Permit Filings Database for 2000, 2010, and 2020.



Residential Units

The percentage of units classified as residential within the Lower East Side-Chinatown-Two Bridges study zones has declined slightly since the year 2000. This figure was calculated as a simple percentage of overall units. This decrease in built-environment allocated to residential uses can suggest a deterioration of the live-work context common in ethnic enclave environments.

DATA SOURCE: MapPLUTO Datasets from 2003, 2010, and 2020.



Mixed Commercial-Residential

While calculations of individual residential units give a good sense of the extent of housing in an urban area, the percentage of lots zoned for mixed commercial-residential adds depth to an understanding of the commerce-rich environments of ethnic enclaves. The percent of lots zoned for mixed use actually increased between 2000 and 2020, suggesting a more complicated relationship to enclave shopping patterns than is visible in this dataset.

DATA SOURCE: MapPLUTO Datasets from 2003, 2010, and 2020.

2000

2010

2020

600 people

1,324 people

375 people

Public Amenities

The density of public amenities were measured to estimate the occupancy amount of public spaces. This metric can speak to the capacity of public amenities and gesture at how well the city serves a given community. The results show that density has decreased after an increase around 2010, alluding to the decreased availability of public amenities.

DATA SOURCE: City of New York City Planning Facilities Database for 2000, 2010, and 2020.

2000

2010

2020

28.2 sq mi

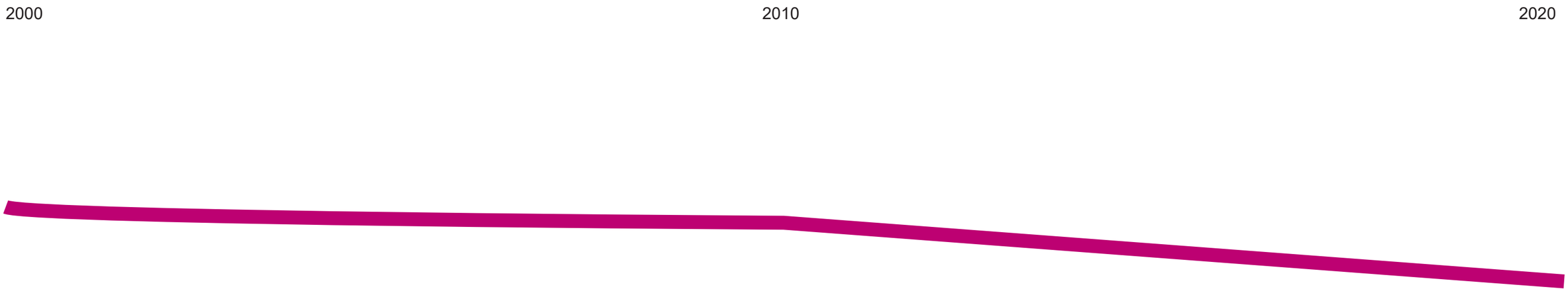
26.3 sq mi

28.5 sq mi

Connectivity

Connectivity was measured to estimate how well-located the Lower East Side-Chinatown-Two Bridges cluster is relative to the opportunities of the city at-large. An area measure of the concave hull contained by the extent of a multi-modal network representing a 30 minute journey was used to calculate this metric. Over time, the neighborhood became slightly more connected to the city, while we know that the connectivity to specific regions was likely more impactful than this overall measure.

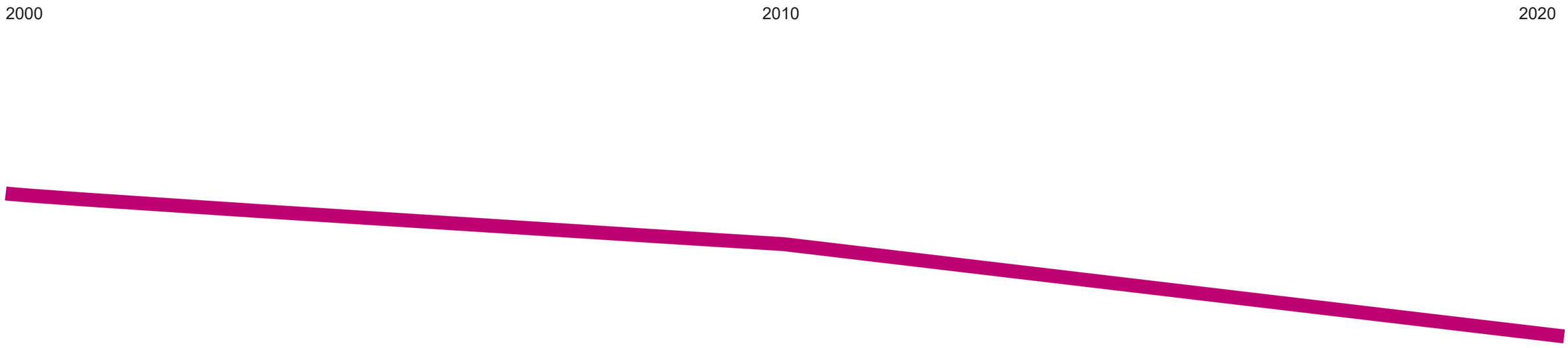
DATA SOURCE: Multi-Modal Network Analysis, drawing on TIGER Street Centerlines, NYC Subway Lines, and ArcGIS-constructed Connection Lines for 2000, 2010, and 2020.



Immigrant Residents

The percentage of immigrant residents was measured to understand demographic change for a key identifier ethnic enclaves. This metric was calculated by taking the percentage of foreign-born residents relative to overall population. The results show that the percentage of immigrant residents has decreased by 2% since 2000.

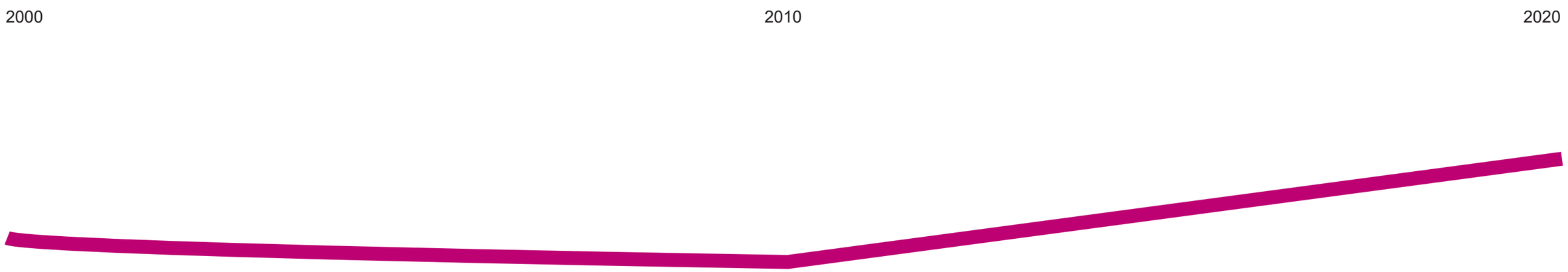
DATA SOURCE: U.S. Decennial Census Data at Block Group level for 2000, 2010, and 2020.



Non-English Speakers

Another demographic factor that could be descriptive of immigrant enclaves is language. In this metric we assess the percentage of non-English speakers in the study areas. The results show a 5.2% decrease in non-English speakers since 2000. Of course, there is the possibility that English education has become more accessible, but the results suggest that fewer non-English speakers overall call the ethnic enclave home than did previously.

DATA SOURCE: American Community Survey: 5-Year Data at Block Group level for 2000, 2010, and 2020.



Commute Length

Our final metric calculates the arithmetic average of commute lengths. Since the project is oriented around transportation developments, this metric is used to assess whether transportation experiences have improved, here defined as a shorter journey. The results show that the average commute has increased by two minutes, which could be attributed to service quality but also other factors such as relocation to neighborhoods farther away from workplace destinations.

DATA SOURCE: U.S. Decennial Census: Block Group Data for 2000, 2010, and 2020.

Conclusions | Study Findings

Conclusions | Overview

The results of our study paint a complicated picture on how various measurements of life in the city have affected the ethnic enclave near the foot of the Manhattan Bridge. Our report demonstrates that in the past twenty years, express D trains have come to serve a greatly different Lower Manhattan.

The area serviced from our cluster centroids is one with higher property values, greater connectivity to the city at large, and a lower percentage of immigrant residents. It is one where the outright number of construction permits has sky-rocketed recently, suggesting a significant increase in development. Public amenities per person are fewer today than in 2000, and the average commute time of residents within the service zone has climbed slightly to an additional 10 hours per month. These conditions have likely contributed to a movement out of the historic ethnic enclave in Manhattan's Chinatown.

We observed this movement in the shifting, fragmentation, and shrinkage of a clustered population near the Grand Street subway station. We also largely observed the inverse in Southern Brooklyn, suggesting that there is a relationship between these two locations and our metrics of urban life.

Of course, this report shies from claiming causation but rather doubles back on the exploratory nature of our methodology. We suggest that the metrics measured here offer a method and means for understanding a city as complex and diverse as New York. We can see in these results a tale of gentrification, a deterioration of a diverse community in the city-center despite the city around it growing more diverse over time.

To conclude, our report feels incomplete without acknowledging the agency of individuals in determining much of this present-day reality. While we are suggesting that there is something lost in the fraying of Manhattan's historic Chinatown, we also recognize that data shows aggregate information about decisions made by individuals. We would be foolish to imply that the movement of an ethnic enclave to Southern Brooklyn, where rents are cheaper, apartments more spacious, and life much quieter, is a net negative for those who made this move. To this end, we again highlight that our methodology is exploratory, and welcome greater scrutiny of our results in the context of supporting ethnic enclaves wherever they may form.

East Broadway, Chinatown | Flickr

86th Street, Bensonhurst | Flickr

Sources | Datasets, Concepts

CONCEPTS

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