**Intro paragraphs:**

**ESTOS PARRAFOS SON LOS QUE USTEDES DICEN QUE FALTAN EN LA INTRODUCCION! MOTIVANDO EL ESTUDIO Y DANDO PRIMERAS LUCES DEL INDICE**

The Dissimilarity Index (ID) serves as a key metric for understanding segregation in London, where values range from 0 (complete integration) to 1 (total segregation). This measure captures the extent to which two groups are unevenly distributed across spatial units—in this case, London’s Middle Layer Super Output Areas (MSOAs). London, one of the most ethnically diverse cities in England and Wales, demonstrates persistent patterns of residential segregation despite a modest decline in ID values from 0.46 in 2000 to 0.44 in 2021 (Van Ham et al., 2021). While this decline suggests some progress in reducing segregation, significant localized and dynamic shifts highlight the persistence of entrenched socio-spatial inequalities shaped by housing dynamics, migration patterns, and public policies. Although aggregate trends appear broadly similar across nationalities, they mask the complex and multidimensional processes that influence segregation. Drawing on Bourdieu’s (1984) concept of social capital, this study explores how migrant communities rely on distinct networks that shape their housing access and spatial clustering, intersecting with economic, cultural, and structural factors to produce varied segregation patterns.

Temporal, spatial, and nationality-based trends in segregation reveal important patterns that justify the scope of this study. Between 2000 and 2011, all six nationalities analyzed experienced notable declines in segregation. However, this trend stagnated between 2011 and 2021, with Caribbeans becoming the most segregated group in the past decade despite earlier integration efforts. While spatial patterns within each nationality remain broadly similar, significant changes across the city reflect dynamic and localized shifts in settlement trends. For instance, Poles and Southeast Africans cluster south of the Thames, while Romanians exhibit center-east segregation, contrasting with the central-west clustering of Bangladeshis. Such patterns underscore the need to move beyond aggregate trends to examine the nuanced interplay between segregation and housing characteristics. As Massey and Denton (1993) emphasize, segregation outcomes result from intersecting systems of economic, cultural, and social constraints, which vary across groups. A comparative approach enables the uncovering of both shared and divergent dynamics, enriching our understanding of how segregation is shaped across diverse migrant populations.

Hubs and clusters can coexist with low dissimilarity when the population of a minority group, like South Americans, is distributed in proportions similar to the majority population across geographic units (e.g., MSOAs). This means even if tight-knit clusters exist within hubs, the dissimilarity index remains low as long as these clusters are evenly spread or align proportionally with other groups in the area.

**IV. RESULTS**

The objective of this chapter is to address the primary research question: “What is the correlation between segregation and various housing characteristics in London?” and its accompanying sub-questions:

* How does this correlation differ among the six nationalities chosen for this study?
* Which housing and neighbourhood characteristics exhibit stronger correlations with segregation patterns?
* For which communities does historic segregation play a more significant role than housing characteristics?
* How do these correlations vary across different parts of London, highlighting geographical disparities?
* How can these findings be interpreted considering key public policies aimed at improving housing availability and quality?

This chapter delves into spatial and temporal trends in segregation indices and their relationship with housing characteristics. The findings provide insights into how these relationships vary among six nationalities and across London’s MSOAs, while contextualizing the results within the framework of key housing policies.

The results are organized into the following sections:

* Correlations and Linear Regression Analysis: Investigating quantitative relationships between segregation indices and housing variables, using correlation measurements, followed by progressive linear regressions.
* CCF Analysis: Evaluating temporal relationships between segregation indices (Y variable) and housing characteristics (X variables) to assess lagged correlations and the persistence of historical segregation.
* Geographically Weighted Regression: Exploring spatial variations in these relationships across London.
* Synthesis of Policy Context: Linking findings to the objectives and outcomes of housing policies, providing a broader interpretation of results.

1. **EDA**
   1. **EDA demographics:**

Isolation and Theil’s H

The Isolation Index remains consistently high for all six nationalities, exceeding 0.75, indicating significant clustering within specific neighborhoods and limited intergroup interactions. This persistent isolation underscores the impact of historical settlement patterns and housing dynamics. In parallel, Theil’s H, which measures entropy or evenness of population distribution, rose from 0.25 to 0.4 over the study period, indicating increased spatial disparities. Together, these indices highlight the persistent challenges in fostering even distributions across London’s MSOAs, despite reductions in overall segregation trends.

Dissimilarity Index

The median dissimilarity index (ID) for the six nationalities demonstrates distinct levels of segregation. Southeast Africans have the lowest median ID (0.398), followed by Caribbeans (0.407), Poles (0.411), South Americans (0.411), Bangladeshis (0.413), and Romanians with the highest at 0.414. All six nationalities experienced rapid decreases in segregation between 2000 and 2011, but this trend stagnated between 2011 and 2021.

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Southeast Africans, who started with the lowest segregation levels in 2000, have approached almost full integration by 2021. Romanians, who began with the highest levels of segregation, show the fastest decline. Caribbeans, despite starting as one of the least segregated groups, have stagnated in integration efforts, becoming the most segregated among the six groups in the last decade. Bangladeshis followed a similar declining trajectory but remained relatively more segregated than other groups by 2021. South Americans experienced notable declines between 2000 and 2011, followed by stagnation. Caribbeans, who initially had lower segregation levels than Romanians, have stagnated significantly over the past decade and now exhibit the highest levels of segregation among the six nationalities. This stagnation is particularly pronounced in the last ten years, marking a reversal of earlier integration trends. These temporal dynamics highlight the interplay between historical settlement patterns, housing policies, and socio-economic constraints.

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Over the past two decades, the settlement patterns of South Americans, Southeast Africans, Romanians, Poles, Caribbeans, and Bangladeshis in London highlight a clear trend of decreasing segregation and increasing integration. Outer boroughs such as **Bromley, Havering,** and **Bexley** consistently exhibit higher levels of segregation (yellow) across all groups, particularly in the earlier years. However, these areas have gradually become more integrated, reflecting a steady decline in dissimilarity. Similarly, for the Bangladeshi population, **Barking and Dagenham**showed early signs of segregation but has since experienced notable integration.

Inner boroughs such as **Hackney, Newham**, and **Southwark** stand out as central hubs for multiple groups, characterized by lower dissimilarity (purple). These areas are marked by a combination of **clustering and integration**: clustering signifies the presence of cohesive, tightly-knit communities, while integration indicates their coexistence alongside other groups, resulting in balanced demographic distributions. Notably, **Tower Hamlets** continues to serve as a significant hub for the Bangladeshi population, reflecting its historical and cultural importance. For the Caribbean population, **Croydon** and**Lewisham** have emerged as additional key hubs, expanding the group’s established presence beyond the inner city.

The spatial patterns reveal a dual dynamic across all groups. While maintaining strong cultural and social networks in central boroughs, these populations have gradually expanded into outer boroughs, adapting to economic opportunities and housing availability. This outward migration has been accompanied by increasing diversity and integration in historically segregated areas, underscoring the evolving demographic landscape of London.

While the six nationalities share similar temporal and spatial tendencies, there are notable spatial differences in their settlement patterns that should not be overlooked. These differences are hypothesized to result in varying interactions with housing conditions, likely influencing access, affordability, and the lived experience of housing over time.

* 1. **EDA housing**

This section explores the temporal and spatial dynamics of five key housing characteristics across London over a 20-year period. While borough-level policy impacts are evident, MSOA-level inconsistencies highlight how localized factors mediate these broader trends.

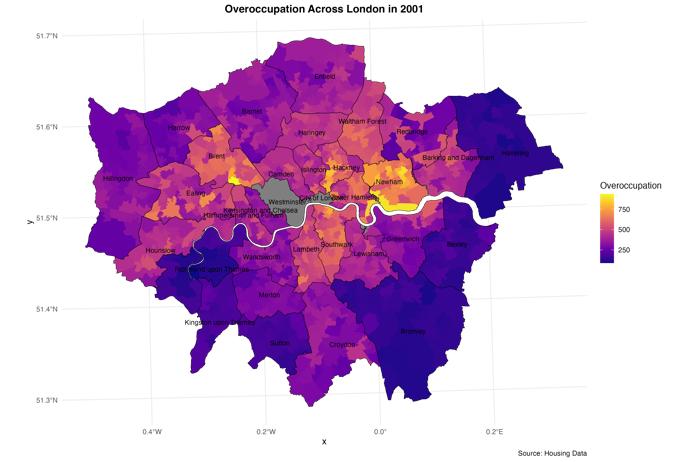
#### **Over occupation**

Over occupation shows a notable temporal trend, increasing between 2000 and 2010, followed by a sharp decrease post-2010, which aligns with policy interventions such as the Housing Act 2004 and Welfare Reform Act (2012–2016). The Housing Act introduced stricter HMO regulations, which, while improving housing quality, displaced low-income tenants, increasing overcrowding in less-regulated boroughs like Barking and Enfield (Arbaci, 2019). Similarly, the Welfare Reform Act implemented caps on housing benefits and the "bedroom tax," which further increased over occupation as families moved into smaller or shared accommodations (Hamnett, 2014).

Spatially, over occupation is concentrated in inner London boroughs such as Tower Hamlets, Newham, and Hackney. However, within these boroughs, MSOAs reveal substantial variability. For instance, MSOAs near the City of London in Tower Hamlets display lower over occupation rates compared to central MSOAs, which maintain higher rates due to older housing stock and larger household sizes. In outer boroughs like Barking, over occupation rates decrease in MSOAs further from transport hubs, reflecting localized economic factors.

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#### **House Prices**

House prices exhibit a steady increase over time, reflecting London’s overall housing market trends and the impact of policies like the Elephant and Castle Redevelopment (2004–2021). This redevelopment drove property prices up in Southwark by attracting higher-income residents while displacing low-income households (Hamnett, 2016; Watt & Bernstock, 2017). Similarly, the Right to Buy policy contributed to rising house prices by transitioning council homes to private rentals, inflating demand (Jones & Murie, 2008).

Spatially, house prices remain highest in central boroughs like Southwark and lowest in outer boroughs like Barking. Within Southwark, MSOAs closer to redevelopment sites such as Elephant and Castle exhibit significantly higher prices, while southern MSOAs maintain lower prices, reflecting less gentrification. In Barking, some MSOAs near transport hubs or new developments show moderate increases, while others remain stagnant, indicating localized disparities in market dynamics.

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#### **Homeownership**

Homeownership rates across London have remained remarkably stable over the 20-year period, despite rising house prices and declining social housing stock. This stability reflects structural barriers such as stagnant wage growth, affordability issues, and limited housing supply, which have constrained shifts in ownership patterns (Whitehead & Travers, 2018). Policies like the Right to Buy initially increased ownership but eventually plateaued, as fewer eligible tenants remained and properties transitioned into private rentals (Arbaci, 2019).

Spatially, homeownership displays significant variability at the MSOA level, even within boroughs. For example, Redbridge exhibits higher ownership rates in MSOAs with detached housing, while MSOAs with flats or converted properties show lower rates. In Barking, areas closer to transport hubs exhibit slightly higher ownership, suggesting the influence of accessibility and development projects. However, the broader trend highlights ownership stagnation, underscoring the persistent structural challenges in London’s housing market.

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#### **Social Housing**

Social housing demonstrates notable temporal fluctuations, with a decline post-2010, a peak around 2015, and another decline post-2016. These shifts align with policies like the Right to Buy, which reduced council housing stock, and the Affordable Housing Program, which delivered 72,000 units by 2021 (Mayor of London, 2021). The Welfare Reform Act further pressured social housing availability, as benefit cuts limited affordability for low-income families (Hamnett, 2014).

Spatially, social housing is concentrated in boroughs like Tower Hamlets and Southwark but shows variability within these areas. MSOAs near large council estates in Tower Hamlets retain higher levels of social housing, while areas closer to Canary Wharf reflect declines due to redevelopment and gentrification. In Southwark, MSOAs near Elephant and Castle exhibit a mixed picture: some have higher social housing levels due to integrated affordable units, while others show declines following estate demolitions.

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#### **Rents**

Rents show a sharp upward trajectory over the 20-year period, particularly in boroughs affected by the Welfare Reform Act and Housing Act 2004. These policies reduced rental affordability through benefit cuts and increased compliance costs for landlords, which were passed on to tenants (Hamnett, 2014; Arbaci, 2019). The Elephant and Castle Redevelopment also contributed to rising rents in Southwark by attracting wealthier renters (Watt & Bernstock, 2017).

Spatially, rents are highest in central boroughs like Tower Hamlets and Southwark, particularly in MSOAs near financial districts or redevelopment sites. Outer boroughs like Barking show moderate rent increases, with lower rates in MSOAs farther from transport and economic centers. This spatial pattern reflects the compounded effects of policy-driven affordability challenges and localized economic factors.

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### **Consistency and Inconsistency with Policies**

Overall, the temporal and spatial trends align well with the housing policies under review. However, MSOA-level inconsistencies highlight localized factors that mediate borough-wide policy impacts. For example, in Tower Hamlets, high over occupation rates are consistent with the Welfare Reform Act, but certain MSOAs near newer developments exhibit lower rates. Similarly, while house prices and rents increase across Southwark, some southern MSOAs remain relatively affordable, reflecting uneven gentrification.

The stability in homeownership rates aligns with structural barriers noted in the literature but contrasts with rising house prices and rents, which might be expected to reduce ownership further. This apparent inconsistency underscores the entrenched nature of London’s housing challenges, where affordability constraints limit both renting and buying options for many households.

Social housing trends, while broadly consistent with policy impacts, reveal localized preservation efforts in certain MSOAs, such as areas near large estates in Tower Hamlets. These pockets of stability suggest that borough-wide policies do not uniformly affect all neighbourhoods, emphasizing the importance of granular, MSOA-level analyses.

Rent trends, similarly, align with broader borough patterns but reveal inconsistencies within outer boroughs like Barking, where some MSOAs exhibit slower increases. These disparities likely reflect localized economic stagnation or less competitive rental markets.

1. **Correlation Analysis – matrix and scatterplots**

This section presents the results of the analysis, focusing on the relationships between the dissimilarity index and various housing and neighborhood characteristics.

While the initial hypothesis anticipated significant differences in how housing characteristics influenced segregation patterns among the six nationalities due to their distinct spatial distributions, the analysis revealed striking consistency across all groups. Despite some spatial differences in settlement patterns, the relationships between housing characteristics and segregation proved to be uniform, suggesting that the observed dynamics are broadly applicable across migrant communities in London.

The two methodologies employed, a correlation matrix and scatterplots with trendlines, provide complementary perspectives on these relationships, enabling a comprehensive understanding of how housing dynamics shape segregation patterns across different neighbourhoods in London.

**House Prices:**

The correlation matrix reveals a moderate positive correlation between house prices and segregation, indicating that higher-priced areas tend to have higher dissimilarity index values. This result is visually corroborated by the scatterplot, which displays a clear upward trend. This relationship aligns with traditional expectations, as high house prices create exclusivity, limiting access for lower-income and minority groups. Wealthy neighbourhoods, often characterized by limited affordable housing and exclusionary zoning practices, reinforce socio-economic and ethnic clustering.

**Rent:**

By itself, rent exhibits no significant relationship with segregation in the correlation matrix or scatterplots. However, an analysis of interactions reveals that rent becomes significant in conjunction with high house prices. In neighbourhoods with high house prices, higher rent correlates with higher segregation, amplifying affordability barriers and exclusionary effects. This finding underscores the compounded effect of affordability challenges in expensive neighbourhoods. While rent alone may not drive segregation, its interaction with house prices creates conditions that restrict access for lower-income groups, reinforcing segregation patterns.

**Ownership:**

The relationship between homeownership and segregation is moderately positive, as indicated by the correlation matrix. The scatterplot confirms this finding with an upward trendline, showing that areas with higher proportions of owned housing tend to have higher levels of segregation. This pattern likely reflects the historical stability of homeownership, where long-term settlement by specific ethnic or socio-economic groups reinforces clustering over time. While homeownership is traditionally seen as a pathway to stability, these results suggest that, without mechanisms to promote diversity, it can entrench existing settlement patterns.

**Social Housing:**

The correlation matrix shows a weak negative relationship between social housing and segregation, suggesting that areas with higher proportions of social housing exhibit slightly lower dissimilarity index values. The scatterplot supports this finding, with a downward trend visible in the data. This relationship highlights the potential for social housing policies to foster integration.

**Over occupation:**

A negative correlation between over occupation and segregation is evident in the correlation matrix and in the scatterplot, which shows a clear downward trend. Over occupation tends to dilute segregation by bringing diverse populations into shared housing arrangements. High-density, overcrowded areas often reflect economic constraints that cut across ethnic or socio-economic lines, leading to mixed communities.

**Lagged Dissimilarity:**

The correlation matrix highlights a strong positive relationship between lagged dissimilarity and current dissimilarity index values. This relationship underscores the persistent nature of segregation, where historical settlement patterns reinforce present-day residential distributions. The scatterplot confirms this pattern, with a steep upward trend showing how areas with high past segregation levels continue to exhibit similar trends today.

**Other neighbourhood characteristics:**

The negative correlation between crime and segregation suggests that migrant communities may be more integrated in areas with higher crime rates. This pattern might reflect economic constraints, as lower-income migrant groups often settle in more affordable neighbourhoods, which may also have higher crime rates due to systemic underinvestment in infrastructure and public services. These neighbourhoods may inadvertently foster integration as diverse populations converge out of necessity rather than choice.

On the other hand, the positive correlation between greenery and segregation is surprising but can be explained through historical and socio-economic dynamics. Green spaces are often concentrated in more affluent neighbourhoods, historically less accessible to migrant communities due to economic or social barriers. These areas may have remained segregated as high property values and exclusionary zoning practices limited affordability and accessibility for diverse groups. This finding underscore how urban planning and the uneven distribution of amenities like green spaces can contribute to spatial inequalities, reinforcing segregation patterns rather than mitigating them.

Public transport accessibility shows little to no relationship with segregation in the correlation matrix, and this finding is mirrored in the scatterplot, which displays no clear trend. This result suggests that transport connectivity does not directly drive settlement patterns or influence segregation levels. However, PTAL may still play a role in moderating other factors, such as employment access or housing affordability, which indirectly affect segregation.

1. **Progressive Linear Regression Models**

This analysis explores the relationships between housing and neighbourhood characteristics and segregation, represented by the dissimilarity index focusing on the South American nationality while highlighting findings consistent across other nationalities. The results reveal striking consistency in the relationships across the six nationalities examined, with variations in magnitude but no significant deviations in direction or overall trends. This uniformity underscores the robustness of the findings and suggests broadly applicable dynamics governing segregation patterns across different groups in London.

In a correlation-based framework, regression coefficients do not imply causality but instead provide a controlled measure of **association**. Within a multiple linear regression context, each coefficient represents the estimated change in the dependent variable (Dissimilarity Index, ranging from 0 to 1) for a one-unit change in the independent variable, holding all others constant. The sign (+ or -) of the coefficient indicates the direction of the relationship—positive coefficients suggest that an increase in the independent variable is associated with an increase in the Dissimilarity Index, while negative coefficients suggest the opposite. The magnitude of the coefficient reflects the strength of this association within the scaled range of the variables. This interpretation allows for meaningful insights into the relationships among variables while avoiding implications of causation.

A coefficient of 0.02, for example, indicates that a 1-unit increase in the scaled independent variable is associated with a 2% increase in the segregation index. This is because regression coefficients are influenced by the scale of both the dependent and independent variables: when the dependent variable has a larger scale, the corresponding coefficients reflect larger numerical changes to align with that scale. In this case, the Dissimilarity Index’s small range ensures that the coefficients accurately reflect meaningful, proportional changes.

**Rent**

Rent exhibits a positive and significant relationship with the dissimilarity index across all models, starting at 0.138 in the first model and reducing slightly as additional variables are included. In the final model, Rent maintains its significance with a coefficient of 0.147. This result suggests that an increase in rent can be associated with higher segregation. This positive association is consistent with expectations and reflects affordability barriers created by high rents, which likely limit access to diverse neighbourhoods for lower-income groups. These results confirm that rent is a key driver of segregation, even when interacting with other housing characteristics.

**House Prices**

The relationship between house prices and segregation exhibits a dynamic progression as additional housing and neighbourhood characteristics are incorporated into the analysis. Initial findings from correlation matrices and scatterplots indicate a positive association, suggesting that higher house prices align with higher levels of segregation. However, as house prices are incorporated into progressive linear regression models alongside other housing characteristics such as rent, social housing, and over-occupation, the direction of the relationship transitions from positive to negative. This shift highlights the evolving interplay between house prices and segregation as additional explanatory factors are accounted for, capturing the complexity of housing market dynamics. The final multivariate models suggest that higher house prices, when considered within a broader context of affordability and tenure structure, are associated with decreasing segregation levels, albeit with varying statistical significance.

**Social Housing**

Social housing begins with a negative relationship in the first model (coefficient = -2.083) but becomes less significant as other variables are added. In the final model, the coefficient is still negative but much smaller in magnitude. While social housing can foster integration by providing affordable options for diverse groups, its effect is modulated by the presence of other variables, such as rent and house prices.

**Over occupation**

Over occupation shows a consistently negative relationship with segregation across all models, with coefficients around -2.435 to -2.779 in models 2 through 6. This result indicates that higher levels of over occupation are associated with lower segregation, likely reflecting the blending of diverse populations in shared or overcrowded living arrangements due to affordability pressures. These findings are intuitive, as over occupation typically occurs in economically constrained areas that attract a mix of residents.

**Ownership**

The relationship between homeownership and segregation presents an intriguing, non-linear pattern throughout the analysis. While the initial models show a strong positive correlation between ownership rates and segregation, this relationship weakens as more variables are introduced. However, in the final regression models, ownership returns to a positive coefficient, suggesting that higher ownership rates may reinforce segregation patterns. This finding aligns with the idea that ownership often reflects socio-economic stratification and barriers to mobility, where housing markets dominated by ownership tend to create stable but potentially segregated residential patterns. These results highlight how ownership dynamics can subtly perpetuate segregation over time, even amidst broader shifts in housing markets.

**Lagged Dissimilarity**

Lagged dissimilarity emerges as the most dominant predictor of current segregation, with coefficients near 9.988 in models 4 through 6. This result underscores the persistence of historical settlement patterns in reinforcing present-day segregation. The near-perfect relationship (R² = 0.993) highlights the path-dependent nature of residential distributions and the difficulty of disrupting entrenched segregation dynamics without significant policy intervention.

**Interaction: Rent × House Price**

The interaction term between Rent and House Price is introduced in the final model, where it shows a significant positive relationship (coefficient = 0.019). This finding highlights the compounded effect of affordability barriers in high-cost areas. When rent and house prices are both high, segregation intensifies, suggesting that these two factors reinforce each other to create exclusionary housing markets. This result reflects the amplified impact of affordability challenges when these two variables intersect, underlining the importance of addressing them together in policy interventions.

**Other Variables**

Several additional neighbourhood characteristics contribute to segregation patterns. **Crime**shows a small but significant **positive relationship** with segregation (coefficient = **0.002**), suggesting that areas with higher crime rates may reinforce clustering patterns, possibly reflecting avoidance of such areas by wealthier or majority populations. **Greenery** demonstrates a significant **negative relationship** (coefficient = **-0.214**), indicating that greener areas tend to be less segregated. This finding might reflect efforts to promote inclusivity and equitable access to environmental amenities in these neighbourhoods. Finally, **PTAL (Public Transport Accessibility Level)** exhibits a small but significant **positive relationship** (coefficient = **0.0005**), suggesting that neighbourhoods with better transport connectivity may attract wealthier populations, reinforcing exclusivity and segregation. Together, these results highlight the nuanced roles of neighbourhood characteristics, emphasizing the need to address not only housing policies but also environmental and infrastructural factors in efforts to reduce segregation.

**Consistency Across Nationalities**

One of the most significant insights from this analysis is the consistency of relationships across the six nationalities examined. While the magnitude of coefficients varies slightly, the direction and significance of the relationships remain uniform. For example:

* Rent and house prices consistently show positive relationships with segregation across all groups, highlighting their role as universal drivers of exclusion.
* Over occupation and greenery exhibit negative relationships, reflecting their integrative potential in shared or environmentally improved areas.

This consistency suggests that the factors driving segregation are not unique to a specific nationality but are instead shaped by broader structural dynamics in London’s housing market.

**Conclusion**

The model diagnostic plots suggest that the linear regression model provides a solid foundation for analysing the relationships between segregation and housing characteristics. While the assumptions are mostly satisfied, slight deviations—particularly in heteroscedasticity and non-linear patterns—indicate opportunities for refinement. The model is well-suited for interpreting correlations but could benefit from additional exploration of non-linear effects or spatial variability, as planned in subsequent Geographically Weighted Regression (GWR) analyses.

1. **Cross-Correlation Function (CCF)**

Analysing annual lags within a 20-year scope is particularly relevant for understanding the temporal dynamics of segregation and housing characteristics. This approach allows us to explore year-to-year relationships while maintaining a long-term perspective, ensuring that patterns are not obscured by short-term fluctuations or averages. By examining lags, we can identify whether changes in variables such as house prices or rents align contemporaneously with segregation patterns (lag 0), or if they exhibit delayed effects (positive lags) or feedback loops (negative lags). The 20-year period provides a robust temporal framework to capture structural and persistent trends, enabling insights into how housing policies, affordability, and mobility barriers evolve over time. Importantly, while these lagged correlations suggest alignment between variables, they do not imply causation, maintaining the analytical focus on identifying patterns of association rather than direct impacts. The Cross-Correlation Function (CCF) results reveal interesting temporal relationships between housing characteristics and segregation, some of which align with previous correlation analyses, while others diverge.

For **house prices**, the CCF exhibits a positive correlation at lag 0, indicating that higher house prices are contemporaneously associated with increased segregation. This contrasts with the negative relationship observed in correlation and scatterplot analyses, where higher house prices were linked to reduced segregation. The positive relationship in the CCF at lag 0 might reflect short-term affordability pressures that reinforce existing segregation patterns, whereas the negative relationship in other models likely captures a more structural trend of displacement and redistribution. The shift to positive relationships in regression models as additional variables are integrated highlights the nuanced role of house prices in influencing segregation dynamics, suggesting that its impacts may vary depending on the spatial and temporal scales of analysis.

For **over-occupation**, the CCF shows a positive correlation at lag 0, suggesting that higher levels of overcrowding are immediately associated with increased segregation. This finding contrasts sharply with the negative correlations observed in scatterplots, correlation matrices, and regression models. The CCF results likely capture short-term clustering effects caused by housing shortages or population pressures, where over-occupied households tend to concentrate within specific neighbourhoods. Over the long term, however, the negative relationship observed in other analyses may reflect gradual dispersal or policy interventions that alleviate overcrowding and promote integration.

For **social housing**, the results are consistent across all models, with consistently negative correlations observed in the CCF, correlation matrices, scatterplots, and regression analyses. This consistent trend suggests that higher availability of social housing is associated with lower segregation levels, supporting the idea that social housing plays a mitigating role in spatial inequalities by providing affordable housing options across diverse populations. The lack of statistically significant relationships in the CCF, however, may indicate that the effects of social housing on segregation are more static and less influenced by temporal dynamics.

For **rent**, the CCF reveals a negative correlation at lag 0, indicating that higher rents are contemporaneously associated with reduced segregation. This finding is surprising, as previous models consistently showed positive correlations between rent and segregation. The negative correlation at lag 0 could reflect a short-term redistribution effect, where higher rents displace low-income populations to other areas, temporarily reducing segregation. Over time, however, the positive relationships observed in other models may emerge as displaced populations cluster in more affordable but segregated areas, reinforcing longer-term patterns of spatial inequality.

The Cross-Correlation Function (CCF) analysis for homeownership could not be performed due to the lack of temporal variance in the homeownership rates across London over the 20-year study period. While there is significant spatial variability in homeownership percentages between different MSOAs, the city-wide average has remained remarkably stable. This lack of temporal change makes it impossible to detect any meaningful lagged relationships with segregation or other variables over time. This stability aligns with existing literature, which highlights persistent structural barriers to homeownership, such as rising house prices, stagnant wage growth, and limited availability of affordable housing, particularly for first-time buyers. These factors have constrained significant shifts in overall ownership rates despite a dynamic housing market, reinforcing the robustness of this observed trend.

The CCF results demonstrate both alignment and divergence with previous correlation and regression analyses. The consistent negative relationship for social housing across all models underscores its role in reducing segregation. However, the positive CCF correlation for over-occupation at lag 0 contrasts with its negative relationship in other models, highlighting the temporal clustering dynamics that short-term pressures may create. Similarly, the negative correlation for rent at lag 0 in the CCF contradicts its consistently positive association in other models, reflecting the complexity of immediate displacement effects versus longer-term patterns of clustering. House prices, with a positive lag 0 correlation in the CCF but negative relationships in other analyses, illustrate how short-term affordability pressures can reinforce segregation even as longer-term trends reflect redistribution. These divergences emphasize the importance of combining static and temporal analyses to capture the multifaceted relationships between housing characteristics and segregation.

1. **Geographically Weighted Regression (GWR) at msoa level**

 Present MSOA-level spatial variability in GWR coefficients and local R² for housing characteristics.

 Compare specific years (e.g., 2001, 2011, 2021) to highlight temporal changes.

 Use borough-level policies to interpret findings:

* Example: "In Tower Hamlets, GWR coefficients for rent showed a stronger positive correlation with segregation in 2011 compared to 2001, potentially reflecting the effects of rent increases driven by regeneration initiatives."
* Example: "Within Barking, the variability in GWR coefficients for social housing between MSOAs highlights uneven impacts of policy interventions."

 **Key Focus:** Policies are used as a lens to understand MSOA-level heterogeneity and temporal shifts.

**Approach:**

* Discuss the general GWR results (20-year aggregated data).
* Highlight key correlations across housing characteristics (e.g., rent, social housing, house prices) and their relationship with segregation patterns.

#### Approach:

* Compare nationality-specific GWR results.
* Identify housing variables with strong correlations for each nationality and discuss spatial patterns.

#### Approach:

* Identify variables with the highest GWR coefficients and strongest local R² values.
* Highlight consistent patterns across nationalities and years.

#### Approach:

* Use coefficient and local R² maps to describe spatial variability.
* Identify key regions with notable patterns.

#### Approach:

* Use coefficient and local R² maps to describe spatial variability.
* Identify key regions with notable patterns.

The results of the Geographically Weighted Regression (GWR) model demonstrate strong explanatory power, as evidenced by the consistently high local R² values, which approach 1 across most areas. This indicates that the model captures nearly all the variability in the dependent variable (segregation) based on the selected housing and neighborhood characteristics. Furthermore, the residuals, ranging between -0.002 and +0.002, are exceptionally small relative to the coefficient magnitudes (approximately 0.1/-0.1). This highlights the robustness of the model, with minimal unexplained variation or systematic error. The alignment of high R² values and low residuals strongly supports the validity of the GWR framework in understanding spatial variations in segregation patterns across London, underscoring the strength of the housing characteristics as explanatory variables.

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| --- | --- | --- | --- | --- | --- | --- |
| Policy | Time Scope | Geographical Scope | Aim | Actions | Impacts | Sources |
| Right to Buy (1980–2010) | 1980–2010 | Barking, Havering, Redbridge, Newham, Haringey | Increase homeownership by allowing council tenants to purchase their homes. | Reduced council housing stock, transitioned homes to private rentals. | Loss of affordable housing, increased segregation, displacement to outer boroughs. | Housing Act 1980, Hamnett (2003), Jones & Murie (2008), Arbaci (2019) |
| Welfare Reform Act (2012–2016) | 2012–2016 | Newham, Tower Hamlets, Barking, Hackney, Enfield | Reduce government spending on housing benefits by capping rents and implementing the bedroom tax. | Reduced rent affordability, increased overcrowding, displaced low-income renters to suburban areas. | Reinforced socio-economic segregation, clustered low-income groups in outer boroughs. | UK Welfare Reform Act 2012, Hamnett (2014), Watt & Minton (2016) |
| Elephant and Castle Redevelopment (2004–2021) | 2004–2021 | Southwark (Elephant and Castle, Walworth Road) | Redevelop Heygate Estate into a mixed-use area to attract higher-income residents. | Demolished 1,200 council homes, replaced with mixed-income developments. | Displacement of low-income households, gentrification, rising property values. | Southwark Regeneration Plan (2004), Watt & Bernstock (2017), Hamnett (2016), Burgess (2023) |
| Housing Act 2004 (2004–2011) | 2004–2011 | Tower Hamlets, Hackney, Newham, Brent, Ealing | Improve safety and quality of private rental housing through stricter HMO regulations. | Enforced landlord licensing, increased rental standards. | Reduced affordable housing availability in regulated boroughs, increased overcrowding in less regulated areas. | Housing Act 2004, Arbaci (2019), Hamnett (2014) |
| Affordable Housing Program (2016–2022) | 2016–2022 | Newham, Tower Hamlets, Croydon, Barking | Deliver 116,000 affordable homes for low-income households and key workers. | Built affordable homes, integrated affordable units into mixed-income developments. | Delivered 72,000 affordable homes by 2021, reduced segregation, supported low-income households. | Mayor of London’s Housing Strategy 2016, Whitehead & Travers (2018), Mayor of London (2021) |

**V. Discussion**

- no differences for nationalities  
correlations/linear:  
- price: This finding highlights the role of affordability barriers in perpetuating segregation. Policy efforts to reduce segregation in high-price areas should prioritize increasing access through inclusionary zoning, affordable housing programs, and mixed-income housing developments. same results in ccf of +. in reg: The observed transition in the relationship between house prices and segregation from positive in simpler analyses to negative in multivariate models reflects the layered complexity of housing dynamics in London. While higher house prices may initially appear to exacerbate segregation by restricting access to certain areas, the inclusion of variables such as rent and social housing reveals a more nuanced narrative. Rising house prices often coincide with gentrification and mixed-income redevelopment efforts, which, while displacing lower-income households, may also introduce socioeconomic integration in previously homogenous neighborhoods. Furthermore, the negative association in multivariate models underscores the indirect effects of housing policies, such as affordability schemes and tenure diversification, which can mitigate segregation despite escalating property values. This finding highlights the importance of contextualizing housing characteristics within broader socio-economic and policy frameworks, demonstrating that segregation is shaped not by singular factors but by a constellation of interrelated dynamics.  
- rent: In high house price areas, policies targeting rental affordability (such as rent controls, rental subsidies, or mandatory affordable rental units in new developments) could help mitigate segregation and promote diversity. in reg, its the same. in ccf, its interesting that its -.   
- ownership promotes segregation. in reg, its the same. in ccf, no temporal variance.   
- socialhousing: In London, social housing allocations may be structured to encourage diversity, creating mixed-income and multi-ethnic communities. However, the relatively weak relationship suggests that social housing alone is insufficient to address segregation comprehensively. To enhance the integrative potential of social housing, policies could focus on equitable access and distribution across neighbourhoods. in reg its the same. in ccf same.   
- overoccupation: negative correlation, These findings highlight the role of affordability in shaping settlement patterns. Addressing over occupation through improved housing supply and affordability policies could help mitigate segregation while improving living conditions. in reg, its the same. in ccf, interestingly its +.

One of the main contributions is having the public policy lense while also comparing the msoas within it to see how even an area with the same policy had intenral variance.

Comparing Methodologies: Correlation Matrix vs. Scatterplots  
The correlation matrix provides a high-level overview of the relationships between variables, summarizing their direction and strength. Scatterplots, on the other hand, offer a detailed visual representation of these relationships, revealing potential outliers, non-linear patterns, and the consistency of trends.  
  
For most variables, the two methodologies yield consistent results:  
  
Lagged Dissimilarity, House Prices, Owned Housing, and Overoccupation show strong alignment between the correlation matrix and scatterplots, with both methodologies capturing the expected relationships.  
Social Housing and Crime exhibit weaker relationships, which are similarly reflected in the scatterplots.  
Greenery stands out as a variable where the scatterplot confirms the moderate positive correlation observed in the matrix, highlighting its role as a marker of exclusivity.  
PTAL, with no clear relationship in either methodology, reinforces its status as a neutral factor.  
The complementary nature of these methodologies strengthens the robustness of the results. The correlation matrix identifies broad patterns, while the scatterplots validate these findings and offer additional insights into the data's distribution.  
  
Key Takeaways  
Historical Persistence: Lagged dissimilarity is the strongest predictor of current segregation, highlighting the entrenched nature of settlement patterns.  
Affordability and Integration: Higher house prices and overoccupation are associated with lower segregation, emphasizing the role of affordability in fostering mixed communities.  
Environmental Inequalities: Greener areas tend to be more segregated, reflecting socio-environmental disparities.  
Policy Implications: Social housing and homeownership policies must balance stability with integration, while interventions in high-price and green neighborhoods could reduce segregation.  
These findings provide a comprehensive understanding of the factors driving segregation in London and suggest avenues for policy reform to promote integration.

The findings highlight the complex, and often unintended, consequences of housing policies on segregation patterns in London. Policies such as Right to Buy significantly altered housing variables, leading to observable changes in spatial distributions of populations. This discussion critically analyzes how such policies indirectly shaped segregation through their impacts on housing affordability, social housing availability, and displacement dynamics. While the analysis does not pass judgment on segregation, it underscores the importance of understanding these outcomes to inform future policy interventions.

**Content:**

* **Synthesis of Findings:**
  + Reflect on how policies indirectly influenced segregation by shaping housing characteristics.
  + Highlight how borough-wide policies had uneven impacts within boroughs at the MSOA level.
  + Address cases of alignment or divergence between policy intentions and outcomes.
* **Broader Implications:**
  + Discuss the role of spatial and temporal analyses in revealing nuanced policy effects.
  + Reflect on the limitations of borough-wide policy implementation in addressing segregation at finer spatial scales.
* **Policy Recommendations:**
  + Suggest how future policies could be more spatially targeted to avoid unintended segregation outcomes.

 **Purpose**:

* To critically analyze your results in light of the literature.
* To reflect on the implications, mechanisms, and broader significance of your findings.
* To explore why alignment or divergence occurs and what it means for the field.

 **How to Do It**:

* Discuss in more depth how and why your findings align with or differ from prior work.
* Reflect on broader implications for housing policy, segregation dynamics, and theoretical frameworks.
* Example:
  + "The observed alignment with Hamnett’s (2014) findings highlights the persistent displacement effects of welfare reforms, yet the results also reveal unexpected variations in segregation across boroughs, suggesting that localized infrastructure and housing policies may have mitigated these impacts in areas like Barking. This divergence underscores the importance of spatially targeted interventions."

|  |
| --- |
| limitaciones: |
| usar datos de nacionalidad son muy chiquitos, y la segregacion no es muy significativa |
| muchas personas tienen esa nacionalidad, pero deprotno llevan muchisimo tiempo entonces no son "migrantes" |
| quizas los housing dynamics por ser economicos, afectan mas a etnias que a nacionalidades |
| scaling de los housing variables vs el seg indice |
| muchisimos otros factores que no se tuvieron en cuenta |
| muchos factors no deberian ser de barrio, sino a nivel persona (su economia, su educacion, su emplo, su familia) porque esos drivers los hacen mas sensibles a condiciones externas y tambien son tomas de decision mas importantes |
| este informe mide correlacion, no causalidad, este es un abre bocas |
| While the linear regression models provide valuable insights into the correlations between segregation and housing characteristics, several limitations must be acknowledged. First, the residual diagnostics revealed slight non-linear patterns in the relationships between predictors (e.g., Rent, House Prices) and the Dissimilarity Index. These patterns suggest that the current linear framework may not fully capture the complexity of these associations, particularly in contexts where housing dynamics exhibit non-linear effects. |
|  |
| Second, the presence of slight heteroscedasticity, observed as increasing residual variance at higher fitted values, indicates potential biases in the model’s predictions. Although the impact is minor and does not invalidate the results, this issue could limit the accuracy of the estimates in certain ranges of the data. |
|  |
| Third, while most observations fall within acceptable leverage and Cook’s distance ranges, a small number of high-leverage points were identified. These observations may disproportionately influence the regression coefficients, though their impact was deemed minimal in the current analysis. |
|  |
| While the Geographically Weighted Regression (GWR) analysis provided valuable insights into the spatial heterogeneity of segregation and its relationship with housing and neighborhood characteristics, certain limitations should be acknowledged. The exceptionally high local R² values across MSOAs indicate a strong model fit, but they may also reflect overfitting in areas with highly localized patterns, potentially limiting the generalizability of findings beyond the specific study region. Similarly, although the residual analysis suggested minimal errors, with small magnitudes relative to the coefficients of the independent variables, the reliance on GWR assumes a linear and localized relationship between variables, which may not fully capture complex, non-linear dynamics or interactions across broader spatial scales. Finally, while the residuals displayed little spatial autocorrelation, indicating the model accounted well for spatial structure, this does not imply causation or rule out the influence of omitted variables that might also affect segregation patterns. These limitations underscore the importance of interpreting GWR results within their methodological constraints and supplementing them with other approaches for a more holistic understanding of segregation dynamics. |

**VI. Conclusion**

 **Purpose**:

* To succinctly summarize your study’s findings, contributions, and implications.
* To provide closure by synthesizing key points without introducing new information.
* To emphasize the study's significance for academia, policymakers, and urban planners.

 **Key Content**:

* **Restate the research questions** and summarize key findings:
  + Briefly highlight the main takeaways from the Results and Discussion.
* **Synthesize insights**:
  + Emphasize the broader contribution of your work to housing policy, segregation studies, and spatial methodologies.
* **Final reflection**:
  + Highlight the importance of addressing housing inequalities and the need for more equitable policies.

 **Example**:

* "This study examined the correlation between housing policies and segregation dynamics in London, leveraging spatial and temporal analyses. The findings reveal that policies such as Right to Buy and the Welfare Reform Act indirectly shaped segregation through their impacts on housing affordability and availability. By incorporating GWR, this research provides nuanced spatial insights, emphasizing the uneven impacts across boroughs. These findings underscore the importance of equitable housing strategies to mitigate socio-spatial inequalities and inform future policy interventions."

1. **Massey, D. S., & Denton, N. A. (1993). *American Apartheid: Segregation and the Making of the Underclass*.**This book examines how residential segregation contributes to the creation and perpetuation of a Black underclass in the United States.

[Internet Archive](https://archive.org/details/americanaparthei0000mass?utm_source=chatgpt.com)

1. **Bourdieu, P. (1984). *Distinction: A Social Critique of the Judgement of Taste*.** In this work, Bourdieu explores how cultural preferences and tastes are used to reinforce social distinctions and power structures.

[Social Capital Research](https://www.socialcapitalresearch.com/bourdieu-on-social-capital-theory-of-capital/?utm_source=chatgpt.com)

1. **Logan, J. R., Alba, R. D., & Leung, S. Y. (1996). "Minority Access to White Suburbs: A Multiregional Comparison." *Social Forces*, 74(3), 851-881.** This study investigates the extent to which minority groups have access to predominantly white suburban neighborhoods, highlighting variations across different metropolitan regions.

[JSTOR](https://www.jstor.org/stable/3088879?utm_source=chatgpt.com)

1. **Crenshaw, K. (1989). "Demarginalizing the Intersection of Race and Sex: A Black Feminist Critique of Antidiscrimination Doctrine, Feminist Theory, and Antiracist Politics." *University of Chicago Legal Forum*, 1989(1), Article 8.** In this seminal paper, Crenshaw introduces the concept of intersectionality to describe how race and gender intersect in shaping the experiences of Black women.

[JSTOR Daily](https://daily.jstor.org/kimberle-crenshaws-intersectional-feminism/?utm_source=chatgpt.com)

1. **Peach, C. (1996). "Good Segregation, Bad Segregation." *Planning Perspectives*, 11(4), 379-398.** Peach discusses the complexities of residential segregation, distinguishing between forms that may have positive aspects and those that are detrimental.
2.  Ethnicity Facts and Figures. (2021). Regional ethnic diversity. Retrieved from https://www.ethnicity-facts-figures.service.gov.uk
3.  Van Ham, M., Tammaru, T., & Janssen, H. (2021). Understanding Ethnic Segregation: Comparing Trends Across Cities. Springer. Retrieved from [https://link.springer.com](https://link.springer.com/chapter/10.1007/978-3-030-64569-4_16)
4.  LSE Blogs. (2018). London: Less integrated than the rest of the country. Retrieved from https://blogs.lse.ac.uk
5.  The Times. (2017). How segregated are British cities? Retrieved from https://www.thetimes.co.uk