

City of Boston: Remodeling and Unit Loss

Team A Final Report

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INTRODUCTION

Under the impact of rapid urbanization, cities like Boston face the challenge of accommodating growing populations while maintaining the equitable distribution of housing resources. Our client, the Citywide Analytics Team, is dedicated to enhancing city operations and improving the life quality of its residents through the understanding and usage of data.

The primary goal of this report is to answer four foundational questions that frame our understanding of the city's housing trends:

1. What communities are actively building more housing units?
2. Which communities are experiencing a net loss in housing units?
3. Where are housing remodels and renovations most prevalent?
4. On average, how many housing units are lost annually due to remodels?

Building on these questions, our report extends the inquiry to provide insights into the dynamic shaping Boston's housing landscape:

1. How does the rate of renovations in each community relate with the annual variation in housing availability?
2. The factors that lead to substantial shifts in housing availability in areas like Hyde Park and the South End.
3. Which communities have the most significant reductions in housing units due to conversions of Multi-unit properties into Single-family homes by higher-income residents?

By delving into these questions, our team aims to examine the effects of remodeling and conversions in the housing markets in Boston.

BASE ANALYSIS

Data Cleaning (For Part 1 & 2)

For these two parts, our analysis was based on the property assessment data from 2004 to 2024. ‘Communities’ are defined by the ‘Zip Code’ associated with each data entry. This classification method is detailed in *Figure 1*.

In processing each CSV file, we located the columns that indicate zip codes, and corrected mislabels to standardize naming across datasets. Then, we removed any rows with missing values, and formatted zip codes to a 5-digit number. Finally, grouped the pre-processed data by zip codes, and assigned each with its corresponding “community/neighborhood.”

```
neighborhood_zip_codes = {
  "Allston/Brighton": ["02134", "02135", "02163"],
  "Back Bay/Beacon Hill": ["02108", "02116", "02117", "02123", "02133", "02199",
    "02216", "02217", "02295"],
  "Central Boston": ["02101", "02102", "02103", "02104", "02105", "02106", "02107",
    "02109", "02110", "02111", "02112", "02113", "02114", "02196",
    "02201", "02202", "02203", "02204", "02205", "02206", "02207",
    "02208", "02209", "02211", "02212", "02222", "02293"],
  "Charlestown": ["02129"],
  "Chestnut Hill": ["02467"],
  "Dedham": ["02026"],
  "Dorchester": ["02122", "02124", "02125"],
  "East Boston": ["02128", "02228"],
  "Fenway/Kenmore": ["02115", "02215"],
  "Hyde Park": ["02136"],
  "Jamaica Plain": ["02130"],
  "Mattapan": ["02126"],
  "Newton": ["02458"],
  "Readville": ["02137"],
  "Roslindale": ["02131"],
  "Roxbury": ["02119", "02121"],
  "Roxbury Crossing": ["02120"],
  "South Boston": ["02127", "02210"],
  "South End": ["02118"],
  "West Roxbury": ["02132"]
}
```

Figure 1. Detailed way of classification for “Community/Neighborhood”

Part 1: What communities are actively building more housing units?

Detailed Findings & Key Insights

From the analysis conducted using the property assessment data from 2004 to 2024, the changes in Boston overall have its largest percentage increases from 2014 to 2015, and the largest percentage decreases from 2013 to 2014 (-0.85%) (*Figure 2*).

This increase is pivotal in understanding urban expansion, gentrification trends, and the shifts in community demographics and housing needs. Below is a detailed exploration of the findings:

Figure 2. Yearly Total Percentage Change in Boston (2004-2024)

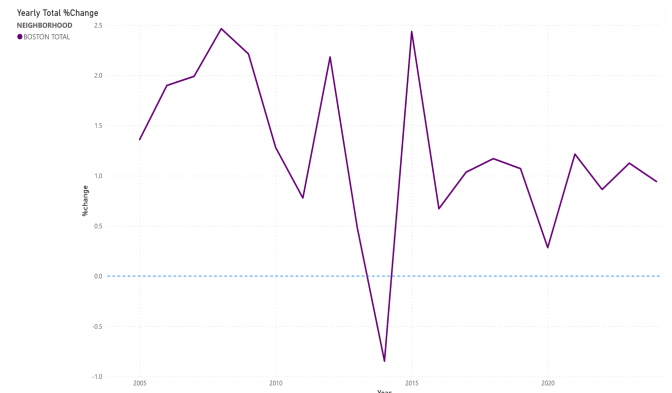
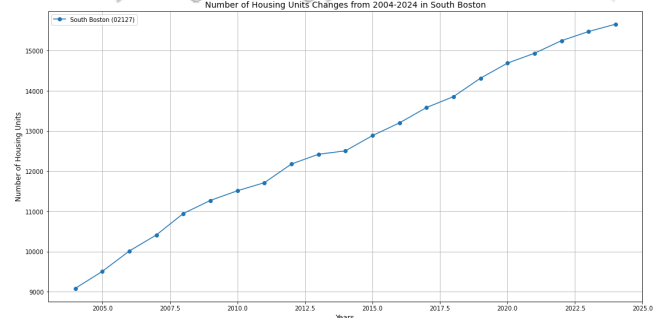


Figure 3. Number of Housing Units Change from 2004-2024 in South Boston (02127)



South Boston (02127) (Figure 3):

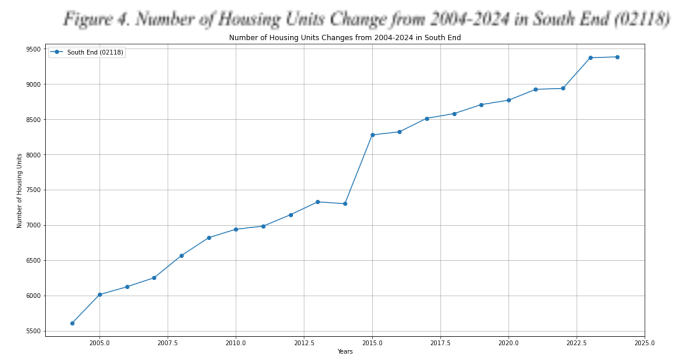
Increase: 6571 units.

Insights: South Boston has been a focal point for new residential developments, likely driven by its proximity to downtown and attractive waterfront.

South End (02118) (Figure 4):

Increase: 3774 units.

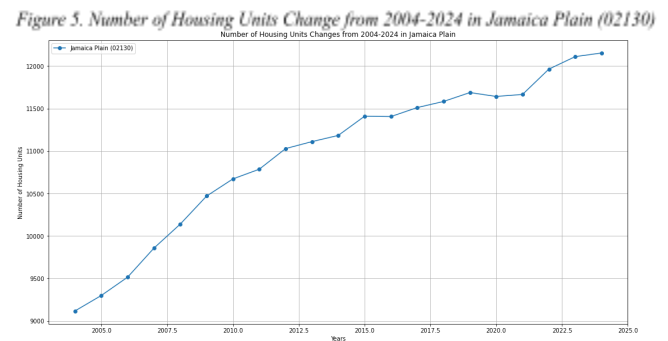
Insights: The South End has experienced substantial growth due to its historic appeal and the proliferation of luxury condos and renovations of existing townhouses.



Jamaica Plain (02130) (Figure 5):

Increase: 3038 units.

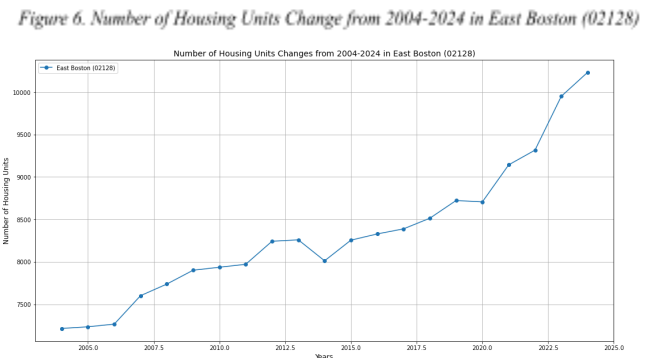
Insights: Known for its eclectic community and green spaces, Jamaica Plain has seen a rise in housing developments, particularly in the form of small apartment buildings and the conversion of older homes into condominiums.



East Boston (02128) (Figure 6):

Increase: 3016 units.

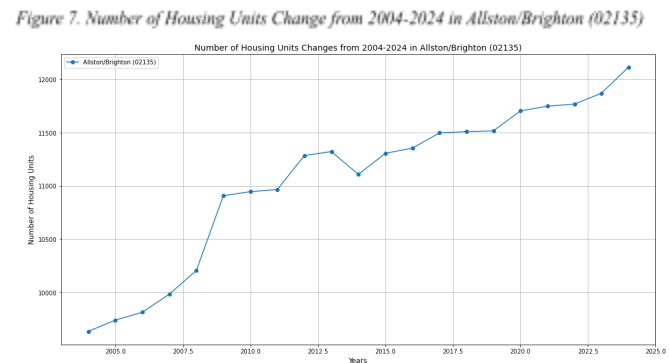
Insights: Traditionally an area with affordable housing compared to other Boston neighborhoods, East Boston has undergone significant transformations with numerous new apartment complexes catering to both the middle and upper-income brackets. The expansion of Logan Airport and improvements in public transportation have also made it more accessible, enhancing its attractiveness as a residential area.



Allston/Brighton (02135) (Figure 7):

Increase: 2479 units.

Insights: The area's proximity to major educational institutions like Boston University and Boston College, along with the influx of students, and young professionals, makes it a prime target for residential development.



The chart displays the number of housing units for five zip codes in Central Boston from 2004 to 2024. The Y-axis represents the number of housing units, ranging from 0.0 to 4.0. The X-axis represents the years from 2004 to 2025. All five zip codes start at 1.0 unit in 2004, drop to 0.0 units in 2005, and then show various peaks before returning to 0.0 units by 2009.

Year	Central Boston (02101)	Central Boston (02109)	Central Boston (02104)	Central Boston (02107)	Central Boston (02211)
2004	1.0	1.0	1.0	1.0	1.0
2005	0.0	0.0	0.0	0.0	0.0
2006	4.0	3.0	1.0	1.0	1.0
2007	4.0	3.0	2.0	2.0	1.0
2008	4.0	3.0	2.0	2.0	1.0
2009	0.0	0.0	0.0	0.0	0.0
2010	0.0	0.0	0.0	0.0	0.0
2011	0.0	0.0	0.0	0.0	0.0
2012	0.0	0.0	0.0	0.0	0.0
2013	0.0	0.0	0.0	0.0	0.0
2014	0.0	0.0	0.0	0.0	0.0
2015	0.0	0.0	0.0	0.0	0.0
2016	0.0	0.0	0.0	0.0	0.0
2017	0.0	0.0	0.0	0.0	0.0
2018	0.0	0.0	0.0	0.0	0.0
2019	0.0	0.0	0.0	0.0	0.0
2020	0.0	0.0	0.0	0.0	0.0
2021	0.0	0.0	0.0	0.0	0.0
2022	0.0	0.0	0.0	0.0	0.0
2023	0.0	0.0	0.0	0.0	0.0
2024	0.0	0.0	0.0	0.0	0.0

temporary decrease in available housing units (*Lopez*)¹.

Central Boston (Figure 10):

Decreases: 4 units loss in 02102; 1 unit loss in 02103, 02107, 02211; 3 units loss in 02104.

Insights: Central Boston's housing unit losses are minimal. This trend may be attributed to the high value of real estate in these areas, prompting conversions of residential buildings into commercial spaces or luxury non-residential developments. Another contributing factor could be the conversion of multi-family units into single-family units or luxury condos, reducing the overall housing unit count despite potentially increasing the area's economic value.

Part 3: Where are housing remodels and renovations most prevalent?

Data Cleaning

For this part, our analysis is based on the approved permits data set. Specifically focusing on “issued_date,” “zip,” and “worktype” columns. We removed rows with missing data, standardized “issued_date” and “zip” format, re-categorized “worktype” data into broader groups (detailed way is shown below) and captured new classifications in a newly created “worktype_category” column.

worktype_category	worktype
Renovations	Interior/Exterior Work; Renovations - Exterior; Renovations - Interior NSC; Insulation; Siding; Installation of Decorative Mat; Installation of Floor Covering; Installation of InteriorFinish; Installation/Evaluation of Mat
Municipal	City of Boston
Compliance	Application to Correct a Violation; Change Occupancy; Temp COO
Additions	Addition; No Record of Occupancy; Temporary Change of Use & Occ
Demolition	Demolition - Exterior; Demolition - Interior; Removal of Structure
Safety Systems	Fire Alarm; Fire Protection/Sprinkler; Fire Protection Sprinkler >9; Flammable and/or; Explosive
Signage	Signs; Temporary Signs/Banners; Renewal of Signs Permit
Infrastructure	Cellular Tower; Generators; Residential Parking; Industrial Boiler; Industrial Furnace
New Construction	New Construction; Erect; Garage; Commercial Parking; New
Site Work	Excavation Borings Test Pits; Subdivision Combing Lot; Driveway Installation; Trench; Dumpsters; Staging

¹ Lopez, Erico. “\$300m Tremont Crossing Development Proposed for Roxbury – FELDCO Development.” *Feldco Development - Developers / Owners / Managers of Realty Investments*, Feldco Development, 29 Apr. 2012, feldcodevelopment.com/mixed-use/300m-tremont-crossing-development-proposed-for-roxbury/.

Roofing	Roofing
Plumbing	Plumbing; Gas
Green Energy	Solar Panels
Temporary Structures	Special Events; Temporary Trailers; Temporary Service; Holiday Vendor; Outsid; Seating; Television Truck; Tent; Temporary Enclosures; Special Event
Outdoor Structures	Canopy; Awning; Awning Renewal; Retractable Awning; Canopy Renewal
Fencing	Fencing Renovation >6ft; Fencing Renovation < 6ft; Fencing
Electrical	Low Voltage; Electrical; Service Change
Maintenance	Annual Maintenance; Repair; Service; Maintenance
Other	Other; Fast Track Application; General; Summer Program Fast Track; From TimeMatters-PZ Conversion

Due to the inconsistencies and incomplete documentation in 2006 to 2009, and 2024 data, all the analysis will be based on data from 2010 to 2023.

Detailed Findings & Key Insights

Number of Permits Issued in a nutshell (Figure 11): The number of permits issued by year ranges from 34837 to 48867. With 2019 having the maximum number of permits issued and 2020 having the minimum number of permits issued. In addition, 2019 to 2020 has a minimum percentage growth of -28.75%, and 2020 to 2021 has a maximum percentage growth of 16.30% among these 14 years.

Figure 11. Number of permits issued from 2010-2023

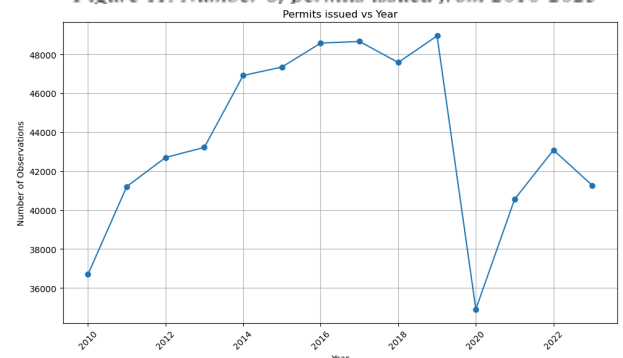
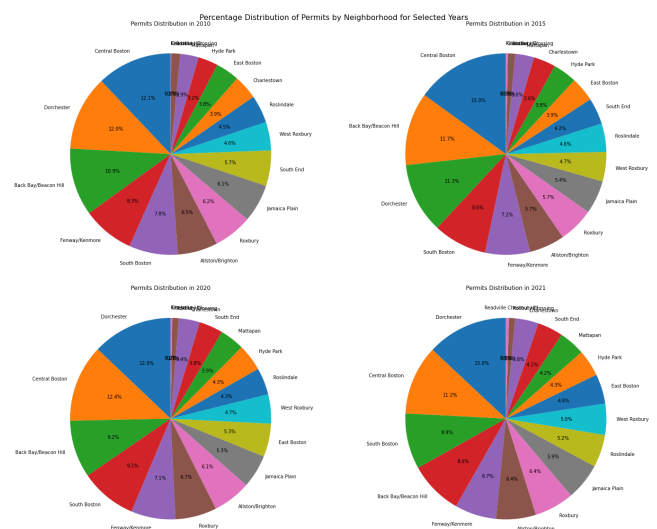


Figure 12. Percentage Distribution of Permits by Community/Neighborhood in 2010 (top-left), 2015 (top-right), 2020 (bottom-left), 2021 (bottom-right)



Geographic Distribution of Renovations: Central Boston consistently led in permit counts between 2010 to 2018. From 2019, Dorchester outpaced all and became the leading community. Overall, Central Boston, Dorchester, and Back Bay/Beacon Hill mostly remained the top three, except in 2021 when South Boston's permits surged, surpassing Back Bay/Beacon Hill (Figure 12).

Below we will dive into the some noticeable findings about the worktype category composition.

Central Boston

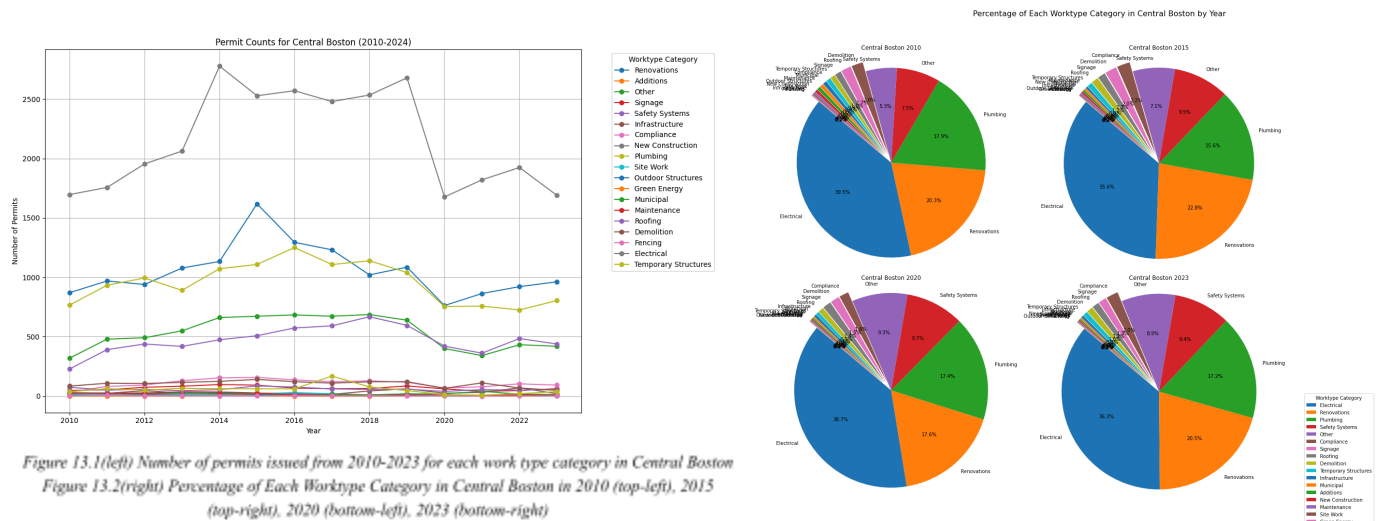


Figure 13.1(left) Number of permits issued from 2010-2023 for each work type category in Central Boston
 Figure 13.2(right) Percentage of Each Worktype Category in Central Boston in 2010 (top-left), 2015 (top-right), 2020 (bottom-left), 2023 (bottom-right)

The Top 5 worktype in Central Boston are: Electrical, Renovations, Plumbing, Other, and Safety System. “Electrical” holds a dominant share, averaging nearly 35% annually, nearly the combined total of “Renovations” and “Plumbing” (Figure 13.2). We saw the peak for “Electrical” in 2014. A peak in 2015 for “Renovations (Figure 13.1),” which could be attributed to the burgeoning era of Boston skyscrapers, like the ambitious projects approved for the Copley Place Tower (Bray²). Additionally, since 2020, the proportion of “Safety System” permits has gradually increased, surpassing the category of “Other” permits (Figure 13.1, 13.2).

Green Energy

A trend in increasing permits for “Green Energy” is shown in communities like Mattapan, (West) Roxbury, Dorchester, and Hyde Park (Figure 14). This uptick in “Green Energy” permits aligns well with the Boston government’s dedicated efforts to promote sustainable energy projects, including 2014 Energy Allies Project in Mattapan, Roxbury, and Dorchester (Energy Allies³); 2015

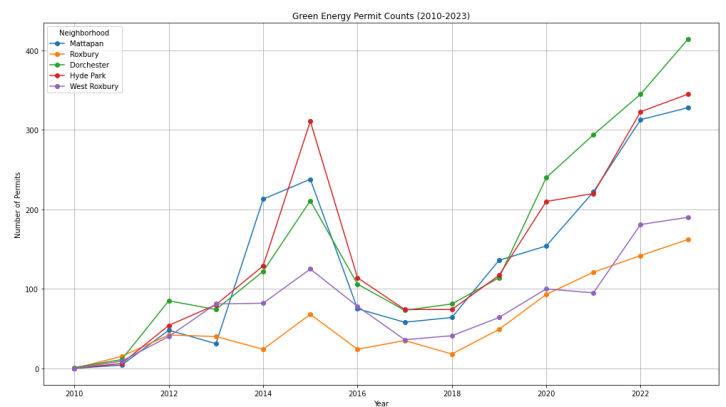


Figure 14. Number of Green Energy Permits from 2010-2023 in Mattapan, Roxbury, Dorchester, Hyde Park, West Roxbury

² Bray, Collin. “2015: A Year of Tall Changes Coming to Boston’s Skyline: Collin Bray.” *Collin Bray | Boston Realtor with 17 Years Experience. Meet Collin Bray an Award-Winning Back Bay Realtor Who Will Guide You at Every Step of the Selling & Buying Process.*, 6 Jan. 2015, collinbray.com/changing-skylines-high-rise-ultra-high-end-residential-towers/.

³ “Community-Led Solar In Boston.” *Energy Allies*, 21 Sept. 2023, www.energy-allies.org/organizing/boston/#.

approved solar generation facility project in Hyde Park (*Gardner*⁴).

Part 4: How many housing units are lost to remodels on average, each year?

Data Cleaning

For this part, our analysis is based on the property assessment data sets. To ensure data accuracy and consistency in our analysis, we standardized all property identifiers to a “PID” column, formatted as a 10-digit number. We also filtered out rows with invalid entries in the “LU” (Land Use) column. By comparing PIDs between two consecutive years, we identified lost units (PIDs present in the previous year but not in the present year) and newly-built units (PIDs absent in the previous year but present in the following year), enabling a clear assessment of changes in housing units.

Detailed Findings & Key Insights

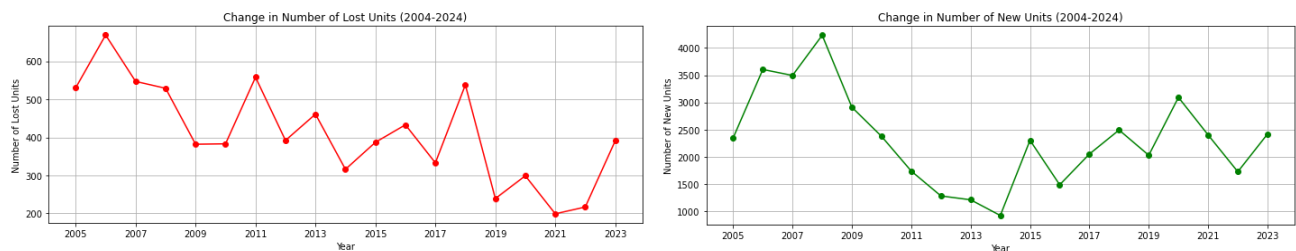


Figure 15.1(left) Changes in Number of Lost Units from 2004 to 2024

Figure 15.2(right) Changes in Number of New Units from 2004 to 2024

Our analysis reveals that Boston loses approximately **410.68 housing units annually** due to remodeling efforts. Within two decades, the number of lost units ranges from 199 units (2020-2021) to 669 units (2005-2006) (*Figure 15.1*); the number of new-built units ranges from 920 units (2013-2014) to 4233 units (2007-2008) (*Figure 15.2*).

“LU” Type Focus

⁴ Gardner, Tommy. “Solar Plan Approved in Hyde Park Village.” *Stowe Reporter*, 6 Oct. 2016, www.vtcng.com/stowe_reporter/news/local_news/solar-plan-approved-in-hyde-park-village/article_c8708ec4-f8b2-11e4-be10-736272d7febb.html.

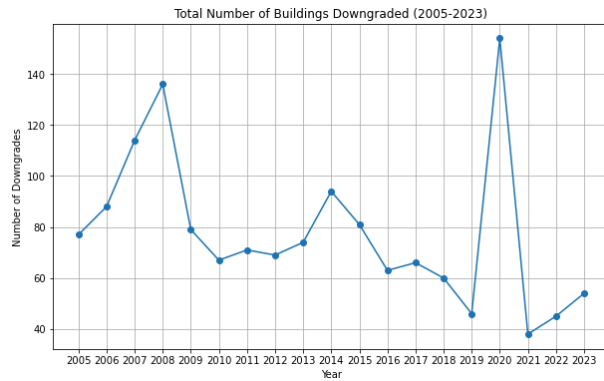


Figure 16.1 Total number of Units Downgraded from 2005 to 2023

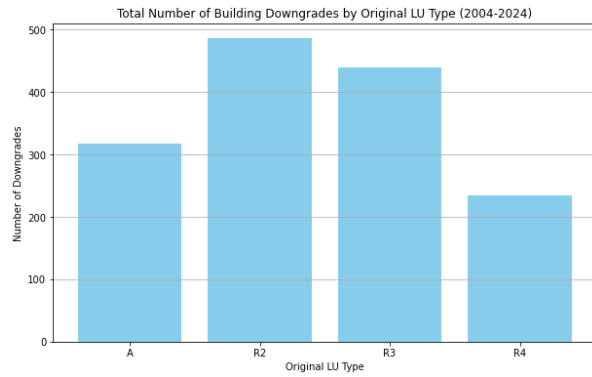


Figure 16.2 Total Number of Units Downgraded by Original “LU” Type from 2004 to 2024

We then focus on the “LU” type that correlates with residential units, which are type “A” (Residential 7 or more), “R1” (single-family), “R2” (2-family), “R3” (3-family), and “R4” (4-family). We define “downgrade” as a situation where the “LU” type of property shifts to a designation reflecting a lower density or value after remodeling (Ex. R3 to R1). We noticed a sharp increase trend from 2006-2008, a sharp decrease from 2008-2009, and a peak in 2020 (Figure 16.1). The most “LU” type that was downgraded is “R2,” followed by “R3,” “A,” and “R4” (Figure 16.2).

Community Focus

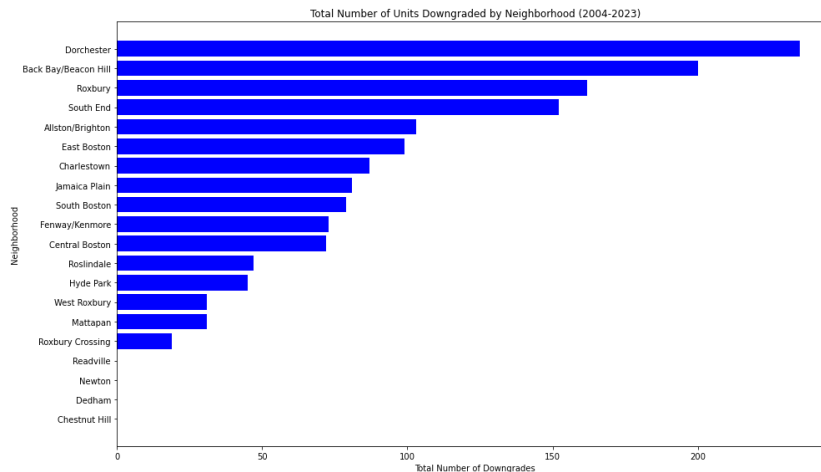


Figure 17. Total Number of Downgraded Buildings By Community from 2004-2024

Regarding the communities that correspond to downgraded buildings. The top 3 communities with the most downgraded buildings are Dorchester, Back Bay/Beacon Hill, and Roxbury (Figure 17).

EXTENDING RESEARCH AND ANALYSIS

Extension Question 1: How does the rate of renovations in each neighborhood relate with the change in available units from year to year? Comparing permits data to changes in available units(R1, R4)

While our analysis for base question 4 focused on finding the average housing units lost to renovations every year, we wanted to extend this further and focus our research on a related extension question. We aimed to investigate whether there exists a relationship between the number of renovation permits issued in each neighborhood and the rate of change in housing units within those neighborhoods. Our intention was to closely examine the pace of transformations occurring in these areas. Specifically, we wanted to ascertain whether these transformations directly influence the availability of housing units in a neighborhood and whether this influence is positive or negative. In essence, we sought to understand whether renovation permits are primarily facilitating the construction of new housing units or the transformation of existing units into fewer ones.

We started out by trying to find if there is any correlation between the remodeling permits and change in housing units for all of Boston. After conducting a correlation analysis between the rate of annual changes in the number of permits issued obtained from the approved permits dataset and the rate of annual changes in the number of housing units for each zip code obtained from the property assessment datasets over the years, we found that the overall correlation coefficient was **0.086**. This indicates a relatively weak correlation between the two variables.

However, despite the overall weak correlation, there were some notable exceptions as listed in the table below when analyzing specifically by neighborhood:

Zip Code	Correlation Coefficient
02109	0.33
02119	0.31
02130	0.3
02136	0.3
02124	0.28

Among the top five zip codes with the highest correlations, zip code 02109 exhibited the strongest correlation coefficient of **0.33**, followed closely by zip codes 02119, 02130, 02136, and 02124 (*Figure 18*). These findings suggest that in these specific areas, there may be a more

pronounced relationship between the issuance of renovation permits and the change in housing unit numbers.



Figure 18. Property Rate of Change & Permits Rate of Change for 02109, 02119 and 02130

In our continued exploration, we pursued a similar analysis but introduced a weighted value for the number of housing units based on the 'LU' (Land Use) classification (*Figure 19*). Since each observation is not equal to one unit, we weighted each observation based on the number of units

in the property which can be identified by the LU variable. This approach aimed to provide a more nuanced understanding of the relationship between remodeling permits and changes in housing units. Here are the top five zip codes with the highest correlations:

Zip Code	Correlation Coefficient
02115	0.50
02136	0.36
02120	0.36
02124	0.35
02122	0.31

For this analysis, we assigned weighted values to different land use categories as follows : {'A': 7; 'R1' (1 family house): 1; 'R2' (2 family house): 2 ; 'R3' (3 family house): 3; 'R4' (4 or more families): 4}.

These weighted values were used to calculate a more comprehensive measure of the number of housing units in each zip code, considering the varying densities associated with different land use types. This approach enabled us to uncover stronger correlations between remodeling permits and changes in housing units in specific zip codes, suggesting a potentially more significant influence of renovation activities on housing dynamics in these areas.

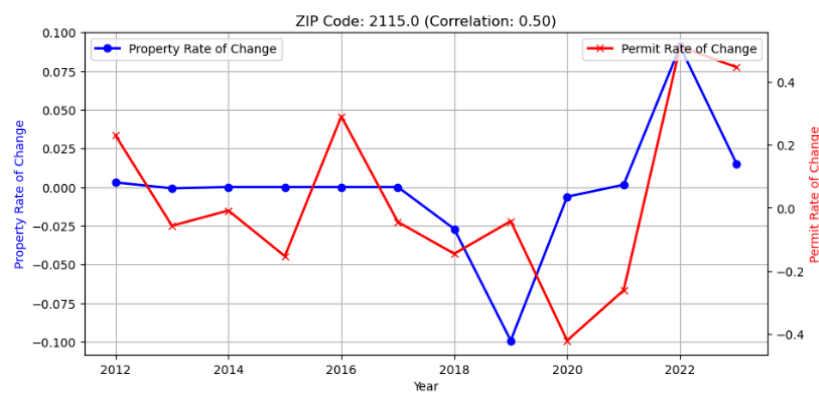




Figure 19. Property Rate of Change & Permits Rate of Change (base on "LU") for 02115, 02136 and 02120

CONCLUSION :

From the research done to understand how rate of renovations is related to the annual variation in housing availability, we have used correlation to understand how the rate of change of units compares with the rate of change of approved permits. 1 neighborhood stood out which was 02115. This tells us that 02115 is a community to potentially keep watch of in the future to see if this relationship still exists. It may also be an experiment to test specifically in 02115 to see if causation exists in this community by potentially varying the number of approved permits and seeing how that affects available units. However, much more thought would have to go into the design of something like this as other ethical concerns may arise. From our data, we also saw that most of the other areas had a fairly weak relationship between the two variables being tested. Thus, this tells us that another variable may help explain a stronger relationship with the annual variation in housing availability. This extension question was expected to provide answers about relationships between approved permits and units within different neighborhoods. Despite not finding many neighborhoods with this relationship, this analysis does provide many new insights that would be very interesting to explore.

Extension Question 2: What contributes to the large changes in housing units in areas like Hyde Park or the South End?

Our investigation and analysis of the base questions revealed an interesting finding, especially with regard to the notable change in housing units in two neighborhoods—Hyde Park and Mattapan—around the year 2012. Not only did these neighborhoods experience substantial changes in housing units, but what's even more captivating is the mirrored trend they exhibited. In essence, they demonstrated nearly identical magnitudes of change but in opposite directions. This observation piqued our curiosity, prompting a deeper exploration to unravel the underlying factors driving such distinct yet connected transformations.

Hyde Park & Mattapan (Figure 8)

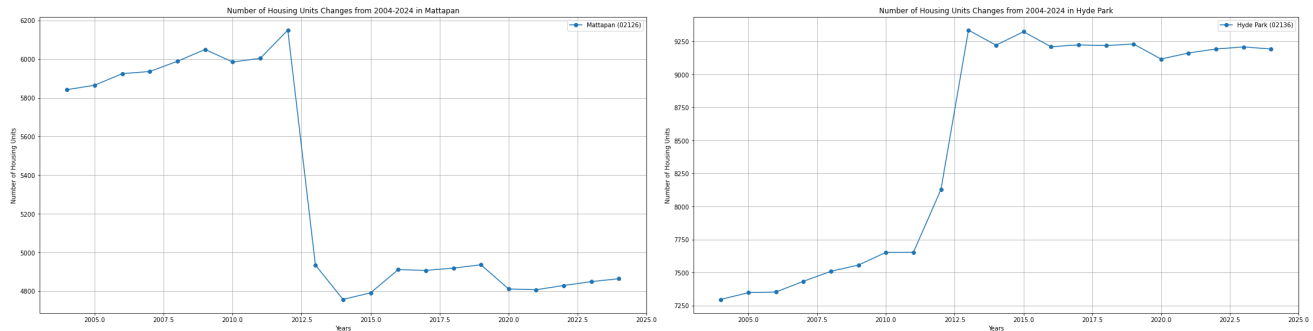


Figure 8. Number of Housing Units Change from 2004-2024 in Mattapan (02126) (left); Hyde Park (02136) (right)

The large changes in housing units in areas like Hyde Park and the South End of Boston can be attributed to a variety of factors including administrative decisions, socio-economic shifts, community activism, and urban development projects. Based on our analysis and further insights from online data, here are a few insights:

Administrative Changes:

A significant factor contributing to the changes in housing units in Hyde Park is the administrative decision to realign the zip code boundaries. In 2012, the Postal Service shifted 1,655 addresses from Mattapan's 02126 zip code to Hyde Park's 02136. This change was driven by the local community's efforts, led by figures such as District 5 City Councillor Rob Consalvo and the East River Neighborhood Association. They argued that the Mattapan zip code adversely affected property values and insurance costs, as demonstrated by a reported \$100,000 difference in home values and increased car insurance costs associated with the Mattapan zip code⁵.

⁵ "Mattapan/Hyde Park Zip-Code Switch Okayed; It Takes Effect on July 1." *Dorchester Reporter*, 22 Mar. 2012, www.dotnews.com/2012/mattapanhyde-park-zip-code-switch-okayed-it-takes-effect-july-1.

This zip code change not only altered the postal addresses but also likely impacted the real estate market dynamics, possibly increasing the attractiveness and perceived value of properties in Hyde Park.

Economic and Socio-Demographic Factors:

Economic disparities between neighborhoods can lead to significant shifts in housing units as residents and investors seek more favorable economic conditions. The adjustment in zip code, and the associated changes in economic factors like insurance costs and property values, can make Hyde Park a more desirable location relative to Mattapan (*Acitelli*⁶).

South End (Figure 20)

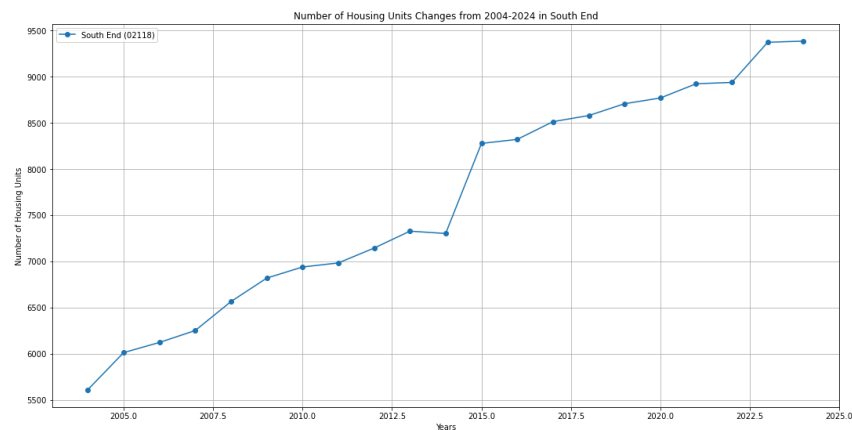


Figure 20. Number of Housing Units Change from 2004-2024 in South End

Urban Redevelopment and Gentrification:

The South End of Boston has undergone extensive gentrification and redevelopment over the past few decades. This area, known for its historic Victorian brownstone buildings, has seen a transformation into a highly desirable residential and commercial area. The gentrification process often leads to the renovation of existing housing units and the construction of new residential and mixed-use developments, contributing to changes in the housing unit count.

Redevelopment projects in gentrifying neighborhoods typically result in increased property values and rents, which can lead to a displacement of lower-income residents and an increase in higher-income residents moving into newly developed or renovated properties.

Broader Urban Trends

Economic Incentives: Tax incentives and zoning changes often encourage developers to invest in certain neighborhoods, leading to spikes in construction and changes in the housing stock.

Community Activism: As seen in Hyde Park, community efforts can significantly influence urban planning decisions and lead to substantial changes in neighborhood characteristics.

⁶ Acitelli, Tom. "Unzipped: Hyde Park Slice Wins Independence from Mattapan." *Curbed Boston*, Curbed Boston, 27 Mar. 2012, boston.curbed.com/2012/3/27/10385044/unzipped-slice-of-hyde-park-wins-independence-from-mattapan.

Conclusion

The changes in housing units in neighborhoods like Hyde Park and the South End are influenced by a mix of administrative, economic, and socio-demographic factors. Administrative decisions such as zip code realignment can have profound impacts on property values and community demographics, while economic incentives and gentrification drive redevelopment and housing stock changes. Understanding these factors provides valuable insights into urban dynamics and can help in planning and policy-making aimed at sustainable urban development.

Extension Question 3: What neighborhoods have experienced the most significant reduction in available units due to the conversion of multi-unit properties into single-family residences by higher-income, and what factors contribute to this trend?

Our previous analysis into conversion from Land Use made us interested in the changes in the availability of units. Particularly our group was curious about how income plays a factor in this type of conversion and even how different prices in properties or rent would affect conversion. This is what led us to research this question.

High Correlation of Conversion Activities:

ZIP Code 02115 exhibits the highest correlation with conversion activities. This area includes Fenway, Kenmore, and Back Bay—neighborhoods known for their prime location and amenities, making them highly desirable for affluent buyers.

ZIP Code 02136 and **ZIP Code 02124** also show significant conversion activities, particularly towards single-family residences, indicative of changing housing demands and neighborhood gentrification.

Annual Loss of Housing Units:

The analysis reveals an average annual loss of 410.68 housing units in Boston due to these conversions. This substantial decrease in housing availability emphasizes the impact of these transformations on urban housing stock.

Identified Contributing Factors:

Economic Factors:

The influx of higher-income individuals into these neighborhoods has increased the demand for housing that suits their lifestyle preferences, such as privacy and luxury, which are more readily offered by single-family homes compared to multi-unit properties.

This demographic is also often willing to invest significantly in property, driving up real estate values and making it financially attractive for developers to convert existing properties to cater to this market segment.

Urban Development Policies:

Changes in zoning laws favoring the development of single-family homes over multi-unit dwellings are critical. These laws may be part of broader strategies aimed at revitalizing neighborhoods and attracting a wealthier demographic, altering the housing landscape significantly.

Market Demand:

There's a strong demand for single-family homes in urban areas, driven by families and individuals seeking more space and privacy. This demand boosts property values, making conversions an appealing investment for homeowners and developers.

Gentrification:

As neighborhoods become more desirable, they attract higher-income residents, leading to increased property values. This economic dynamic can displace lower-income residents and change the housing availability, often resulting in more single-family homes and fewer multi-unit properties.

Aesthetic and Lifestyle Preferences:

The preference among higher-income buyers for larger, more private living spaces significantly influences the housing market. These preferences encourage the conversion of existing multi-unit properties into single-family homes, reshaping the urban residential landscape.

Income Restricted Housing :

While exploring the connection between financial indicators and housing accessibility, we encountered a significant policy and an associated dataset: income-restricted housing in Boston⁸. Income-restricted housing is reserved for households earning below a certain income. Eligibility is based on your household size and total income. Eligibility for income-restricted housing in Boston is determined based on a percentage of the Area Median Income (AMI). AMI represents the household income of the median household in the region. For example, if the AMI is \$100,000, a household with an income of \$70,000 would be at 70% AMI, while a household with an income of \$130,000 would be at 130% AMI. Each year, agencies like HUD and BPDA calculate the AMI for different areas⁷.

Understanding and implementing income-restricted housing policies is crucial for ensuring housing availability for all and promoting socio economic equality. By setting eligibility criteria based on a percentage of the AMI, these policies aim to provide affordable housing options for

⁷ "Income, Asset, and Price Limits." *Income, Asset, and Price Limits* | Boston Planning & Development Agency, Boston Planning & Development Agency, www.bostonplans.org/housing/income-asset-and-price-limits. Accessed 25 Apr. 2024.

⁸ <https://data.boston.gov/dataset/income-restricted-housing>

low- and moderate-income individuals and families. This helps prevent housing segregation and ensures that people from diverse economic backgrounds can access decent and affordable housing within the community. By maintaining a balance of housing options across income levels, income-restricted housing policies contribute to fostering inclusive and equitable communities where individuals of different socioeconomic classes have the opportunity to live and thrive together.

While widespread implementation may be challenging, conserving existing policies and gradually integrating units into neighborhoods can be beneficial. Analysis of Boston's income-restricted rental unit dataset revealed an overall increasing trend in rentals across most neighborhoods, except for six where a decreasing trend was observed. This trend is depicted in the following table and graph (*Figure 21*).

Neighborhood	Net Unit loss (2018-2022)
South End	2198
Hyde Park	946
Mattapan	869
Roxbury	660
Jamaica Plain	658
South Boston	194

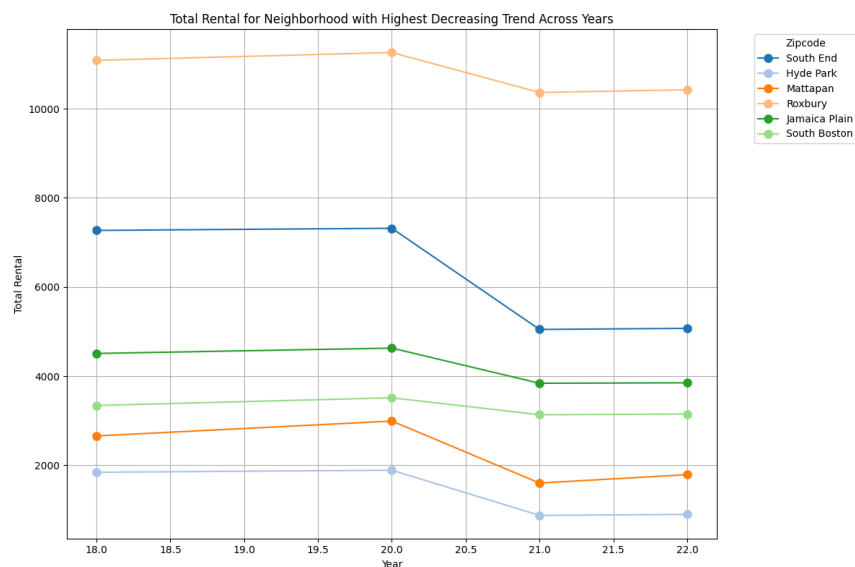


Figure 21. Total Rental for Community/Neighborhood with Highest Decreasing Trend from 2018-2022

We wanted to further explore the economic impact of this loss in these particular neighborhoods. Intuitively, reassigning income restricted housing units and stripping them of that status should result in a significant parallel increase in value of houses in those neighborhoods. To test this hypothesis, we obtained the data⁸ from the open source zillow dataset to observe trends in the value of residential buildings in these neighborhoods over the years.

The trends are represented by the graphs below (*Figure 22*) :

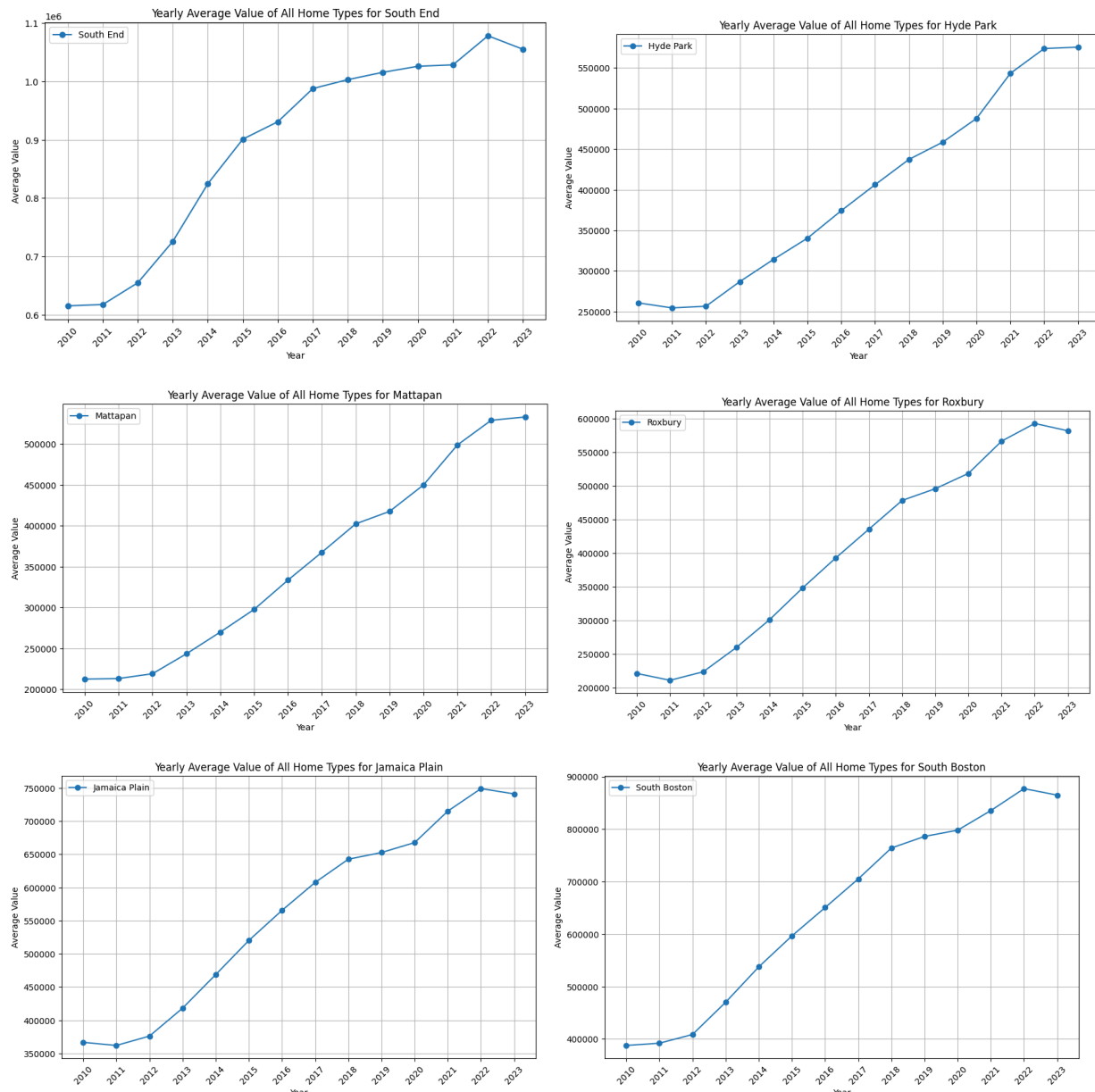


Figure 22. Yearly Average Value of All Home Types for South End (top-left), Hyde Park (top-right), Mattapan (middle-left), Roxbury (middle-right), Jamaica Plain (bottom-left), South Boston (bottom-right)

⁸ “Housing Data.” *Zillow*, 22 Apr. 2024, www.zillow.com/research/data/.

It's evident that the decline in income-restricted units in these neighborhoods isn't the sole factor driving the increase in home values, as it doesn't perfectly align with the decreasing trends in income-restricted housing. Moreover, the general upward trend in housing values over the years is expected. Thus, a direct relationship cannot be conclusively established. However, when comparing these six neighborhoods with other important neighborhoods regarding residential property value trends (*Figure 23*), a notable difference emerges. While all neighborhoods show a monotonically increasing trend, the six neighborhoods in question exhibit a particularly sharp spike in 2020, compared to the surrounding years. In contrast, the other neighborhoods display more of a flattening curve from the late 2010s into the early 2020s.

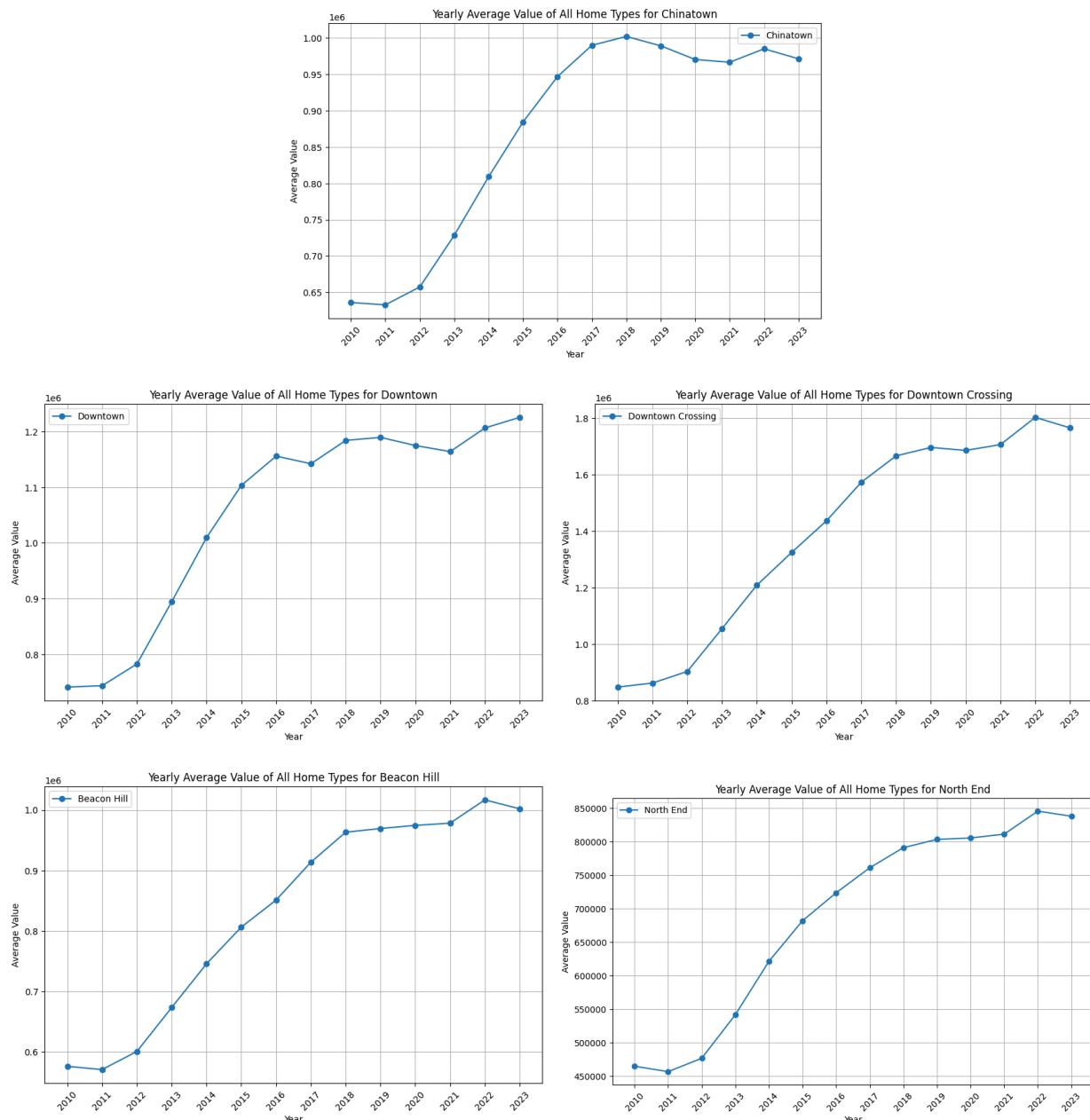


Figure 23. Yearly Average Value of All Home Types for Chinatown (top), Downtown (middle-left), Downtown Crossing (middle-right), Beacon Hill (bottom-left), North End (bottom-right)

Despite the overall generic upward trend and the lack of a direct correlation, it's becoming notably more costly to reside in South End, Hyde Park, Mattapan, Roxbury, Jamaica Plain, and South Boston since the late 2010s. Meanwhile, these areas are gradually losing the safeguard intended to address this issue: income-restricted housing. Ideally, regions experiencing a significant surge in housing value should also witness an increase in available income-restricted housing units to counter the risk of displacement and ensuing inequality.

Conclusion:

The significant reduction in available housing units in the ZIP Codes 02115, 02136, and 02124 underscores a concerning trend towards decreased housing affordability and potential socioeconomic disparities. This trend is particularly pronounced due to the conversion of multi-unit properties into single-family residences by higher-income individuals, which aligns with broader urban development patterns and market demands. The conversion of multi-unit properties into single-family residences by higher-income individuals, coupled with the decline in income-restricted housing units, underscores a concerning trend towards decreased housing affordability and potential socioeconomic disparities. By maintaining a diverse housing stock that includes both income-restricted units and multi-unit properties, policymakers can create a more resilient and equitable housing landscape, fostering thriving communities for all residents.

FUTURE SCOPE

The future scope of this project offers a comprehensive exploration into various dimensions of Boston's housing market.

First, the broader socioeconomic and demographic factors that relate to the fluctuations in number of Boston housing units, which could provide deeper insights into housing availability and pricing affordability. For instance, understanding how Boston's student population affects rental markets could help in crafting policies that address seasonal rental price fluctuations and housing shortages during academic years.

Furthermore, analyzing the impact of socioeconomic changes on the perceptions of property values and the decision-making process behind the conversion of multi-unit properties into single-family home could reveal the underlying trends that influence community transformations. On the other side, this analysis might also explore the difference in how each

community perceive investment potential in its properties, which provides insights on future housing strategies and urban planning decisions.

Moreover, expanding the inquiry to include the effects of economic developments such as employment rates, income levels, and urban policies on housing availability could provide a macroeconomic perspective on the challenges that Boston faces. Such analyses will not only strengthen our current understanding but also aid in forecasting future trends and preparing more effective housing policies and development frameworks for Boston communities.

Individual Contribution:

Ayan Patel: I worked on extension question 1, and the slides that were used in the final presentation. I created the graphs, and analysis that was used for extension question 1 in order to understand the relationship between rate of approved permits and change in property numbers. I was also one of the people who presented our final project to the client. Lastly, as a team representative, I helped organize our weeks, communicated between our group and the project manager, and utilized Trello to stay organized.

Ian Tsai: I worked on answering extension question 2, and the slide for the final presentation. For extension question 2, I made multiple graphs to attempt to understand the factors that lead to an increase in housing units in the Hyde Park and South End area. For the slides of the final presentation, I worked on the slides for extension question 2.

Matthew Levine: I worked on gathering information for extension question 2 and slides for the presentation. I gathered info regarding the zipcode change between Hyde park and Mattapan and also worked on the slides for extension question 3 for the presentation.

Mohit Sai Gutha: On the analysis front of the project, I worked on base questions 2 and 3, as well as extension question 3. Specifically, I conducted zip code-wise R1vR4 analysis, analyzed remodel permits for different neighborhoods, examined income-restricted housing patterns, and tracked yearly housing value trends in Boston to address these questions respectively. In terms of documentation and presentation, I contributed to the scrum report, weekly meeting notes, mid-semester presentation, and final report.

Sri Harsha Kotamraju: I analyzed the datasets provided and other online sources to delve deeper into answering base questions 1, 3, and 4. Additionally, I worked on extension question 3, focusing on identifying High Correlation of Conversion Activities across different neighborhoods and pinpointing contributing factors. I contributed in preparing the early insights presentation, report, mid-semester presentation and writing the final report based on our findings. I was also one of the presenters for both our Mid-semester report and Final report to the client.

Yuchen Li: I am responsible for writing the Introduction, Base Analysis, and Future Scope sections of the final report. I also handled the overall formatting of the paper, including graph labels and citations. Additionally, I was responsible for the data processing and visualization for the first three base questions, and part of the fourth base question.