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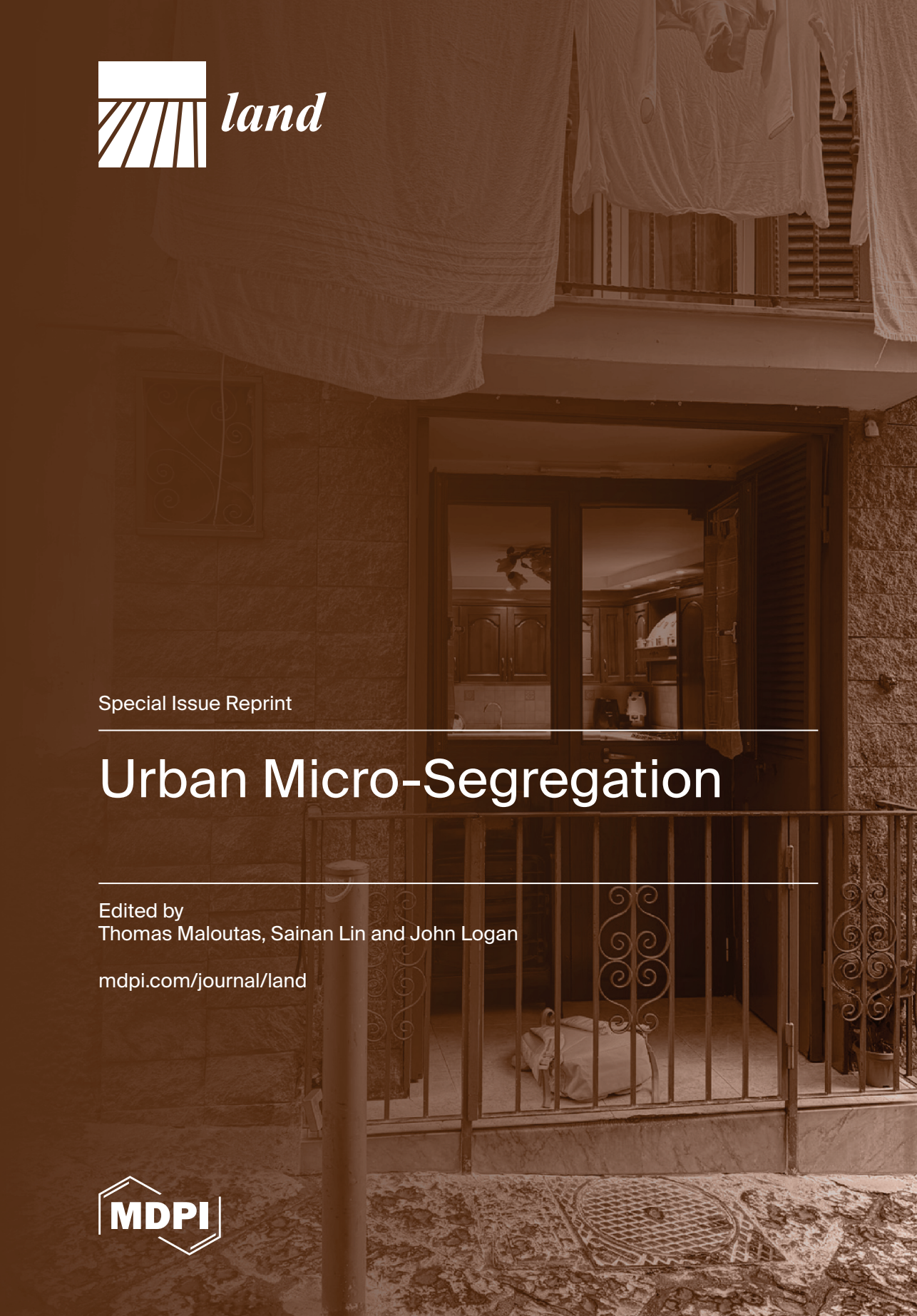

Special Issue Reprint

# Urban Micro-Segregation

Edited by
Thomas Maloutas, Sainan Lin and John Logan

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Guest Editors

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**Sainan Lin**
**John Logan**

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Cover image courtesy of Thomas Maloutas

# Contents

# About the Editors

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Thomas Maloutas is a Professor Emeritus at the Department of Geography, Harokopio University, and an Emeritus Researcher at the National Centre for Social Research (EKKE) interested in changing urban social structures, with a focus on segregation and gentrification related to housing and welfare regimes.

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John Logan is a Professor of Sociology at Brown University, working on studies relating to segregation and neighborhood change at multiple spatial scales using mapped historical data in the U.S. from 1880 to the present and examining recent changes in residential patterns in China.

# Preface

This Special Issue extends the original effort by the Guest Editors to draw attention to the variety of ways that residential segregation can be spatially organized. Although most urban social scientists have emphasized the concept of "neighborhood", which implies a local geographic area with characteristics that distinguish it from adjacent areas, the studies included herein describe forms of separation that appear at a more micro level. The notion is that people can be "segregated" from one another even when they live in close proximity to one another.

A key contribution of this set of studies is that they reflect a wide range of national and local settings and they describe situations where separation among people is based on a variety of social characteristics—not only race and social class, which have received the most attention in previous research, but also other aspects of social background including ethnicity, religion, origin, and generation.

**Thomas Maloutas, Sainan Lin, and John Logan**
*Guest Editors*

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*Editorial*

# Urban Micro-Segregation: Taking Segregation Analysis at the Micro Level

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## 1. Introduction

Urban micro-segregation refers to segregation at the small scale, below the scale of the neighborhood. Urban segregation research is traditionally focused on the neighborhood, assuming implicitly that spatial effects refer exclusively to that level [1–3]. Micro-segregation is an emerging topic in the urban research agenda and brings new questions for segregation studies.

The perception of the neighborhood spatial level has varied depending on available administrative data across time and contexts. In many countries, census tracts have been the spatial units that provided data and became de facto proxies for neighborhoods. However, segregation can occur at even smaller spatial scales, including within neighborhoods, specific public spaces, and even within individual buildings. At these finer spatial levels, subtle social boundaries and patterns of exclusion may emerge, such as the clustering of groups in different sections of a park, the separation of residents within gated communities, or the unequal access to shared facilities within a building. The question raised by urban micro-segregation, and treated in this Special Issue, is the need to investigate segregation at spatial levels below the neighborhood and to explore the (assumed) importance of social boundaries operating at those scales. By focusing on these micro-level interactions and spatial dynamics, we can better understand the complexity and nuances of segregation in urban environments.

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## 2. Dominant Methods and Assumptions in Segregation Studies

For a long time, the central question in segregation studies remained the same: Is the level of separation of social and/or racial groups in a city increasing or decreasing? The general hypothesis was that the negative spatial trend (increase in segregation) was related to the negative social outcome (increased inequality and discrimination), while the positive trend (desegregation) was to the opposite, assuming that market forces convert increased inequality and discrimination to spatial trends in the same direction. In actual terms, reality is always more complex than theoretical schemes. Income—reflecting inequality—and ethno-racial segregation—reflecting discrimination—do not necessarily follow the same path. Moreover, social trends are not necessarily translated to spatial trends (e.g., increased inequality in income and wealth is not necessarily translated to more segregation). Examining segregation at the micro-scale allows a better understanding of this complexity and provides further material to interpret broader segregation processes and trends.

The traditional assumption that social and spatial trends follow similar directions and patterns goes back to the Chicago School and to Park's assertion that social trends are so much correlated with spatial trends that it is eventually possible to study the former through the latter [4]. More than half a century later, the same assumption emerged in another way: the social polarization thesis stated that the developing social polarization in global cities was also leading to spatial polarization, i.e., to increased segregation [5].

These assumptions were endorsed by the main context of reference for both the Chicago School and the social polarization thesis, i.e., the metropolis of the US, where urban space is much more divided—socially and racially—at the neighborhood level than in other cities in the rest of the world. Moreover, in this urban reference context, discriminatory practices persisted well beyond their abolition, and regulation policies never really obstructed the shifting and sorting of market mechanisms. Eventually, these assumptions became part of a universalized model for segregation studies, even though segregation structures and trends in US cities are much more complex than the universalized model.

Nevertheless, evidence from various urban contexts has challenged this universalization and raised new questions for segregation research. The most significant challenge pertains to the diversified segregation outcomes observed across different urban contexts within a globalized world. These diverse outcomes highlight the importance of contextual parameters that are often overlooked in approaches such as the social polarization thesis. Such parameters ultimately challenge the assumed dominance of global forces over political decisions, local welfare regimes, or other systemic arrangements.

Alternative approaches to segregation, diverging from the models developed in the English-speaking world, have emerged from scholars examining contexts where welfare policies have been far more influential (mainly in Western and Northern Europe) or where the capitalist model deviates from the US paradigm, as seen in East Asia's developmental capitalism [6–17].

This new evidence on the forms, trends, and processes related to segregation challenged not only the similarity of trends followed by inequality and polarization, on the one hand, and by segregation trends on the other. It also questions the unvaryingly negative connotation of segregation, asserting that social distance is not interchangeable with spatial distance [18] and that social homogeneity at the local level is not inevitably negative. Proximity among low-income households may indicate the concentration of disadvantage but may offer, at the same time, possibilities of interaction and solidarity. This suggests that desegregation is not necessarily positive, as it may reflect the effects of poverty dispersal policies or gentrification processes, rather than the alleviation of inequality and discrimination [19–22]. Similarly, the social–spatial mix does not inherently lead to positive outcomes, as it does not necessarily prevent or reduce the persistence of deprivation [23] or even lead to conflicts [24]. These findings underscore the complexity of segregation and desegregation processes and challenge the assumption that spatial integration automatically produces social benefits.

Research evidence from outside the English-speaking world challenged the unduly universalized segregation model by firstly turning attention to parameters beyond the free market affecting segregation outcomes. It also contributed to challenging dominant assumptions about the unequivocally negative outcomes of segregation and the undoubtedly positive impact of social mix. This research evidence opened the door to turning attention to micro-segregation and to starting to investigate the forms, processes, and significance of segregation at the micro-spatial scale.

## 3. The Urban Micro-Segregation Research Agenda

The emerging research on urban micro-segregation should provide a deeper analysis of the social function of social (and/or ethno-racial) mix and of social (and/or ethno-racial) separation below the neighborhood level, promoting the discussion on the effective relation between social and spatial distance and its impact on social reproduction. This should lead to a better understanding of the potentially different types of social mix and of their characteristics that should be addressed to facilitate the objectives of urban policies promoting social integration and cohesion.

The research on urban micro-segregation needs detailed data to investigate segregation processes at the micro-space level and across time. Geolocalized data liberate segregation analysis from the ecological fallacy related to spatial units [25]. More particularly, the work based on the geolocalization of US census data in the 1880–1940 decades has challenged the stereotypical view that the level of segregation was much lower in US cities before the big wave of suburbanization ([26]). The volume *Vertical Cities* [27] provides evidence on urban micro-segregation from 20 cities across the world. However, the research on micro-segregation is still at the beginning.

The research agenda on urban micro-segregation can be summarized in the following three components:

1. Provide evidence on the multiple forms of urban micro-segregation in different urban contexts across the world.
2. Investigate the mechanisms that produce urban micro-segregation and the trends of their reproduction.
3. Evaluate the importance of urban micro-segregation for social reproduction in terms of their impact on social inequalities and discrimination.

## 4. The Contents of the Special Issue

This Special Issue is the first open call inviting work on urban micro-segregation. The Special Issue contains 13 papers (Appendix A) dealing with different aspects of urban micro-segregation in diverse urban contexts. It is an exploratory attempt to trigger research on micro-segregation and inspire future work on diverse micro-segregation topics.

Four papers of the Special Issue develop a macroscopic view of the detailed patterns of social and ethnic segregation in Vienna, Rome, Athens, and other Greek cities. The paper on Vienna examines in spatial detail the increased social mix produced by the socially and spatially segmented housing market in two of the city central districts. The paper on Rome investigates the patterns of ethnic segregation at the micro level in the whole metropolitan area. The one on Athens focuses on the patterns of micro-segregation for Albanian migrants in the housing market. The fourth paper relates the types of building stock with the forms of deprivation in the six largest Greek cities, taking into account the EU-funded territorial programs developed by local communities.

Two other papers focus on the social mix at the neighborhood level of Naples and in two cities in Northern Greece and the way the proximity in social mix functions as a cohesive element or as a boundary. The paper on Naples describes the working-class enclaves situated within the bourgeois strongholds of the city and their functional interaction with their surroundings. The one on Thessaloniki and Tyrnavos (Northern Greece) investigates the combination of absolute deprivation and ghettoization with spatial proximity with mainstream communities. The paper on Lima, Peru, explores the relationship between residential micro-segregation and social capital.

Two more papers are dealing with the relation of daily activities and urban amenities with micro-segregation. The paper on Fuzhou, China, investigates micro-segregation through the comparison of daily activities in three different types of neighborhoods, and

the one on Seoul explores the different levels of residents' access to urban amenities living in the two main different types of housing.

The four remaining papers relate micro-segregation with public space in different ways. The paper on Malmö and Paris deals with the emergence of gated spaces within spaces that represented open access (large public housing estates) in both. The paper on Quetta, Pakistan, investigates the aspiration for gated communities for protection from criminality among residents with different experiences and social status. The one on Szeged, Hungary, investigates micro-segregation in a context where spatial proximity and the weak feeling of segregation are supported by the lack of public space and the potentially conflictual encounters it could generate. Finally, the paper on Santiago, Chile, focuses on a large urban park and investigates the ways of accessing public space in conditions of peripheralized poverty.

The papers of the Special Issue raise many different questions: How does social mix in one of the most regulated cities across the world (Vienna) affect social reproduction compared to much less regulated urban contexts? Is the introduction of new spatial arrangements (gated spaces) in the emblematic loci of the welfare state era (public housing estates in Paris and Malmö) an embodiment of neoliberal domination in everyday life? And how can aspirations for increased individualized security be treated within completely different contexts (like in Quetta, Pakistan) that have no welfare state tradition and do not provide alternatives? Social mix must have many different facets and effects, revealed by the question of how the vicinity of working-class enclaves within affluent group strongholds in Naples is affecting the lives and the social mobility opportunities of working-class people compared to their counterparts living in other areas. How does social capital affect micro-segregation and vice versa, drawing evidence from research on Lima, Peru? How are the types of building stock –associated with diverse forms of social mix and micro-segregation in Greek cities– related to deprivation levels? How is access to urban amenities affected by different types of social housing corresponding to different levels of micro-segregation and social mix in Fuzhou, China? Do we learn more by investigating ethnic segregation at the micro level in Rome, Italy, compared to segregation at the neighborhood level? The largest immigrant group (Albanians) in Athens is much more dispersed than other immigrant groups. Is this related to its size (by far the largest immigrant group in the city) or to other parameters? Some groups (mainly Roma) experience deprivation and ghettoization in Greek cities, where deprived groups are usually spatially dispersed, embodying inequality and discrimination at the same time. Is discrimination overriding market and liberal democracy mechanisms for particular groups? How does the availability (or the absence) of public space affect segregation experience, drawing evidence from Szeged, Hungary? And how does public space affect social interaction in peripheralized poverty urban contexts, drawing experience from Santiago, Chile?

Most of the papers in this Special Issue on Urban Micro-Segregation are exploratory and partake in an emerging approach of segregation that investigates the forms, mechanisms, and processes of social hierarchies developed at the micro scale and, eventually, their importance for social reproduction. The questions they raise are very diverse, focused on different issues, and are not pointing at overturning the centrality/importance of the neighborhood in segregation studies. However, turning their attention to segregation at the micro scale, they challenge the universalized view of segregation based uniquely on analyses at the neighborhood level and shed light on the importance of micro-segregation, usually neglected in segregation studies.

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**Conflicts of Interest:** The authors declare no conflicts of interest.

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# Housing Market Segmentation as a Driver of Urban Micro-Segregation? An In-Depth Analysis of Two Viennese Districts

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**Abstract:** The concept of segregation analyses the unequal distribution of social groups between neighbourhoods. It rests on two assumptions: that of homogeneous neighbourhoods and of a market liberal housing system. Both assumptions are applicable the context of American cities, but they display severe limitations when applied to the European context. Vienna's housing market is particularly highly segmented, not only throughout the city as a whole but also within neighbourhoods. In the densely built-up area, residential buildings of different segments with different underlying rent regulations and entry barriers can be found side by side. Therefore, buildings are expected to show varying tenant and owner structures, which undermines the idea of a homogeneous neighbourhood. Against this background, we analyse at the micro scale small neighbourhoods defined by 100 m grid cells in a case study of two inner-city Viennese districts (districts 6 and 7) characterised by a particularly vivid housing-transformation and commodification dynamic. Using a novel and fine-grained dataset combining building information with the socio-economic data of households, we investigate the patterns and dynamics of income inequality and income segregation, as well as the relationship between housing market segments and socio-economic patterns. As data comprise two cross-sections for the years 2011 and 2020/21, changes in the neighbourhoods during the house-price boom period are also considered. This leads us to ask the question: How do housing market segmentation and its related changes affect income inequality and segregation at the micro scale? Our analysis delivers two main results: Firstly, we show the existence of marked social variation and related dynamics at the micro scale, even within a small urban area. Secondly, we show that the spatial distribution of housing market segments has a strong impact on income inequality in the neighbourhood.

**Keywords:** micro scale; income; inequality; segregation; housing market; Vienna

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## 1. Introduction

The concept of residential segregation, i.e., the spatial distance between different social groups or the spatial concentration of similar social groups, relies on two basic assumptions that have been observed by social scientists of the School of Chicago: firstly, the existence of socially homogeneous neighbourhoods (e.g., in terms of income, educational level, or race/cultural background), and secondly, a liberal housing market, where demand and supply drive the price gradient that determines the mobility of households in urban space [1]. Based on these assumptions, Burgess's model of homogeneous zones in urban space and the mobility of new social groups between these zones has influenced our understanding of social patterns, segregation, household mobility, and neighbourhood change for almost a century [2].

These classical principles of residential segregation have been questioned by two strands of the literature: Firstly, the debate on micro-segregation, which analyses segregation within or between single residential buildings [3]. Although this debate has emerged in the last few years, micro-segregation is a historic phenomenon: residential buildings in

19th-century metropolises such as Vienna or Paris displayed a very pronounced vertical social differentiation [4,5]. Further, beyond the European city, neighbourhoods in southern cities in the United States likewise display a high degree of social variety at the scale of individual buildings [6,7]. Alongside the vertical expansion of the modern city after World War II, this issue increasingly arose in various cities [1,8]. The second strand addresses allocation mechanisms influencing the housing market: the existence of informal and non-market-based allocation [9], the interplay of market- and non-market-segments [10], or the degree of market segmentation [11] have implications for the residential segregation of the housing market. This is relevant insofar as housing market segments differ regarding their accessibility and entry barriers for households [12]. Consequently, the spatial distribution of housing market segments in the city can either drive or cushion income inequality and, as a consequence, income segregation at various spatial scales.

The main intention of this paper is twofold: Firstly, it analyses the relevance and magnitude of micro-scale income segregation, using income inequality as its prerequisite, for two inner-city districts in Vienna. Secondly, it estimates the impact of housing market segmentation on inequality and segregation against the backdrop of Vienna's housing boom during the 2010s. For this purpose, we link a dataset outlining housing market segmentation at the scale of individual residential buildings with various socio-economic register data at the scale of households, provided by the Austrian Micro Data Centre (AMDC) [13]. Based on this database, and by applying separate multiple linear regression models, we investigate the relationship between the dependent variables of income, inequality, and segregation and a set of predictor variables including housing market segmentation. The analysis is conducted for 2011 and 2020/21, at the scale of a $100 \times 100$ metre grid, focusing on a case study in Vienna's high-density built-up area (districts 6 and 7).

Vienna is a useful case study for the analysis of the relevance of micro-segregation and the role of market segmentation for two reasons. Firstly, Vienna's housing market displays a high degree of market segmentation, in particular in comparison to most other larger metropolises. Secondly, Vienna's housing market has experienced an enormous house-price boom during the last 15 years, which, on one hand, triggered a construction boom in the large urban expansion areas at the periphery [14]. On the other hand, this boom gave rise to the commodification of the existing housing stock, with greatly varying implications for the housing market segments. Against this background, our analysis investigates the patterns and drivers of micro-segregation in a study area characterised by a high share of historic housing stock in a period of a booming housing market.

This paper is structured as follows: In Section 2, we discuss the interplay between the scalarity of segregation and housing market segmentation, provide an overview of the segmentation and dynamic of Vienna's housing market, and formulate the research question. Following the description of the materials and methods used and a presentation of the research area (Section 3), we discuss our results in Section 4, covering the patterns and dynamics of income inequality and residential segregation and the role of housing market segmentation in that regard. In Section 5, we discuss our results, their limitations, and their further conceptual implications and provide a conclusion (Section 6).

## 2. Research Context: Micro-Segregation and Housing Segmentation

Segregation can be defined as the formation of distinct patterns of over- and under-representation of specific social groups across residential space [1]. The classic literature based on the socio-ecological model of the Chicago school relies on two assumptions: Firstly, the existence of homogeneous neighbourhoods, which allows the measurement of segregation between statistical units. Secondly, a liberal housing market, where social differentiation in urban space is driven by households that compete on account of their incomes to realise their housing preferences [15]. In the following section, we scrutinise both assumptions, particularly for the European city.

### *2.1. The Micro Scale: Vertical and Horizontal Segregation*

The recent debate on micro-segregation points to social inequality at the scale of individual buildings within a neighbourhood [3,8]. Besides some examples from historic case studies in cities in the Southern USA, micro-segregation is de facto discussed synonymously with vertical segregation. As such, vertical segregation means micro-segregation within residential buildings, while horizontal micro-segregation describes socio-economic differences between them.

Segregation within individual buildings has a long history. The residential buildings of the Belle Époque particularly displayed pronounced social differentiation: from the bourgeois Belle Étage, holding the highest social status, a declining social gradient led towards the poorest households, situated in the last storey, directly under the roof [5]. During the twentieth century, emerging from cities in the USA, the verticalisation of the urban fabric became a global phenomenon [16]. As such, the vertical differentiation of urban society presents itself in various forms: rooftop extensions in the existing housing stock of European metropolises such as Paris or Vienna [17], social differentiation in former socialist housing estates in Eastern Europe [18], or high-rise buildings as a dominant building type, with a strong degree of vertical segregation within the building and/or its surroundings—for instance, in Santiago de Chile [19] or Hong Kong [20]. These cases of micro-segregation all share the dimension of vertical social differentiation within a residential building.

In Europe, the phenomenon of vertical micro-segregation is much more widespread in cities in the south than in the north or west. This is a consequence of a specific built-up structure (prevalence of apartment buildings), the structure of the housing market (dominance of owner-occupation), and the specific context of housing provision [21]. Qualitative analyses for Athens reveal the long-term transformation of these condominium buildings, which show strong segregation between native Greek and migrant residents, between social groups, and, finally, between owners and tenants [22]. Similar patterns have been analysed for residential buildings in arrival spaces in Marseille [23] or for inner-city neighbourhoods in Naples [24].

Although vertical segregation is described as a sub-form of micro-segregation and social diversity is a core feature of the European city, there is hardly any research on horizontal micro-segregation [25]. Likewise, certain 19th-century cities in the USA featured a high degree of horizontal segregation at the micro scale. Logan and Bellman [6], for instance, identified different forms of ethnic segregation in Philadelphia between 1880 and 1900, where 'black' residential buildings in 'white' neighbourhoods were hidden in backyards or smaller, isolated back streets. This pattern was the outcome of a strategy to ensure social distance and control, as well as the availability of a (slave-)workforce within spatial proximity [26]. However, most segregation studies rather focus on statistical aggregates at the scale of statistical units or neighbourhoods, which hides the patterns and dynamics of socio-spatial inequality, as well as the mechanisms that lie behind them.

### *2.2. Residential Segregation and Housing Market Segmentation*

The term 'residential segregation' implicitly points to the role of urban residents. Consequently, the housing market and its allocation system have an impact on urban segregation. As such, the housing market functions as an interface between the two dimensions of societal structures and dynamics, on the one hand, and spatial urban patterns, on the other hand.

In the classic literature that is based on the socio-ecological model of the Chicago school, the social differentiation of households in the urban space is driven by a liberal housing market [15]. Accordingly, the demands and preferences of different social groups within an existing price gradient determine the social pattern, as well as its dynamic, as the mobility of groups modifies the urban price landscape and shifts the borders between different social neighbourhoods, as explained in the arbitrage model [27]. In this liberal market model, residential income segregation relies on the presence of income inequality and

"income-correlated residential preferences, an income-based housing market, and/or housing policies that link income to residential location" [28] (p. 1102). Thus, in a liberal housing market, income sorting and related segregation is driven by market preferences related to location factors, e.g., the distance from the city centre or quality of public spaces [29], or urban amenities such as education facilities [30], urban green [31], and metro stations [32]. As such, the price differential between the top- and bottom-quality/price submarket drives the market structure and its variation.

This assumption of a homogeneous urban housing market is questioned by the concept of housing market segments. Segments are defined by a variety of market mechanisms, regulations, allocation systems, and entry barriers. In a simple way, the segmentation of housing markets can be analysed by distinguishing between a rental and an ownership market. Here, Allen et al. [33] distinguish between 'dual' and 'unitary' housing systems, whereby the former is highly segmented between socially weak households that are concentrated in the rental segment and wealthy households on the ownership market. In the unitary housing system, in contrast, there is no social differentiation between the rental and ownership markets. A further division is provided by Kemeny [34], who distinguishes between an 'integrated' and a 'dual' rental system. In the integrated system, social housing provides good housing standards, competing directly with the private segment. In dual rental systems, on the other hand, social housing is restricted to households in need, which causes stronger social segmentation within the private rental sector.

As housing market segments rely on different legal regulations, they are characterised by different housing costs, and they display different entry barriers and access restrictions regarding social or ethnic groups. This implies an uneven distribution between market segments, also called 'socio-tenure differentiation' [12]. Consequently, it could be assumed that these segments are characterised by different resident structures with regard to different factors, e.g., household income, level of education, or migration background. As such, the access to different housing market segments plays a crucial role as a driver of the spatial (un)evenness of an urban population [35].

As the national and regional regulative context (tenancy law and welfare system), housing policy, and planning system are closely related to the differentiation of housing market segments, the consideration of these factors is crucial for the understanding of segregation [36,37], in particular in comparative urban research. For instance, Murie and Musterd [38] identified the social housing sector as relevant for explaining the different levels of segregation in Dutch and British cities. Kesteloot and Cortie [39] explained variations in ethnic segregation between Brussels and Amsterdam, and Skifter Andersen et al. [11] analysed the impact of social housing and urban policies on the level of ethnic segregation in different Nordic capitals. Thus, even if two cities display the same level of aggregate social inequality, the segmentation of the housing markets and their regulative context, in combination with spatial patterns within the urban space, might produce a different outcome regarding residential segregation at different scales.

### *2.3. Segmentation and Segregation on Vienna's Housing Market*

Vienna's housing market displays a high degree of market segmentation: it comprises two segments of social housing, communal housing and limited-profit housing associations (LPHAs) [40], which together comprise about 42% of households in Vienna. Beyond that, a huge historic housing stock built pre-1945, with the vast majority of buildings being constructed during the 'founders' period' (1848–1918, 'Gründerzeit'), comprises about 22% of the total stock in Vienna. This segment is socially relevant, because it is regulated by a law of tenancy (Mietrechtsgesetz, MRG), keeping its capped rental rates below the market level. Due to a combination of regulated, affordable rent prices and private, low-threshold access to housing, the historic housing stock often provides the first entry point to the housing market in Vienna for migrants [41]. In contrast, apartment buildings constructed after 1944 (11%) underlie a different tenure law, where rents are non-regulated. Beyond this, ownership housing makes up just about 20% [42].

Since the mid-2000s, the Viennese housing market has faced an enormous price boom, which triggered the transformation of the historic housing stock (by tenure conversion or demolishing/new construction) due to the increasing 'value gap' [43]. The outcome of this process is, on one hand, the changing social structure of residents, and on the other hand, increasing granularity between the housing market segments, in particular between the transformed and the non-transformed historic housing stock. Consequently, within one street block containing about 20 apartment buildings, we can find an increasing variety of housing market segments, representing different social structures and different means of access and mechanisms of exclusion; transformed and non-transformed residential buildings, as well as newly constructed residential buildings, are the drivers of this granularity.

For the case of Vienna, several authors point to the role of market segmentation and the specific housing market barriers regarding segregation: according to Giffinger [44], the accessibility of housing market segments drove the ethnic segregation of Turkish and ex-Yugoslavian immigrants in the 1990s. Hatz et al. [45] found that Vienna's social geography had become more polarised in the early 2000s due to structural shifts in the economy, a neoliberal trend for stronger market-orientation in the housing sector, and spatially selective gentrification processes. More recently, Premov and Schnetzer [46] estimated the impact of the spatial prevalence of the council housing segment on local income inequality, confirming a positive relationship between the broad provision of council housing and the social mix within the neighbourhood. Kadi et al. [47] demonstrate that socio-spatial inequality in Vienna has increased, partly related to uneven housing market development since the financial crisis, driven by the private sector. Morawetz and Klaiber [32] demonstrate that the provision of municipality housing and capped rents moderate the income- and preference-based sorting of residents.

### *2.4. Housing Market Segmentation in Vienna—A Driver or Obstacle of (Micro-)Segregation?*

The combination of a highly segmented housing market in Vienna and the increasing granularity of the spatial structure of these segments—in particular in the more central, inner districts—has implications for the measurement of residential inequality and segregation. The analysis at the scale of differently sized, politically or historically defined spatial units (e.g., census districts) hides the existing pattern of market segmentation and, therefore, its social implications, in particular regarding segregation dynamics between individual buildings. Consequently, we investigate the impact of housing market segmentation on income inequality between households existing in close proximity to each other ($100 \times 100$ m cell grid), as well as the segregation of income groups in so-defined neighbourhoods compared to the overall distribution of income groups in the study area. Micro-scale variations in these phenomena are likely insofar as residential buildings in Vienna's densely built-up area display pronounced variation regarding housing market segmentation (see Section 2.3). Two cross-sections for the years 2011 and 2020/21 were chosen to analyse the dynamics of the phenomena under consideration. This period includes two census years for which detailed register-based microdata are available, and it covers Vienna's house-price boom, which started in the aftermath of the global financial and sovereign debt crisis of 2008–2010.

Building on existing research, we expect the spatial pattern of housing market segments to influence the level of income variation and residential segregation at the micro scale. In case of a boom of increasing house prices, similar to what we have experienced in Vienna during the last 15 years, we would expect increasing price differentiation within urban space, as price booms drive spatial variation in housing prices [48]. This would further imply increasing residential segregation, following a socio-spatial gradient from the city centre to the periphery. However, considering the high segmentation of Vienna's housing market, this central–peripheral pattern would be distorted by the uneven distribution of the housing market segments, as the ability to pay is not the only allocation mechanism influencing Vienna's housing market. Against this background, we can formulate the following research questions:

(1) What are the spatial patterns and the dynamics of income inequality and segregation in the research area?
(2) What is the effect of housing market segmentation in the neighbourhood on income inequality and segregation at the micro scale? How does this relationship change during the period 2011–2020/21?

## 3. Data, Methods, and the Research Area

### *3.1. Data*

In this paper, we analysed the variation in household income in small neighbourhoods to quantify social inequality and residential micro-segregation. Even though strongly correlated to other variables of socio-economic status that have been used in segregation studies, such as occupational groups or educational attainment [49], this indicator had advantages over measures of segregation based on ordered or unordered categorical data. In particular, we did not lose information on the income distribution within and across spatial units, we were not influenced by arbitrary cut points to define groups (e.g., of income), and we did not limit the analysis to specific subgroups in society [28].

Our analysis was based on the Austrian wage-tax statistics (LUE) for 2011 and 2020 and labour market statistics (AEST) for 2011 and 2021, with socio-economic data on individuals obtained from the AMDC. For each individual, the data contained unique and pseudonymised keys attributing them to a household, building, and 100 × 100 m grid cell. To safeguard the robustness of inequality and segregation measures calculated by grid cell, cells with fewer than 30 households were excluded from the analysis. Data on building locations and attributes were taken from a geocoded dataset from the Austrian Address and Building Register (AGWR) and combined with building and address data from the Federal Office of Metrology and Surveying (BEV). Due to data gaps regarding the matching of the resident register and the AGWR, and due to the exclusion of certain grid cells for reasons of data protection, our dataset covered roughly 70% of persons and 90% of private households in our study area, which is still high compared to survey data [45,50].

However, certain methodological and conceptual issues related to income used in this study must be pointed out, as segregation measured by microdata can be very sensitive to the presence of measurement error and extreme values. The original data of gross yearly personal income including transfers (excluding capital income) received from the AMDC, on the one hand, contained some negative or very low values due to negative or very low taxable income (e.g., losses from self-employment, social security withholding, or inter-household mandatory payments). Some of these households might have been as well off as, or even better off than, other households in terms of material well-being, as they could draw on other sources of income not captured by wage tax statistics to cover their monthly expenses [51,52]. On the other hand, certain individuals had extremely high incomes. The related right skew of our income data reflects empirical evidence on the dispersion of the upper half of the income distribution. The literature suggests that this 'upper-tail inequality' has driven the growth in income inequality in the past few decades [53]. However, conceptually and related to our research question, with growing income or assets, the influence of housing affordability on the choice of residence—steered by housing policies and the supply of housing segments with capped rents, among others—decreases in relation to other factors of income- and preference-based sorting, such as proximity to amenities or distance to the city centre [32,54].

To improve the data structure and for the conceptual reasons mentioned above, negative and very low income values of individuals were bottom-coded by setting them to a 1000 EUR yearly income, and extreme values at the top end of the distribution were top-coded by setting them to 100,000 EUR yearly income. The winsorising of extreme values roughly concerned data below the 5th percentile and above the 95th percentile for both years. Further, as households—and not individuals— sort into buildings and apartments, we calculated equivalised household income based on the gross yearly incomes of all household members, including transfers. The aggregated household income was

adjusted for household size by dividing the sum of individual incomes by the square root of the household size [55]. The equivalisation of household income allowed us to account for economies of scale in consumption and living costs and to control for intra-household inequality. To arrive at a set of socio-economic control variables at the household level, we took the employment status, educational attainment, and migration background of the highest earner ('household reference person') to be representative of the whole household.

The descriptive statistics presented in Table 1 provide summary statistics for the two cross-sections of 2011 and 2020/21[1]. The sample comprised 28,101 (2011) and 29,620 (2020/21) households living in 272 grid cells in the sixth and seventh districts of Vienna. As dependent variables for each grid cell, our dataset contained the median annual gross equivalised household income, a bias-corrected Gini coefficient [56] measuring income inequality, and bootstrapped multi-group local segregation scores of the Mutual Information Index $M$ [57] as a measure for segregation between income quintile groups. Median equivalised household income ranged between 11,430 EUR in the poorest and 63,210 EUR in the richest raster cell in 2011, increasing to a range of 10,460 EUR to 76,720 EUR in 2020. Regarding income inequality, the spread in the Gini coefficient of grid cells increased in this period, while the average coefficient stayed constant. Due to the top- and bottom-coding of outliers at the individual level, the originally strong right skew of the income variable at the household and grid-cell level was reduced. Lastly, segregation, as measured by local segregation scores, was characterised by a high variance distribution, with a coefficient of variation greater than 1. That is, income groups were rather homogeneously distributed across the majority of grid cells, which resulted in segregation scores close to zero in those grid cells.

The main explanatory variables of interest—the percentage share of households living in different housing market segments by grid cell—were constructed following a sequence of steps. In the first step, each building in the study area was attributed to a housing market segment by using a combination of sources [42]. In the second step, the number of households per building was calculated by matching each household with the unique building ID (AGWR OBJNR) obtained from the AMDC. Finally, the share of households living in different housing market segments by grid cell was calculated by spatially joining the geolocation of buildings and grid cells and aggregating the number of households per building belonging to a specific segment.

A set of demographic and labour market indicators hypothesised to have a strong effect on income variation within a grid cell were tested as control variables. All of these were calculated from individual-level statistics matched with households and buildings. Lastly, average property prices per square metre, sourced from DataScience Service GmbH, Wien, Austria, were included to control for price effects. This spatially detailed dataset is based on comprehensive geo-referenced broker data and sales contracts.

### *3.2. Methodology*

We assessed the relationship of income, inequality, and segregation with housing market segmentation, while controlling for socio-economic status, agglomeration, and location effects, in three separate multiple regression models. Each model was run for the two cross-sections of 2011 and 2020/21. To arrive at the main dependent variables of interest for this study, inequality and segregation indices were computed by 100 × 100 m grid cells, based on equivalised household incomes, using R statistical software version 4.4.1 [58]. As a measure of income inequality between 0 (no concentration of income and, therefore, perfect equality) and 1 (maximum inequality), the Gini index was calculated with the R package '*DescTools*' [59]. The data inputs for the calculation of the Gini index were household-level income data, grouped by spatial units. The resulting values depicted the degree of income inequality between households of a spatial unit and, therefore, inequality within neighbourhoods. As a measure of local income segregation, multi-group local segregation scores of the Mutual Information Index $M$[2] were computed with the R package '*segregation*' [60]. Local segregation scores of the entropy-based $M$ index indicated the

contribution of spatial units to the overall segregation of income groups in the study area and, therefore, inequality between neighbourhoods. The data inputs for the calculation of the segregation index were population counts per income groups (quintiles), grouped by spatial units. As we were working with very small neighbourhoods, we used the bootstrap function and bias correction built in the *'segregation'* R package. However, 95% confidence intervals showed that local segregation scores were quite variable and, therefore, had to be interpreted conservatively.

**Table 1.** Descriptive statistics of the datasets for 2011 and 2020/21. N = 272, 100 × 100 m grid cells.

| **2011** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Variable** | **Mean** | **St. Dev.** | **Min** | **Pctl(25)** | **Median** | **Pctl(75)** | **Max** |
| Median househ. income (1000 EUR) | 32.55 | 6.93 | 11.43 | 27.69 | 32.03 | 36.50 | 63.21 |
| Gini coefficient | 0.39 | 0.04 | 0.25 | 0.37 | 0.39 | 0.41 | 0.54 |
| Local segregation (1000) | 0.10 | 0.22 | −0.07 | −0.01 | 0.04 | 0.12 | 1.83 |
| Share council housing | 0.07 | 0.16 | 0.00 | 0.00 | 0.00 | 0.01 | 1.00 |
| Share limited-profit housing | 0.04 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.87 |
| Share housing post-1944 | 0.15 | 0.21 | 0.00 | 0.00 | 0.05 | 0.25 | 1.00 |
| Share housing pre-1945 | 0.55 | 0.26 | 0.00 | 0.36 | 0.57 | 0.74 | 1.00 |
| Share housing pre-1945, transf. | 0.19 | 0.16 | 0.00 | 0.04 | 0.17 | 0.30 | 0.85 |
| Share university degree | 0.36 | 0.11 | 0.04 | 0.30 | 0.37 | 0.43 | 0.68 |
| Share migr. background, ex-YU | 0.07 | 0.05 | 0.00 | 0.04 | 0.06 | 0.08 | 0.40 |
| Share migr. background, EU-East | 0.03 | 0.02 | 0.00 | 0.02 | 0.03 | 0.04 | 0.14 |
| Share resid. mobility 2011–21 | 0.54 | 0.09 | 0.33 | 0.49 | 0.53 | 0.60 | 1.00 |
| Mean property price (1000 EUR/m$^2$) | 3.16 | 0.27 | 2.60 | 3.01 | 3.12 | 3.25 | 3.98 |
| **2020/21** | | | | | | | |
| **Variable** | **Mean** | **St. Dev.** | **Min** | **Pctl(25)** | **Median** | **Pctl(75)** | **Max** |
| Median househ. income (1000 EUR) | 37.93 | 8.35 | 10.46 | 32.64 | 37.40 | 41.74 | 76.72 |
| Gini coefficient | 0.39 | 0.03 | 0.25 | 0.37 | 0.39 | 0.41 | 0.57 |
| Local segregation (1000) | 0.08 | 0.19 | −0.07 | −0.01 | 0.03 | 0.11 | 1.82 |
| Share council housing | 0.06 | 0.16 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |
| Share limited-profit housing | 0.03 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.82 |
| Share housing post-1944 | 0.18 | 0.22 | 0.00 | 0.00 | 0.10 | 0.29 | 1.00 |
| Share housing pre-1945 | 0.51 | 0.27 | 0.00 | 0.32 | 0.52 | 0.71 | 1.00 |
| Share housing pre-1945, transf. | 0.22 | 0.17 | 0.00 | 0.07 | 0.20 | 0.32 | 0.84 |
| Share university degree | 0.47 | 0.11 | 0.09 | 0.41 | 0.48 | 0.54 | 0.78 |
| Share migr. background, ex-YU | 0.07 | 0.05 | 0.00 | 0.04 | 0.06 | 0.08 | 0.37 |
| Share migr. background, EU-East | 0.04 | 0.03 | 0.00 | 0.02 | 0.04 | 0.06 | 0.13 |
| Share resid. mobility 2011–21 | 0.55 | 0.10 | 0.34 | 0.47 | 0.54 | 0.61 | 1.00 |
| Mean property price (1000 EUR/m$^2$) | 6.26 | 0.55 | 5.16 | 5.87 | 6.18 | 6.47 | 7.81 |

With the calculation of inequality and segregation indices at the granular level of 100 × 100 m grid cells, we aimed to uncover the micro-scale neighbourhood sorting of households by income, which contributes in sometimes contradictory ways to large-scale patterns of inequality and segregation [28]. Grid cells represent a consistent definition of neighbourhood size and shape as opposed to historically or politically delineated units, which vary widely in their meaning across time and place. The three dependent variables were subjected to separate multiple regression analyses for 2011 and 2020/21, using

ordinary least squares (OLSs). Based on a row-standardised queen contiguity spatial weights matrix, Moran's *I* test for spatial dependence detected no spatial autocorrelation in the residuals of our models. Therefore, it was confirmed that OLS estimates were the most efficient solution as opposed to spatial regression models. However, the Breusch–Pagan tests indicated heteroscedasticity in the error terms, which is why we reported heteroscedasticity-robust confidence intervals in all regression results. Further, the variables 'median household income' and 'Gini coefficient' were log transformed to fit the structure of the data better and reduce potential bias in the results caused by outliers. The correlation matrix of variables tested and/or finally included in the regression models are presented in Appendix A.

The first empirical model, with the dependent variable representing the natural logarithm of the median household income in grid cell *i*, has the following form:

$$\begin{aligned}\ln(income_i) = \; & \beta_0 + \beta_1 housing\ market\ segmentation_i + \beta_2 employment_i \\ & + \beta_3 education_i + \beta_4 migration\ background_i \\ & + \beta_5 household\ composition_i + \beta_6 residential\ mobility_i \\ & + \beta_7 location_i + \varepsilon\end{aligned}$$

where $income_i$ is the median equivalised household income for grid cell *i*, $\beta_0$ is the constant or intercept term, and $housing\ market\ segmentation_i$ is a vector of variables representing the share of households encountered in four different housing market segments. The weight of housing provided by limited-profit housing associations (LPHAs) was used as reference group in the regression analysis. Further, $employment_i$ denotes a vector of measures of the share of household reference persons by employment status, which has a direct relation to incomes. $Education_i$ is a vector of variables representing household education levels. Furthermore, a vector of variables denoted by $migration\ background_i$ represents the share of persons born in ex-Yugoslavia, Turkey, Eastern EU/New Member States, and outside of Europe (i.e., first generation) and/or holding the citizenship of their respective birth countries (thus also including the second generation) as opposed to persons born in Austria and holding Austrian citizenship (i.e., no migration background). $Household\ composition_i$ by grid cell represents average household size, the ratio of dependent persons (i.e., persons earning below 1000 EUR per year), and population density to control for the accumulation effect of personal income in households with multiple employed persons, as well as to control for agglomeration effects positively influencing wages, house prices, rents, service access, and the efficiency of public services [61]. $Residential\ mobility_i$ in grid cells is included as a variable representing the share of households relocating within or from/to the area in the period 2011–2020/21. Theoretically, the residential mobility of households of different socio-economic statuses affects the distribution of top and bottom socio-economic groups in the neighbourhoods [62]. Lastly, $location_i$ represents a vector of indicators representing the quality of the neighbourhood—proxied by an 'active mobility score', 'access to medium- and high centrality amenities', and property prices—and the distance to the city centre as a proxy for agglomeration effects [32]. $\varepsilon$ represents the idiosyncratic error term.

Model 2 is an extension of Model 1, where the natural logarithm of the Gini coefficient of household income in grid cell *i* becomes the new dependent variable, and $median\ household\ income_i$ is added as a control variable to the right-hand side of the model. This is to control for the hypothesised large influence of the upper tail dispersion of the income distribution on the inequality measure. Model 3 is an extension of Model 2, where the $multi-group\ local\ segregation\ score$ of grid cell *i* becomes the new dependent variable and the $Gini\ coefficient_i$ is added as a control variable to the right-hand side of the model. Due to the fact that the *M* index measures deviations from the global average in both directions (i.e., both, the over- or under-representation of certain income groups in a neighbourhood lead to a high local segregation score), the relationship between income and local segregation takes a U-shape rather than a linear one. Therefore, the

variable *median household income*$_i$ is added to the model as a second-order polynomial (quadratic) term.

### *3.3. Study Area*

The present study analysed an area comprising two inner-city districts of Vienna (district 6, *Mariahilf*, toward the south of the area under scrutiny, and district 7, *Neubau*, in the north). The study area is characterised by a very high building density, delimited by three high-level roads. The *Belt Road* (*'Gürtel'*) defines the western boundary, *Linke Wienzeile* the southern boundary, and the so-called *'Zweierlinie'*, running parallel to the *Ring Road*, the eastern boundary. The northern district boundary is not characterised by as strong a morphological break as the others. *Mariahilfer Straße*—a well-known shopping promenade—cuts right through the middle of the study area (see Figure 1).

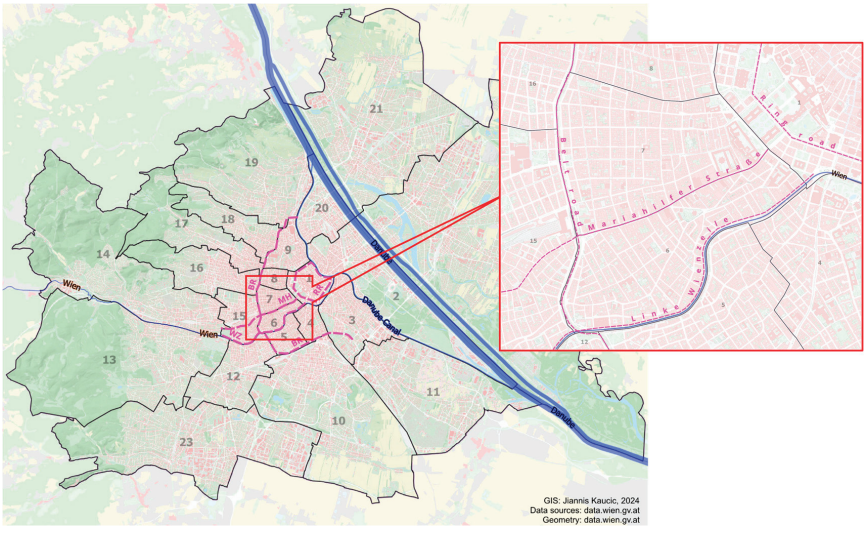


**Figure 1.** The location of the study area within the city of Vienna. Note: BR = Belt Road; MH = Mariahilfer Straße; RR = Ring Road; WZ = Linke Wienzeile. Numbers denote the 23 Viennese districts.

During the last few decades, both districts have undergone intensive transformation: this is more apparent in the district *Neubau*, where the former middle- and working-class area was turned into a new urban creative milieu with a high share of academics [63]. The symbolic manifestations of gentrification are apparent in this district, in particular in the ground-floor zones, which are dominated by creative and alternative shops and restaurants. In comparison, the process of social upgrading has also affected the sixth district, *Mariahilf*, albeit to a lesser extent. Both districts exhibit a falling socio-economic gradient from the inner city (alongside the *Ring Road*) towards the peripheral zones (towards the *Belt Road*), but this is more apparent in *Mariahilf*. Compared to the city as a whole, both districts display an above-average resident income profile (Vienna: 24,400 Euro/head; *Mariahilf*: 25,700 Euro/head; *Neubau*: 27,200 Euro/head [64]).

## 4. Results

In the first subsection (Section 4.1), we analyse the detailed spatial patterns of household income levels, income inequality, and income segregation at the scale of grid cells. In the second subsection (Section 4.2), we intersect these patterns with the housing market segments and investigate the impacts of the different segments on the existing patterns while discussing changes between 2011 and 2020/21.

*4.1. Spatial Patterns and Dynamics of Income Inequality and Segregation at the Micro Scale*

What are the general patterns and dynamics of income inequality and segregation emerging from the spatial distribution of households with different income levels? Theil's information theory index $H$ [65][3], for income percentiles in 2011 and 2020, provides an initial insight into composite income segregation across micro-scale spatial units in the study area. Figure 2 indicates estimated segregation at the scale of 100 m × 100 m grid cells, between households with incomes above, at, or below each percentile of the study-area-wide household income distribution. As the $H$ index is normalised between 0 and 1, the level of segregation of percentiles can be interpreted as percentages. The J-shaped segregation profile shows a tendency towards a larger spatial segregation of affluence (the extent to which the highest-income households are isolated from middle- and lower-income households), compared to segregation of poverty (the uneven distribution of low-income households among grid cells). Interestingly, segregation slightly decreased in the sixth and seventh districts of Vienna between 2011 and 2020. Generally, the entropy-based measurement of income segregation seems to be at a similar level to those of other urban areas (e.g., Beaubrun-Diant and Maury [66] or OECD [67]).

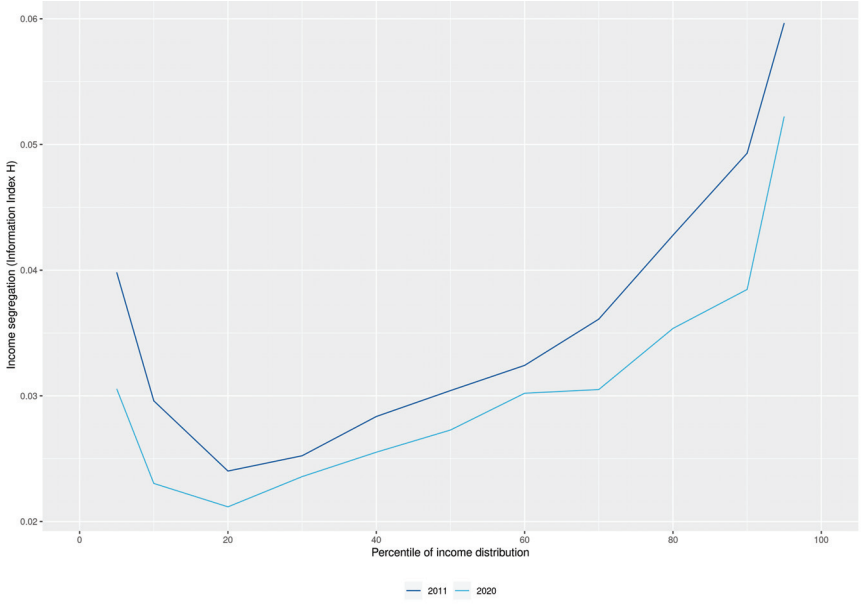


**Figure 2.** Household income segregation for 2011 and 2020 across 100 × 100 m grid cells by income percentile, as measured by the information theory index H.

We now continue to explore the spatial patterns of median income levels, income inequality, and income segregation at the micro scale, comparing patterns across years. Figure 3 shows each variable in 100 × 100 m grid cells in separate maps for 2011 (left) and 2020 (right). For each variable individually, the range of attribute values was divided into five equal-sized sub-ranges and mapped to a colour scale to highlight the amount of an attribute value relative to other values. The legend gives an indication of the value distribution of each variable. The mapping of median equivalised household income as an indicator of socio-economic status within small neighbourhoods at the same time shows spatial patterns of inequality between these spatial units (Figure 3a,b). The spatial distribution shows a slight central–peripheral pattern and the clustering of cells with similar income levels in specific areas. Grid cells along and close to *Mariahilfer Straße* in the centre of the area, as well as in the areas closer to the city centre, belong to the more affluent

group of neighbourhoods. In contrast, grid cells in the west of the study area along the *Belt Road* ('*Gürtel*'), which has a high traffic load, as well as along the peripheral part of *Linke Wienzeile* (south-western part of the map), belong to the less affluent parts of the area. Furthermore, the central–peripheral pattern of income is overlayed by a dispersed, spatially random juxtaposition of grid cells with different income levels. Comparing spatial patterns between 2011 and 2020, we can observe the slight relative socio-economic status upgrading of some grid cells near neighbourhoods with already high socio-economic status, especially around *Mariahilfer Straße*. Apart from this, the spatial patterns of income levels remain stable between 2011 and 2020, meaning that the spatial clustering and central–peripheral gradient of income do not change significantly in the area.

The spatial patterns of income inequality within grid cells, measured by the Gini coefficient of equivalised household income (Figure 3c,d), show only a weak coincidence with the distribution of median income across grid cells in 2011, as well as a moderate negative one in 2020 (see correlation matrix in Appendix A). Due to the top- and bottom-coding of outliers and the use of median instead of mean income, there are only very few grid cells in which higher income levels also exhibit higher levels of income inequality. Mostly, we see evidence of a pattern of more affluent grid cells, e.g., along *Mariahilfer Straße*, that exhibit a lower income spread. In 2020—as also evidenced by the increasingly negative correlation coefficient—this pattern intensified, and income inequality further decreased in grid cells with higher income levels. This is likely due to the influx of households with similar income levels into these already affluent neighbourhoods. At the same time, some grid cells with lower income levels—along the *Belt Road* and *Linke Wienzeile*—saw increases in income variation, which might point to gentrification and/or residualisation dynamics.

Finally, we analyse the degree of income segregation between grid cells (Figure 3e,f). For this purpose, we decomposed the Mutual Information segregation index $M$ into population-weighted local segregation scores, which can be used to assess whether some grid cells contribute more to overall segregation than other units [60]. Maps e and f both show the multi-group segregation of income quintiles (i.e., the disproportionality in income-group proportions across spatial units). High segregation scores indicate a significant upward or downward deviation of the within-unit distribution of income quintiles from the overall distribution in the study area. Based on this grouping of household incomes, economic micro-segregation appears to be low in most neighbourhoods (note the distribution of segregation scores). Only a few highly segregated grid cells contribute to the bulk of aggregate segregation in the study area. There is a tendency of highly segregated grid cells to coincide with those with lower income levels and low inequality, a relationship that decreases between 2011 and 2020 (Pearson's correlation coefficient of $-0.25/-0.34$ in 2011 and $-0.15/-0.27$ in 2020; see the correlation matrix in Appendix A). However, the relationship between income and local segregation takes a U-shape rather than a linear one.

### *4.2. Relationship between Housing Market Segmentation and Income Inequality & Segregation*

#### Patterns of Housing Market Segmentation

The main intention of this paper is to analyse the relationship between housing market segmentation, income inequality, and segregation at the micro scale. In the previous subsection, the spatial exploratory analysis displayed highly diverse patterns regarding levels of household income, inequality, and segregation in small grid cells. What is the impact of housing market segments on these patterns? To approach this question, we first provide an overview of the housing market segmentation in our area of interest (Table 2). At the household level, the housing market is dominated by the historic housing stock, which comprised 71.3 percent (2011) and 69.5 percent (2021) of all households (transformed and non-transformed historic housing combined). The share of households in transformed historic residential buildings on all historic buildings increased from 26.2 percent in 2011 to 31.5 percent in 2021, which points to a high transformation level and dynamic compared to the total housing market in Vienna [42]. The share of households in the segment of newly constructed buildings post-1944 increased from 16.5 percent (2011) to 19.3 percent

(2021) of all households. This significant change was mainly driven by the demolition and replacement of historic buildings, since there are hardly any vacant lots to be developed in the area. In contrast to the dominance of historic housing, council housing and limited-profit housing have comparably little relevance compared to the total housing market, consequently displaying hardly any changes.

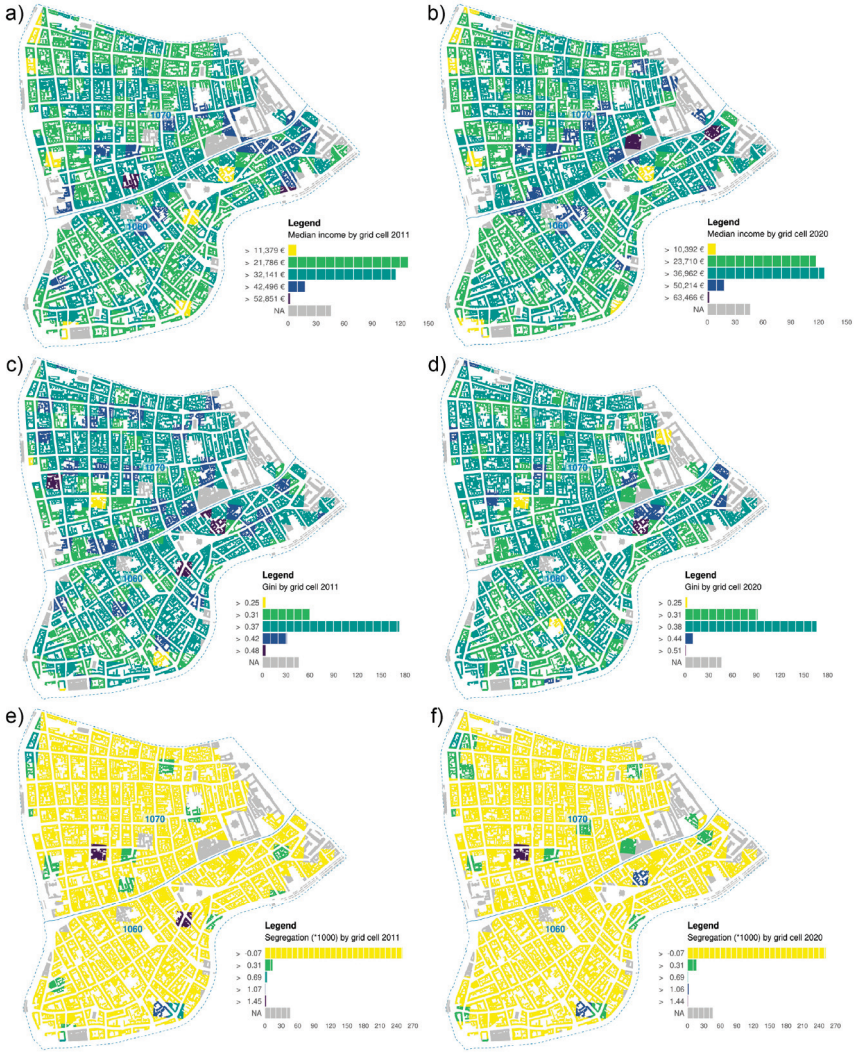


**Figure 3.** Spatial distribution of indices for 2011 (**left**) and 2020 (**right**) in 100 × 100 m grid cells. Panels (**a**,**b**) contain the median equivalised household income, panels (**c**,**d**) show the Gini coefficient of average equivalised household income, and panels (**e**,**f**) present the local segregation scores of the multi-group Mutual Information segregation index M of the equivalised household income quintiles.

In a second step, we analyse the spatial pattern of this housing market segmentation by considering the dominating housing market segments within 100 × 100 m grid cells for 2011 and 2020/21 (Figure 4). The main segment was determined by the maximum share of households found in buildings of the same type. In cases where the coefficient of variation between housing market segment shares was smaller than one, grid cells were

termed 'mixed housing' (i.e., no housing market segment dominates). Although the area of interest is dominated by the historic housing stock, there is a pronounced variation in housing market segmentation at the micro scale. Grid cells with an even mix of housing market segments constitute the second largest group within the study area (87 grid cells, or 32%, in 2011 and 92 grid cells, or 34%, in 2020/21; black colour), mainly dominating the peripheral zones, particularly in the sixth district. In contrast, 185 grid cells in 2011 and 180 in 2020/21 were dominated by a single housing market segment, with historic tenement houses (green cells) being the most prominent segment in the study area. Grid cells characterised by historic housing built before 1945 decreased from 144 in 2011 to 127 in 2020/21. Clusters of these cells were concentrated in the northern and more central parts of the study area. Only three out of 272 grid cells (two in 2020/21) were dominated by limited-profit housing (orange cells), and seven grid cells (eight in 2020/21) were dominated by council housing (brown cells). Council housing was mainly located in the southern parts of the study area. The grid cells mainly characterised by transformed historic tenement houses (blue cells) doubled from nine in 2011 to eighteen in 2020/21. These cells were well dispersed across the whole study area. Twenty-two cells (twenty-five in 2020/21), located mostly in the central and south-western part of the area, were dominated by private housing built after 1945 (yellow cells). Strikingly, even within these grid cells dominated by a specific segment, we could find significant variation in housing market segments. Only 18 grid cells (20 in 2020/21), that is, seven percent of all grid cells, displayed a share of 90 percent and above in one segment.

**Table 2.** Housing market structure and dynamics in Mariahilf and Neubau, 2011 and 2021.

| Households by Housing Market Segment | | | | | | |
|---|---|---|---|---|---|---|
| | **2011** | **2021** | **Change** | **2011** | **2021** | **Change** |
| **Segment** | **N** | **N** | **N** | **Percent** | **Percent** | **PP** |
| Council housing | 2082 | 1960 | −122 | 7.4 | 6.6 | −0.8 |
| Limited-profit housing | 1359 | 1343 | −16 | 4.8 | 4.5 | −0.3 |
| Housing post-1944 | 4636 | 5724 | 1088 | 16.5 | 19.3 | 2.8 |
| Housing pre-1945 | 14,781 | 14,114 | −667 | 52.6 | 47.7 | −4.9 |
| Housing pre-1945, transf. | 5243 | 6479 | 1236 | 18.7 | 21.9 | 3.2 |
| **Total** | **28,101** | **29,620** | **1519** | **100.0** | **100.0** | **–** |

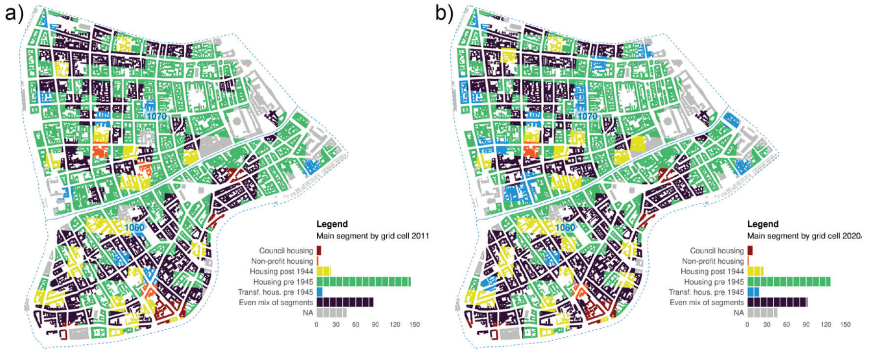


**Figure 4.** Main housing market segments in 100 × 100 m grid cells for 2011 (panel **a**) and 2020/21 (panel **b**).

### Housing market segmentation and household structure

How do income levels and variation relate to the housing market or other socio-economic variables? The ridgeline plots in Figure 5 provide some descriptive evidence, com-

paring the income distribution of households for 2011 (top panel) and 2020 (bottom panel) by housing market segment, distance to the city centre, and educational attainment.

For each year, household groups were sorted by their median income in ascending order. In 2011, households displaying compulsory education only, households in council housing, and households in the most peripheral distance band from the city centre had lower median incomes than other households. Furthermore, the generally heavily right-skewed distribution of incomes was less pronounced in these three groups, and the income spread was lower. In contrast, the segments of transformed and non-transformed housing built before 1945, housing built post-1944 and housing provided by limited-profit associations, households living within 2 kilometres from the centre, and households with tertiary education had the highest median incomes and increasingly flat and wide income distributions. The one-way ANOVA test and multiple Tukey pairwise comparisons of group mean values confirmed the visual impression that there were significant differences in income distribution between the group of households living in council housing and all other housing segments (but not between the other segments). In the period 2011–2020/21, differences between the housing market segments remained stable. Furthermore, in both years, differences between housing market segments appeared to be more pronounced than those between central–peripheral distance zones: although there was a decline in average incomes following a distance gradient, the differences in median income and the dispersion of incomes were very small across the five distance zones.

**Regression model**

We now turn to the regression analysis at the spatial scale of 100 × 100 m grid cells. The expectation of the multiple regression models is that the income level, its variation, and income segregation in 100 × 100 m grid cells change when the mix of housing market segmentation varies. We ran, separately for 2011 and 2020/21, three regression models with median household income, Gini coefficient, and multi-group local segregation scores as dependent variables and shares of housing market segments as the main explanatory variable of interest. Based on theoretical–conceptual considerations (see the empirical model in Section 3.2), an array of variables representing employment status, educational attainment, migration background, household composition, residential mobility, and location factors were tested as controls. The regression outputs presented in Table 3 represent the best fit models, accounting for multicollinearity issues between explanatory variables (see the correlation matrix in Appendix A for a comprehensive overview of tested variables).

Turning to the regression outputs 1 and 2 (Table 3), we observe that in 2011, the share of households in council housing has a significant ($p < 0.05$) and negative relationship with median income in a grid cell. This was expected, as the below-market rents in this housing segment allow lower-income households to move to these areas. The other housing market segments show non-significant coefficients, rendering their effect not statistically different from zero. The negative relationship between council housing and income loses its significance in 2020/21, which can be partly explained by the diminishing share of council apartments in the area and the in situ upward social mobility of some of the residents with open-ended tenancy agreements. Unexpectedly, in 2020/21, transformed historic housing displays a similarly high and negative correlation with income, which can be explained by the ambiguity of this market segment: residents in this segment could either be renters with a capped rent or owners with presumably higher incomes or other sources of income not registered by wage tax.

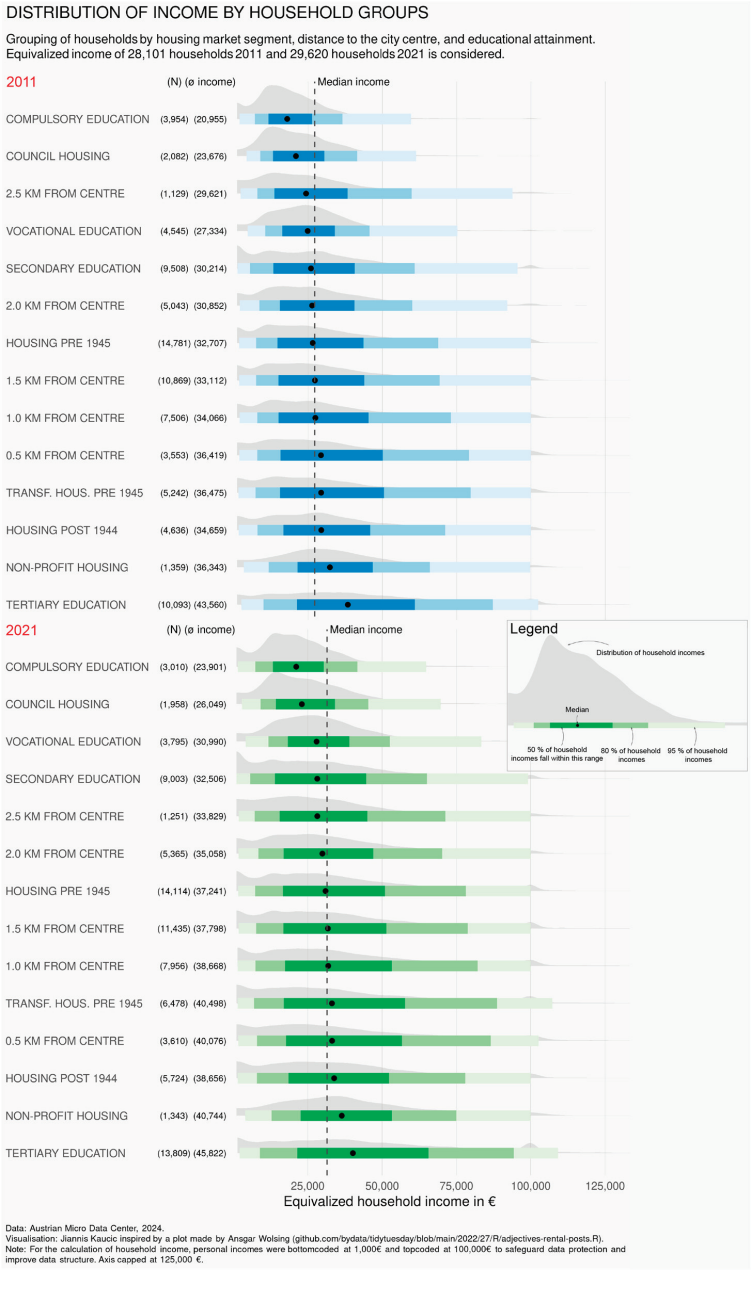


**Figure 5.** Distribution of equivalised household income by housing market segment, distance to the city centre, and educational attainment for the years 2011 (**top** panel) and 2020/21 (**bottom** panel). Note: For the calculation of household income, personal incomes were bottom-coded at 1000 EUR and top-coded at 100,000 EUR to safeguard data protection and improve data structure. The axis was capped at 125,000 EUR.

**Table 3.** Regression outputs. Notes: ln = natural logarithm; multi-group local segregation scores were multiplied by 1000 to improve legibility of coefficients; 95% confidence intervals in square brackets. We report heteroskedasticity-robust confidence intervals in all models, as the Breusch–Pagan tests indicated heteroscedasticity in the error terms.

| | *Dependent Variable:* | | | | | |
|---|---|---|---|---|---|---|
| | **Household Income (ln)** | | **Gini Coefficient (ln)** | | **Local Segregation (in 1000)** | |
| | **2011 (1)** | **2020/21 (2)** | **2011 (3)** | **2020/21 (4)** | **2011 (5)** | **2020/21 (6)** |
| Median household income (ln) | | | −0.247 *** | −0.273 *** | −0.895 *** | −0.647 |
| | | | [−0.325, −0.168] | [−0.335, −0.285] | [−1.506, −0.285] | [−1.476, 0.182] |
| Median household income (ln)$^2$ | | | | | 2.380 *** | 1.883 *** |
| | | | | | [1.586, 3.175] | [0.639, 3.126] |
| Gini coefficient (ln) | | | | | −0.604 *** | −0.815 ** |
| | | | | | [−0.997, −0.212] | [−1.455, −0.175] |
| Share of council housing | −0.341 ** | −0.186 | −0.030 | 0.069 | −0.139 | −0.120 |
| | [−0.641, −0.042] | [−0.478, 0.107] | [−0.189, 0.128] | [−0.088, 0.226] | [−0.832, 0.554] | [−0.996, 0.756] |
| Share housing built post-1944 | −0.089 | −0.057 | 0.086 | 0.090 | −0.231 | 0.327 |
| | [−0.374, 0.197] | [−0.334, 0.221] | [−0.056, 0.228] | [−0.058, 0.239] | [−0.814, 0.351] | [−1.087, 0.433] |
| Share housing built pre-1945 | −0.157 | −0.203 | 0.128 * | 0.125 * | −0.211 | −0.243 |
| | [−0.422, 0.109] | [0.455, 0.050] | [−0.006, 0.261] | [−0.017, 0.267] | [−0.755, 0.333] | [−0.964, 0.478] |
| Share housing built pre-1945, transformed | −0.224 | −0.346 ** | 0.151 ** | 0.188 *** | −0.227 | −0.202 |
| | [−0.504, 0.057] | [−0.609, −0.082] | [0.016, 0287] | [0.047, 0.328] | [−0.743, 0.288] | [−0.856, 0.452] |
| Share migration background, ex-YU | −0.420 | −0.324 | −0.499 *** | −0.244 * | 0.016 | 0.181 |
| | [−1.087, 0.246] | [−1.129, 0.480] | [−0.835, −0.163] | [−0.524, 0.037] | [−0.710, 0.742] | [−0.425, 0.787] |
| Share migration background, EU-East | 0.236 | −1.135 ** | 0.166 | 0.081 | −0.056 | 0.252 |
| | [−0.747, 1.219] | [−2.086, −0.184] | [−0.336, 0.668] | [−0.279, 0.440] | [−1.013, 0.901] | [−0.498, 1.002] |
| Share university degree | 1.016 *** | 1.183 *** | 0.243 *** | 0.192 ** | −0.138 | −0.069 |
| | [0.604, 1.429] | [0.642, 1.724] | [0.071, 0.414] | [0.040, 0.344] | [−0.558, 0.282] | [−0.381, 0.244] |
| Share residential mobility 2011–2021 | −0.680 *** | −0.579 *** | −0.029 | 0.054 | −0.014 | 0.246 ** |
| | [−1.113, −0.248] | [−0.968, −0.190] | [−0.198, 0.140] | [−0.055, 0.163] | [−0.177, 0.150] | [0.055, 0.437] |
| Mean property price (ln) | 0.088 | 0.141 | 0.240 *** | 0.145 ** | 0.090 | −0.032 |
| | [−0.234, 0.410] | [−0.306, 0.587] | [0.096, 0.385] | [0.032, 0.257] | [−0.153, 0.333] | [−0.221, 0.157] |
| Constant | 9.843 *** | 9.316 *** | −0.480 | 0.433 | −0.936 | −0.296 |
| | [7.297, 12.389] | [5.459, 13.173] | [−1.777, 0.816] | [−0.739, 1.604] | [−2.915, 1.042] | [−1.960, 1.367] |
| Num.obs | 272 | 272 | 272 | 272 | 272 | 272 |
| Adj. $R^2$ | 0.479 | 0.479 | 0.370 | 0.464 | 0.639 | 0.546 |

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Beyond housing variables and for both years of analysis, we observe the expected strong positive relationship between high educational attainment (university degree) and income. Furthermore, a strong negative impact of the share of residential mobility on median incomes in grid cells points to the fact that incoming and outgoing households have a lower income/social status compared to constant residents, which seem to be the drivers of in situ upgrading in some areas [50]. The share of households with different migration backgrounds in the grid cells points to a social succession, with households with backgrounds in the eastern European Union members forming a new migrant group and gaining increasing importance, while 'traditional' migrant groups (ex-Yugoslavian and Turkish) decreased in the area. In 2020/21, the share of households with persons born in Eastern European countries and/or holding the citizenship of the respective countries is strongly negatively related to the median income of a grid cell. Lastly, when controlling for housing market segmentation, education, migration background and residential mobility, location factors—here proxied by the mean property price in the neighbourhood—do not have a statistically significant effect on household incomes in the area.

Regression outputs 3 and 4 (Table 3) reveal a negative correlation between the median income level of a grid cell and the Gini coefficient of the same grid cell in both years of analysis. The negative and slightly higher coefficient in 2020/21 points to a homogenisation trend of neighbourhoods with higher median incomes, leading to a lower income gradient within these neighbourhoods. However, the relationship between income and inequality is not strictly linear, but rather follows a more complex pattern. Thus, inequality in a grid cell, as measured by the Gini coefficient, can be driven by the bottom, middle, or top of the income distribution.

The shares of transformed and non-transformed housing built before 1945 show a significant positive correlation with income inequality at the micro scale. This meets our expectations, as these market segments with capped rents create greater social variation within a neighbourhood. In conjunction with evidence on lower income levels within the segment of pre-1945 transformed housing (in 2020/21), we can infer that higher inequality in neighbourhoods with higher shares of this segment mainly relate to the clustering of lower-income groups. This can be explained by the coincidence of owning and renting residents in this segment, confirming existing findings [68]. In 2020/21, the share of households in transformed historic houses had an even stronger positive impact on income inequality compared to 2011. This outcome leads us to assume that, alongside the housing boom during the 2010s and the increasing transformation of the historic housing stock, the historic private housing stock turned out to be a driver of local social mix in terms of variations in the incomes and education of its residents. Council housing produces ambiguous and non-significant results in this study area, and therefore, the effect of this segment on social mix, which was found by other studies [46], cannot be substantiated.

Apart from this result, income inequality in a grid cell is mainly driven by variations in educational attainment and location factors, while it is significantly reduced by higher shares of households with migration backgrounds, especially from ex-Yugoslavian countries, in a neighbourhood. This indicates that groups with similar incomes and migration backgrounds tend cluster in some neighbourhoods, leading to lower social mix. When controlling for the other factors, residential mobility seems to have no impact on income inequality in a neighbourhood. In conjunction with the outcomes in model 1 and 2 of a negative relationship with income levels, which would suggest a positive relationship with inequality, this shows the spatially very selective nature of residential mobility in the area.

Regression outputs 5 and 6 (Table 3) show the drivers of local segregation of income quintile groups. Median household income and income inequality are the main drivers of segregation, with income presenting a U-shaped relationship, as evidenced by the significant second-order polynomial terms. Not only do very high levels of income within grid cells consequently lead to segregation across grid cells, but so do very low levels of income or inequality. It is evident that in order for spatial segregation to exist, there has to be some form of income inequality between individuals or households [28]. This theoretically points towards a positive relationship between the two phenomena. However, the direction of this relationship depends on the configuration of the income distribution that drives inequality within a grid cell compared to the average configuration of income distributions in all other grid cells[4]. Furthermore, the fact that income variation across households in very small spatial units—as measured by the Gini coefficient—can be much higher and be more strongly influenced by outliers than variation between quintile income groups—as measured by the segregation score—can also influence the relationship between inequality and segregation. Apart from this, for both years, the housing market segments prove to have no additional explanatory value for local income segregation, which is partly due to its correlation with the income variable.

## 5. Discussion

In this paper, we have analysed the spatial patterns and drivers of income inequality and income segregation at the micro scale. Our main intention was to estimate the influence of housing market segments on the patterns and dynamics of income inequality/segregation. Our analysis at the scale of 100 × 100 m grid cells reveals two main results.

Firstly, household income displays a heterogenous pattern: A general decline alongside the central–peripheral gradient is distorted by clustered areas with a more affluent population, particularly alongside *Mariahilfer Straße*. Between 2011 and 2020/21, this pattern remained stable or became even more pronounced. Similarly, the spatial pattern also indicates declining income inequality along a central–peripheral gradient. This general pattern is driven by the income gap between central and peripheral neighbourhoods. However, this general picture is distorted by the highly dispersed pattern of grid cells with

high or low incomes and income inequality. This points to the fact that we can encounter social inequality even at the micro scale of 100 × 100 m grid cells, which is smaller than the scale of street blocks. Finally, the area of interest displays only weak segregation at the micro scale, which is driven by a very small number of grid cells with a high upward or downward deviation in social status. Altogether, even in this small area, the results confirm high income variation and inequality, which cannot be explained merely by a central–peripheral gradient, contrary to what the classic segregation literature might let us assume [2,3].

Secondly, our analysis reveals a relationship between local housing market segmentation and income distribution in grid cells. Generally, our data indicate a high variation in housing market segments within the area of study, as well as clear social variation between these segments. The contrast between council housing, which represents the lowest median income and income spread, and transformed historic tenement houses, which represent the highest median income and income spread, is obvious. Our regression models indicate that housing market segmentation generally has an impact on income levels, as well as on income inequality, at the micro scale, in particular in 2020/21, at the peak of Vienna's house-price boom. The share of households in transformed and non-transformed historic tenement houses is significantly related to higher income inequality in the grid cells. However, our models do not reveal any significant impact of housing market segments on income micro-segregation.

Our analysis relies on microdata that link household and building data at the individual scale, which is a methodological novelty, in particular for Vienna. However, microdata on personal income from wage-tax statistics have their limitations in terms of determining the 'real' wealth or material well-being of households, which might distort the relationship between housing market segments (and other variables, such as employment status, etc.) and socio-economic inequality and segregation. Also, the ownership status of residents, despite being an important control variable, is omitted from the models due to missing data: In the segments of historic housing built pre-1945 (transformed and non-transformed), as well as housing built post-1944, we do not know if residents are renting with a capped rent, or if they are the owners of the flat. Furthermore, the small study area, which comprises two small inner-city districts, both dominated by two housing market segments (historic tenement houses, transformed and non-transformed) and characterised by a quite homogeneous, wealthy population compared to the city of Vienna as a whole, is a limitation. Thus, the results must be interpreted cautiously. However, despite this limitation, our analysis provides new insights regarding the social structure and dynamic of Vienna's housing market.

## 6. Conclusions

The empirical results of this analysis contribute to the debate on residential segregation in two ways. Firstly, we have found that the idea of homogeneous neighbourhoods in the city does not correspond to the socio-economic reality—at least not in Vienna's inner-city, densely built-up area. Statistical units larger than the street block hide these socio-economic patterns and dynamics at the level of individual buildings. While most studies on micro-segregation focus on the vertical dimension [21,22], this analysis shows that segregation between individual residential buildings likewise has an impact on the social structure and dynamic of a neighbourhood.

Secondly, notwithstanding the dominance of the historic housing stock in the area of interest, we could illustrate that housing market segments have a direct significant influence on income level and inequality at the micro scale and an indirect one on segregation. As segregation is mainly determined by the income distribution in a neighbourhood and the geography of housing market segments within urban space is a significant driver of income levels and inequality, a mediating effect of housing market segments on micro-segregation can be assumed. This confirms existing findings that point to the impact of the social

housing segment [36,46], but also highlights the important role of the historic housing stock for social diversity in the neighbourhood.

Both arguments taken together, the main assumptions of urban segregation concepts that rely on the Chicago school must be considered much more critically, in particular for the case of Vienna, but arguably also for many European cities.

These outcomes have conceptual implications, which are relevant for urban planners as well as researchers: In a European city such as Vienna, considering housing market segmentation is crucial for our understanding of the mutual relationship between housing market dynamics and social change. Housing market segments, with their different entry barriers, allocation systems, and ownership structures, not only distort the liberal market mechanism. They also react very differently to general market dynamics, such as a house-price boom or bust. As the transformation of Vienna's historic housing stock shows in particular, market segments and their patterns in urban space can turn into drivers of income variation and inequality at the neighbourhood level.

**Author Contributions:** Conceptualization, R.M. and J.K.; methodology, R.M. and J.K.; software, J.K.; validation, R.M.; formal analysis, R.M. and J.K.; investigation, R.M. and J.K.; resources, R.M. and J.K.; data curation, J.K.; writing—original draft preparation, R.M. and J.K.; writing—review and editing, R.M. and J.K.; visualization, J.K.; supervision,; R.M. All authors have read and agreed to the published version of the manuscript.

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**Conflicts of Interest:** The authors declare no conflict of interest.

## Appendix A. Correlation Matrices

**Table A1.** Variables 2011.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) Median income (ln) | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| (2) Gini coef-ficient (ln) | −0.13 | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| (3) Multigroup local segreg. | −0.25 | −0.34 | 1 | | | | | | | | | | | | | | | | | | | | | | |
| (4) Share council hous. | −0.32 | −0.24 | 0.28 | 1 | | | | | | | | | | | | | | | | | | | | | |
| (5) Share hous. built > 1944 | 0.05 | −0.11 | −0.02 | −0.16 | 1 | | | | | | | | | | | | | | | | | | | | |
| (6) Share hous. built < 1945 | 0.08 | 0.23 | −0.12 | −0.40 | −0.56 | 1 | | | | | | | | | | | | | | | | | | | |
| (7) Share hous. built < 1945, tr. | 0.04 | 0.16 | −0.15 | −0.10 | −0.23 | −0.30 | 1 | | | | | | | | | | | | | | | | | | |
| (8) Share mig. bg., ex-YU | −0.48 | −0.25 | 0.23 | 0.14 | −0.07 | 0.04 | −0.05 | 1 | | | | | | | | | | | | | | | | | |
| (9) Share mig. bg., TR | −0.40 | −0.19 | 0.19 | 0.45 | −0.12 | −0.12 | −0.06 | 0.42 | 1 | | | | | | | | | | | | | | | | |
| (10) Share mig. bg., EU-East | −0.12 | −0.09 | 0.08 | 0.08 | 0.12 | −0.10 | −0.09 | 0.23 | 0.11 | 1 | | | | | | | | | | | | | | | |
| (11) Share mig. bg., World | −0.33 | −0.12 | 0.14 | 0.41 | 0.09 | −0.25 | −0.05 | 0.29 | 0.25 | 0.16 | 1 | | | | | | | | | | | | | | |
| (12) Share univ. degree | 0.61 | 0.31 | −0.33 | −0.44 | −0.01 | 0.20 | 0.18 | −0.60 | −0.44 | −0.22 | −0.37 | 1 | | | | | | | | | | | | | |
| (13) Share res. mob. 2011–21 | −0.31 | 0.11 | 0.06 | −0.20 | 0.16 | 0.10 | −0.03 | 0.20 | −0.03 | 0.05 | 0.07 | −0.04 | 1 | | | | | | | | | | | | |
| (14) Share full-time employed | 0.30 | −0.20 | −0.10 | −0.21 | 0.24 | −0.13 | 0.04 | 0.01 | −0.05 | 0.07 | −0.08 | 0.14 | 0.05 | 1 | | | | | | | | | | | |
| (15) Share pensioners | −0.13 | −0.24 | 0.20 | 0.36 | −0.10 | −0.10 | −0.15 | 0.03 | 0.10 | 0.02 | 0.08 | −0.34 | −0.25 | −0.63 | 1 | | | | | | | | | | |
| (16) Share marg. empl. | −0.39 | 0.41 | 0.00 | −0.02 | −0.08 | 0.07 | 0.13 | 0.04 | 0.06 | −0.07 | 0.11 | 0.02 | 0.32 | −0.23 | −0.44 | 1 | | | | | | | | | |
| (17) Share unemployed | −0.52 | 0.21 | 0.31 | 0.28 | −0.10 | −0.07 | 0.02 | 0.14 | 0.24 | 0.04 | 0.22 | −0.35 | 0.14 | −0.27 | −0.01 | 0.53 | 1 | | | | | | | | |
| (18) Share students | −0.17 | 0.19 | −0.16 | −0.13 | 0.14 | −0.08 | 0.09 | −0.03 | 0.05 | 0.12 | 0.01 | −0.06 | 0.18 | 0.02 | −0.11 | 0.14 | −0.01 | 1 | | | | | | | |
| (19) Average household size | 0.43 | −0.18 | −0.01 | 0.13 | −0.33 | 0.19 | −0.04 | 0.04 | 0.07 | 0.01 | 0.04 | 0.04 | −0.31 | −0.01 | 0.08 | −0.20 | −0.18 | −0.18 | 1 | | | | | | |
| (20) Income depend. ratio | −0.07 | 0.27 | −0.03 | −0.07 | −0.02 | 0.10 | −0.01 | −0.11 | −0.01 | −0.10 | −0.06 | 0.11 | 0.07 | −0.16 | −0.08 | 0.17 | 0.02 | 0.15 | 0.07 | 1 | | | | | |
| (21) Popul. dens. (inh./ha) | −0.08 | −0.10 | 0.20 | 0.12 | 0.07 | −0.23 | −0.04 | −0.01 | 0.14 | 0.07 | −0.06 | −0.12 | −0.13 | 0.05 | 0.05 | −0.03 | 0.00 | 0.08 | 0.02 | 0.09 | 1 | | | | |
| (22) Mean prop. price (ln) | 0.37 | 0.32 | −0.17 | −0.17 | −0.19 | 0.27 | 0.05 | −0.45 | −0.28 | −0.20 | −0.22 | 0.49 | −0.22 | −0.15 | 0.05 | −0.11 | −0.15 | −0.14 | 0.07 | 0.11 | −0.10 | 1 | | | |
| (23) Distance to centre (km) | −0.25 | −0.32 | 0.13 | 0.21 | 0.32 | −0.39 | −0.08 | 0.24 | 0.24 | 0.12 | 0.27 | −0.44 | 0.15 | 0.18 | 0.01 | 0.02 | 0.14 | 0.10 | −0.08 | −0.13 | 0.08 | −0.73 | 1 | | |
| (24) Active mobility score | 0.36 | 0.22 | −0.06 | −0.11 | −0.20 | 0.29 | −0.03 | −0.33 | −0.24 | −0.16 | −0.23 | 0.41 | −0.17 | −0.12 | 0.02 | −0.10 | −0.11 | −0.23 | 0.08 | 0.01 | −0.14 | 0.64 | −0.59 | 1 | |
| (25) Amenity access score | 0.23 | 0.31 | −0.13 | −0.23 | −0.31 | 0.39 | 0.08 | −0.25 | −0.23 | −0.15 | −0.29 | 0.46 | −0.10 | −0.12 | −0.07 | −0.01 | −0.17 | −0.07 | 0.01 | 0.09 | −0.07 | 0.63 | −0.92 | 0.57 | 1 |

Source: Authors; Notes: Pearson correlation coefficient (r); N = 272 100 × 100 m grid cells. Rows/columns 1–3: Dependent variables; rows/columns 4–7: Housing market segments; rows/columns 8–11: Migration background; rows/columns 12: Education; rows/columns 13: Residential mobility; rows/columns 14–18: Employment status; rows/columns 19–21: Household composition; rows/columns 22–25: location factors.

**Table A2.** Variables 2020/21.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) Median income (ln) | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| (2) Gini coef-ficient (ln) | −0.46 | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| (3) Multigroup local segreg. | −0.15 | −0.27 | 1 | | | | | | | | | | | | | | | | | | | | | | |
| (4) Share council hous. | −0.30 | −0.11 | 0.24 | 1 | | | | | | | | | | | | | | | | | | | | | |
| (5) Share hous. built > 1944 | 0.08 | −0.16 | −0.01 | −0.15 | 1 | | | | | | | | | | | | | | | | | | | | |
| (6) Share hous. built < 1945 | 0.08 | 0.14 | −0.11 | −0.36 | −0.58 | 1 | | | | | | | | | | | | | | | | | | | |
| (7) Share hous. built < 1945, tr. | 0.00 | 0.26 | −0.15 | −0.16 | −0.28 | −0.27 | 1 | | | | | | | | | | | | | | | | | | |
| (8) Share mig. bg., ex-YU | −0.46 | −0.04 | 0.20 | 0.26 | −0.02 | −0.06 | −0.11 | 1 | | | | | | | | | | | | | | | | | |
| (9) Share mig. bg., TR | −0.29 | −0.15 | 0.20 | 0.50 | −0.09 | −0.12 | −0.16 | 0.36 | 1 | | | | | | | | | | | | | | | | |
| (10) Share mig. bg., EU-East | −0.31 | 0.09 | 0.10 | 0.07 | 0.19 | −0.12 | −0.11 | 0.24 | 0.20 | 1 | | | | | | | | | | | | | | | |
| (11) Share mig. bg., World | −0.32 | 0.02 | 0.13 | 0.43 | 0.13 | −0.25 | −0.08 | 0.28 | 0.36 | 0.20 | 1 | | | | | | | | | | | | | | |
| (12) Share univ. degree | 0.60 | 0.07 | −0.28 | −0.54 | 0.07 | 0.16 | 0.22 | −0.57 | −0.43 | −0.26 | −0.41 | 1 | | | | | | | | | | | | | |
| (13) Share res. mob. 2011–21 | −0.17 | 0.19 | 0.11 | −0.16 | 0.38 | −0.12 | −0.07 | 0.08 | −0.06 | 0.17 | 0.13 | 0.15 | 1 | | | | | | | | | | | | |
| (14) Share full-time employed | 0.22 | −0.18 | −0.08 | −0.23 | 0.39 | −0.20 | −0.03 | −0.03 | −0.12 | 0.04 | −0.01 | 0.24 | 0.45 | 1 | | | | | | | | | | | |
| (15) Share pensioners | −0.05 | −0.17 | 0.10 | 0.22 | −0.13 | −0.03 | −0.09 | 0.05 | 0.12 | −0.06 | 0.02 | −0.37 | −0.62 | −0.59 | 1 | | | | | | | | | | |
| (16) Share marg. empl. | −0.31 | 0.36 | 0.05 | 0.07 | −0.13 | 0.11 | 0.03 | 0.08 | 0.08 | 0.08 | 0.05 | −0.07 | 0.30 | −0.16 | −0.46 | 1 | | | | | | | | | |
| (17) Share unemployed | −0.51 | 0.15 | 0.29 | 0.50 | −0.14 | −0.06 | −0.12 | 0.32 | 0.40 | 0.28 | 0.27 | −0.44 | 0.06 | −0.21 | −0.01 | 0.34 | 1 | | | | | | | | |
| (18) Share students | −0.20 | 0.24 | −0.11 | −0.01 | −0.05 | 0.08 | 0.01 | 0.03 | −0.05 | −0.03 | −0.04 | −0.04 | 0.13 | −0.07 | −0.09 | 0.41 | −0.04 | 1 | | | | | | | |
| (19) Average household size | 0.42 | −0.23 | 0.03 | 0.14 | −0.31 | 0.22 | −0.05 | 0.06 | 0.19 | −0.14 | −0.07 | 0.02 | −0.25 | −0.14 | 0.15 | −0.08 | −0.03 | −0.09 | 1 | | | | | | |
| (20) Income depend. ratio | −0.09 | 0.34 | 0.03 | −0.10 | −0.04 | 0.14 | 0.02 | −0.16 | −0.10 | 0.00 | −0.04 | 0.02 | 0.14 | −0.12 | −0.05 | 0.18 | 0.01 | 0.09 | −0.06 | 1 | | | | | |
| (21) Popul. dens. (inh./ha) | −0.08 | −0.12 | 0.18 | 0.10 | 0.13 | −0.29 | 0.02 | 0.03 | 0.08 | 0.09 | 0.02 | −0.12 | 0.01 | 0.08 | −0.02 | −0.01 | 0.04 | −0.03 | 0.01 | −0.12 | 1 | | | | |
| (22) Mean prop. price (ln) | 0.40 | 0.10 | −0.13 | −0.27 | −0.21 | 0.34 | 0.06 | −0.50 | −0.29 | −0.28 | −0.31 | 0.49 | −0.19 | −0.15 | 0.04 | −0.09 | −0.25 | −0.11 | 0.13 | 0.17 | −0.15 | 1 | | | |
| (23) Distance to centre (km) | −0.27 | −0.12 | 0.09 | 0.25 | 0.30 | −0.40 | −0.09 | 0.34 | 0.22 | 0.26 | 0.31 | −0.43 | 0.16 | 0.19 | 0.01 | 0.00 | 0.21 | 0.04 | −0.11 | −0.17 | 0.13 | −0.85 | 1 | | |
| (24) Active mobility score | 0.38 | −0.01 | −0.02 | −0.15 | −0.16 | 0.31 | −0.07 | −0.32 | −0.22 | −0.28 | −0.22 | 0.36 | −0.14 | −0.15 | 0.09 | −0.10 | −0.22 | −0.16 | 0.11 | 0.10 | −0.20 | 0.67 | −0.59 | 1 | |
| (25) Amenity access score | 0.28 | 0.12 | −0.08 | −0.27 | −0.27 | 0.39 | 0.09 | −0.33 | −0.26 | −0.32 | −0.32 | 0.43 | −0.13 | −0.15 | −0.03 | −0.01 | −0.26 | −0.02 | 0.06 | 0.16 | −0.12 | 0.81 | −0.92 | 0.58 | 1 |

Source: Authors; Notes: Pearson correlation coefficient (r); N = 272 100 × 100 m grid cells. Rows/columns 1–3: Dependent variables; rows/columns 4–7: Housing market segments; rows/columns 8–11: Migration background; rows/columns 12: Education; rows/columns 13: Residential mobility; rows/columns 14–18: Employment status; rows/columns 19–21: Household composition; rows/columns 22–25: location factors.

## Notes

[1] Table 1 shows all variables included in the final regression analyses. Many more variables were tested as controls based on theoretical–conceptual considerations (see Section 3.2), but they were excluded from the final models due to issues of multicollinearity and overfitting; see the correlation matrix in the Appendix A for a comprehensive overview of tested variables.

[2] As opposed to Theil's information theory index *H*, the Mutual Information Index *M* is not normalised between 0 and 1, but it is the preferred segregation index to decompose global segregation into local segregation scores, indicating the contribution to overall segregation.

[3] In this case, we use Theil's *H* index instead of the Mutual Information Index *M*, because it has methodological advantages for analysing composite (aggregate) segregation [60].

[4] For the decomposition of segregation into local segregation scores, the distribution of households across income quintiles was analysed in each grid cell and compared to all other cells. Therefore, grid cells with the over- OR under-representation of certain income quintiles compared to the global average receive higher local segregation scores.

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# Micro-Segregation of Ethnic Minorities in Rome: Highlighting Specificities of National Groups in Micro-Segregated Areas

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**Abstract:** This paper aims to study ethnic micro-segregation in Rome, namely, high residential concentrations of ethnic groups at the micro-area level within neighbourhoods with low concentrations of these groups, with a focus on specific situations of spatial inequality often overlooked in the debate. The Italian capital is one of the five most populous cities in the European Union and a multi-ethnic metropolis with relatively low levels of segregation. It is an urban context that has been little studied, partly due to the lack of reliable and granular data. This work is based on unpublished individual data from the 2020 population register, disaggregated into 155 neighbourhoods and 13,656 census tracts with average populations of about 18,000 and 200 residents, respectively. The five minority groups considered, Bangladeshis, Chinese, Filipinos, Romanians, and migrants from developed economy countries (DECs), add up to 55% of the total foreign residents and show different settlement patterns. The concept of micro-segregated area (MSA) is central to the scope of the analysis. An MSA is a census tract that shows a strong over-representation of a specific ethnic group despite being located within a neighbourhood where that group is under-represented. MSAs can be considered 'interstitial' micro-areas embedded in ethnically diverse neighbourhoods. Descriptive analysis based on location quotient (LQ) mapping and bivariate logistic models is developed to highlight (a) differences in the settlement patterns of minority ethnic groups; (b) differences in the micro-segregation of minority ethnic groups in terms of socio-demographic characteristics, settlement location, and socioeconomic status; and (c) the particular characteristics of minority ethnic groups underlying these differences. The findings indicate that differences in settlement patterns can be related to the interplay between real estate constraints and labour market specialisation. National specificities in micro-segregation are mainly linked to length of stay, but the models of the Asian groups do not offer any empirical support for the spatial assimilation hypothesis, unlike those of Romanians and DECs citizens. Further development of this research will aim to explore segregation patterns and motivations to move to MSAs using a mixed method approach.

**Keywords:** micro-segregation; residential segregation; ethnic groups; minority groups; Rome; Italy

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## 1. Introduction

In this paper, we aim to study the micro-segregation of ethnic minorities in Rome, namely, high residential concentration at the micro-area level within neighbourhoods with a low concentration of these minorities. We focus on specific situations of ethnic spatial inequality often overlooked in the debate that are useful in highlighting the different ways in which residential segregation is manifested according to the spatial scale used. This approach also makes it possible to highlight 'settlement exceptions' that can represent an interesting evolution in the usual settlement pattern of the ethnic groups.

The distribution in the urban space of ethnic minorities with different origins has been the subject of much research on issues such as integration, discrimination and social inequality [1–5].

Urban residential segregation has been analysed according to different explanatory perspectives: within micro-level approaches, as in the case of the spatial assimilation model and the ethnic enclave model [6,7]; and within macro-level approaches, as in the place stratification model [8,9]. Place-specific explanations have been highlighted [10], and research on urban segregation at the micro-area level underlined the great heterogeneity of cases at the local level [11]. The studies of Maloutas and Karadimitriou defined the concept of urban micro-segregation in a vertical perspective [12,13], which recalls the ethnic and economic inequality between groups living in apartments located on different floors of the same building, and allows cases of strong residential segregation to emerge, even within socially mixed neighbourhoods. Examining micro-segregation from a horizontal perspective [11,14], the 'modifiable areal unit problem' (MAUP), that is, the risk of having inconsistent values of segregation indices based on the type of spatial units used, arises. The use of highly disaggregated data makes it possible to overcome the MAUP by adopting a multiscale approach [15].

As will be better explained later, this paper uses a multiscale approach to study micro-residential segregation in Rome. The city has always played a pivotal role in the Italian migratory landscape, being the municipality with the highest number of foreign residents (361,000 in 2020, corresponding to 13% of the total residents). After being a country of emigration for over a century, in the 1980s Italy began to attract the first substantial migratory flows, and during the 2000s, it has become one of the main immigration areas in Europe [16]. Studies on the residential segregation and spatial settlement patterns of foreigners gained momentum, as did the public debate on the integration of immigrants [17–23]. The Italian capital is a multi-ethnic southern European metropolis with relatively low levels of segregation [18,24,25], but it presents persistent social and spatial ethnic marginalisation [26]. Despite being one of the five most populous cities in the European Union (EU), with 2.8 million inhabitants, it is an urban context that has been little studied, in part because of the lack of reliable and granular data.

In order to study the micro-segregation of ethnic minorities, we use original and unpublished individual data from the 2020 population register of the municipality of Rome, disaggregated into 155 neighbourhoods and 13,656 census tracts, the latter being micro-areas with an average of about 200 inhabitants and equal in most cases to blocks. The five minority groups considered—Romanians, Filipinos, Bangladeshis, Chinese, and developed economy countries (DECs) citizens—total 55% of all foreign residents and show different settlement patterns: Bangladeshis and Chinese are clustered in central areas and the poor eastern urban periphery, Filipinos are more likely to live in the well-off neighbourhoods along the north–south axis, and Romanians are mainly settled in peri-urban districts with lower real estate values. Migrants from DECs are more likely to reside in the city centre and the more affluent districts.

The analysis of micro-segregation is performed at both territorial scales of census tracts and neighbourhoods. A micro-segregated area (MSA) is a census tract that shows a very high over-representation of an ethnic group being located within a neighbourhood where that group is under-represented. Examining MSAs allows us to address the main objective of the paper, which is to highlight how residential segregation can hide in the cracks, even in districts characterised by a social mix, especially in a Mediterranean urban context such as Rome where socioeconomic hardship is often sparsely distributed with varying intensity.

Operationally, in this paper, we carry out a descriptive analysis mapping of a local measure, such as the location quotient (LQ) [27,28], to reveal the spatial units in which there is over- and under-representation and identify MSAs, characterising them with respect to the centre–periphery spatial location and socioeconomic status. Bivariate logistic models are also developed to highlight how the characteristics of immigrants residing in micro-areas with very high over-representation differ depending on their location within a neighbourhood with over- or under-representation.

This approach offers the opportunity to answer the following research questions:

RQ1. What differences exist in the settlement patterns of selected minority ethnic groups?
RQ2. What differences exist in the micro-segregation of minority ethnic groups in terms of socio-demographic characteristics, the settlement location (centre vs. periphery) of the residents, and the socioeconomic status of the micro-areas where they live?
RQ3. What peculiar characteristics of minority ethnic groups underlie these differences?

The remainder of this contribution is structured as follows. The next two sections offer a review of the literature and describe the data and methods. The fourth section focuses on socioeconomic and migration aspects in the context of Rome. In the fifth part, the analysis of LQs by census tracts highlights differences in the five ethnic groups' settlement patterns. In the sixth section, we define and map the MSAs of the ethnic groups, and then we use a multivariate approach to explore the relationship between micro-segregation and individual and contextual socioeconomic factors. In the last section, we discuss the key findings and provide directions for future work.

The findings indicate that differences in settlement patterns are related to the interplay between real estate constraints and labour market specialisation. National specificities in micro-segregation are also linked to length of stay, but the models of the Asian groups do not offer any empirical support for the spatial assimilation hypothesis, unlike those of Romanians and DECs citizens.

## 2. Literature Review

The concept of ethnic residential segregation refers to the spatial separation of two or more population groups characterised by different countries of origin or citizenship [1]. Depending on their migration history, different cities have attracted people from different countries, and different groups of immigrants with different origins can consequently be identified [2]. International migrations play a very relevant role in the socioeconomic and demographic transformation of the urban space, fuelling the debate on issues such as integration and discrimination [3,4]. For this reason, the territorial distribution of ethnic minorities has been the subject of much research with the aim of highlighting the risks of negative impacts, for instance, in terms of social inequality [5].

In the literature, urban residential segregation is analysed according to different explanatory perspectives that focus on different dimensions [29,30]. Behavioural theories focus on the individual's attitude by centring choices, preferences, and constraints [6]. Included in these micro-level approaches are the spatial assimilation model and ethnic enclave model. According to the spatial assimilation model, newly arrived immigrants prefer to live in an ethnic enclave, but over time, the level of acculturation increases, and their settlement pattern assimilates with that of the natives [7]. The ethnic enclave model calls into question the occurrence of gradual spatial assimilation, as living in a neighbourhood with a high concentration of co-ethnics facilitates participation in a set of ethnic networks and socioeconomic resources [6,31]. Among the macro-level perspectives, the place stratification model highlights the relevance of structural constraints placed on minority groups in neighbourhood choice, emphasizing discrimination practices within the housing market [8,9,32]. Other studies highlight place-specific explanations, also from a historical perspective [6,10], for example, highlighting how residing in an economically strong area with high human capital can provide greater employment opportunities and integration [33]. It is also relevant to know the spatial scale at which segregation processes occur. In particular, the study of urban segregation at the micro-area level highlights the great heterogeneity of cases that deserves to be investigated for reasons including assessment of the need for ad hoc policy strategies at the local level [11].

According to Maloutas and Karadimitriou [12], it can be said that urban micro-segregation exists in contexts below the neighbourhood level when a proportion of the residents are in a state of socioeconomic or ethnic inequality. The concept of micro-segregation is relevant as it brings out the existence of socio-spatial hierarchies created at the micro-area level, even in neighbourhoods characterised by a social mix [13]. The concept has been developed in vertical and horizontal perspectives. Vertical micro-segregation refers to the

unequal positioning of social or ethnic groups living in apartments on different floors of the same building [11–13,34]. Investigating the horizontal dimension of micro-segregation reveals that the choice of spatial scale is a key aspect, and the MAUP arises [11,14]. In fact, territorial studies based on segregation indexes can provide different and inconsistent results depending on the territorial scale used: in most cases the smaller the spatial units used to indicate the neighbourhood, the higher the value of the segregation index will be [1]. Overall, it is not easy to understand which spatial scale is most appropriate for the phenomenon under study [35]. The issue of scale has been addressed by many authors, and the block has been seen as a level of micro-'proximity' spatial detail that is also of interest in qualitative sociological studies [36]. In recent years, many studies have been able to overcome the MAUP thanks to the availability of granular statistical data that make possible a multiscale analysis through the definition of 'egocentric neighbourhoods' [15,37].

## 3. Data and Methods

This article is based on original and unpublished individual data from the population register of 2020 (on 1st January), disaggregated into 155 neighbourhoods (zone urbanistiche) (Figure A1) and 13,656 census tracts. The census tracts are micro-areas which, in Rome, are mostly equivalent to a single block or a portion thereof and have an average population of about 200 residents. Census tracts have very diverse characteristics depending on their spatial location: they are large and of low density in suburban areas and small and dense in the compact city centre. The neighbourhood corresponds to a territory with a larger surface and has an average population of around 18,000 inhabitants. Neighbourhoods closer to the city centre have high residential density, smaller size, and delineate territories with a distinctive identity for residents. The more suburban neighbourhoods often have a very large area (see ahead, the 'outer periphery' in Figure 1), include dispersed urbanisations typical of urban sprawl, and only rarely can be considered walkable environments.

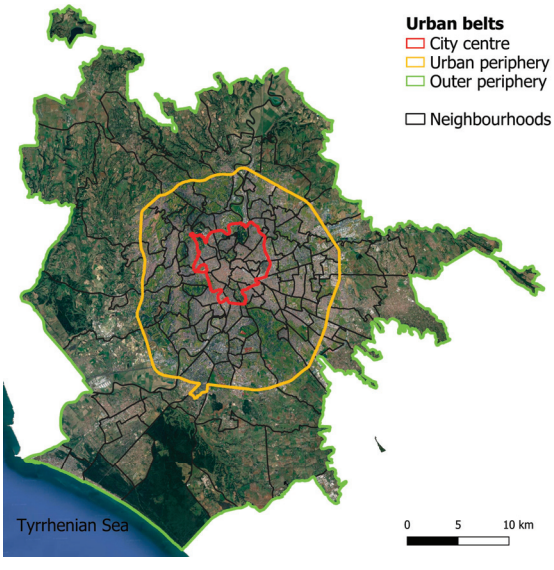



**Figure 1.** Municipality of Rome by neighbourhoods (zone urbanistiche) and urban belts. Source: Google Earth.

Five minority groups are considered in this paper: the four most numerous nationalities of the city (Romanians, Filipinos, Bangladeshis, Chinese), and the group of migrants from DECs. The latter group includes many European and non-European nationalities with different ethnic characteristics and migration histories in several cases[1], but it is interesting

to consider in comparison to the other four groups because it has a rather homogeneous cultural and socioeconomic profile, similar to that of the upper-middle-class Italian population. These five groups add up to 54.6% of the heterogeneous foreign population and show different settlement patterns. Minority groups were identified on the basis of country of citizenship, which is used as a proxy for ethnicity. We are aware of the limitations of this criterion, but it was the only one possible and is commonly adopted within similar Italian studies [20,22].

A large number of indicators has been developed to measure different dimensions of spatial inequality [38,39]. We used a global measure, the dissimilarity index (DI), and a local measure, the location quotient (LQ).

The DI measures the evenness of the spatial distribution of two groups across areal units and can vary from 0 to 1 [38,40]. Essentially, it gives the proportion of minority members that would have to change their census tract of residence in order to achieve an even distribution (in other words, no segregation). We calculate it using Formula (1), which was proposed by Duncan and Duncan [40]:

$$DI = {}^1/_2 \cdot \sum_{i=1}^{k} \left| \frac{N_{im}}{N_{am}} - \frac{N_{ir}}{N_{ar}} \right| \quad (1)$$

where $i$ is the census tract of the examined area, $k$ the number of tracts, $a$ the overall area, $m$ the minority group, $r$ the rest of the population, $N_{im}$ the population of group $m$ in tract $i$, $N_{am}$ the population of group $m$ in the overall area $a$, $N_{ir}$ the rest of the population in tract $i$, and $N_{ar}$ the rest of the population in the overall area $a$[2]. LQ is particularly useful when applied to the study of a city since it identifies sub-areas in which a population group is under-represented (LQ < 1) or, conversely, over-represented (LQ > 1). LQ varies from 0 to infinity and measures how concentrated a particular group is in a certain spatial unit compared with its concentration in the area as a whole.

We compute LQs with reference to Formula (2) proposed by Apparicio et al. [41]:

$$LQ_i = \frac{{}^{N_{im}}/_{N_{it}}}{{}^{N_{am}}/_{N_{at}}} \quad (2)$$

where $i$ is the census tract of the examined area, $a$ the overall area, $m$ the minority group, $t$ the total population, $N_{im}$ the population of group $m$ in tract $i$, $N_{it}$ the total population in tract $i$, $N_{am}$ the population of group $m$ in the overall area $a$, and $N_{at}$ the total population in the overall area $a$.

We map LQs to bring out MSAs and characterising them with respect to centre–periphery spatial location and socioeconomic status.

The micro-segregation perspective allows for the identification of specific features of the settlement pattern of ethnic groups that do not always emerge through aggregate or non-targeted approaches in micro-contexts [12]. In this paper, the analysis of micro-segregation is applied at the double territorial scale of census tract and neighbourhood. An MSA is a census tract that shows a strong over-representation of a specific ethnic group despite being located within a neighbourhood where that group is under-represented. Operationally, an MSA is a census tract where an ethnic group has an LQ equal to or greater than 4 and is located in a neighbourhood with an LQ less than 1. This allows us to highlight inconspicuous situations of high ethnic segregation 'hidden' within mixed neighbourhoods connoted by low levels of concentration. In fact, MSA can be considered, in a certain sense, 'interstitial' micro-areas embedded in ethnically differently connoted neighbourhoods.

For this reason, census tracts with LQ levels below 4 are not considered in the bivariate logistic models that are also developed to highlight how the socio-demographic characteristics of immigrants residing in micro-areas with very high over-representation (LQ $\geq$ 4) differ depending on their location within a neighbourhood with over- (LQ $\geq$ 2) or under-representation (LQ < 1) (see Table 1). In other words, the logistic models measure the propensity of the selected ethnic groups to reside in an MSA, rather than in a very

high-concentration census tract (LQ $\geq$ 4) inside a very high-concentration neighbourhood (LQ $\geq$ 2). Given the large difference in spatial scale and average population between the two area types, it was chosen to set the threshold of over-representation in census tracts at twice the LQ value compared with neighbourhoods. This made it possible to limit the bias produced by the MAUP, as a result of which smaller spatial units tend to have higher values of segregation indices. To better highlight these situations of exception, we let emerge only micro-areas where the group appears remarkably over-represented, not considering census tracts with significant under-representation (LQ < 1) or less micro-segregated (LQ ranging between 1 and 4).

**Table 1.** Typology of micro-areas considered in the logistic models based on location quotients (LQs) values at both census tract and neighbourhood levels.

| Typology of Micro-Areas | Census Tract LQ | Neighbourhood LQ | Considered in the Models |
|---|---|---|---|
| MSA: very high over-representation at census tract level; under-representation at neighbourhood level | $\geq$4 | <1 | Yes |
| Very high over-representation at both census tract and neighbourhood levels | $\geq$4 | $\geq$2 | Yes |
| Medium–high over-representation at census tract level | $\geq$1 & <4 | All the values | No |
| Under-representation at census tract level | <1 | All the values | No |

In detail, within the logistic models we use the independent variables of sex, age, civil status, and years of stay as individual characteristics and the social disadvantage index (SDI) and residential crowding index (RCI) as context characteristics.

The SDI was defined in the 'National plan for social and cultural redevelopment of deprived urban areas' (Piano nazionale per la riqualificazione sociale e culturale delle aree urbane degradate), launched by the Italian government in 2015 to identify the most deprived neighbourhoods nationwide. The index comprises four socioeconomic sub-indexes from 2011 Istat Census data: unemployment rate, employment rate, youth concentration rate, and education rate. The unemployment rate expresses the resident population aged 15 and over without a job, actively seeking employment and immediately available to start work as a percentage of the total labour force. The employment rate is measured as the share of the resident working-age population declaring having a job in relation to the comparable total population. The youth concentration rate refers to the ratio of the resident population aged less than 25 to the number of people living in the area. Finally, the education rate relates the resident population having attained at least upper secondary education to the total over-25 population. Using these sub-indexes, the SDI is computed as the weighted average of deviations of the indicators' values of the single tract from the municipal average values, according to Formula (3) (in the original expression, deviations are calculated from the respective national averages)

$$SDI_i = 0.40 \cdot (UNEM(i) - UNEM(a)) + 0.30 \cdot (EMPL(a) - EMPL(i)) + 0.15 \cdot (YOUT(i) - YOUT(a)) + 0.15 \cdot (EDUC(a) - EDUC(i)) \quad (3)$$

where *i* is the census tract of the examined area, *a* is the overall area, UNEM is the unemployment rate, EMPL is the employment rate, YOUT is the youth concentration rate, and EDUC is the education rate.

The RCI results from the crude ratio of the total surface of residential buildings present in a census tract to the corresponding number of inhabitants, according to Formula (4):

$$RCI_i = {}^{S_i}/_{N_{it}} \quad (4)$$

where $i$ is the census tract of the examined area, $t$ the total population, $S_i$ the total surface of residential buildings in tract $i$, and $N_{it}$ the total population in tract $i$.

In the following elaborations, the classes of the two hardship indexes are defined using population-weighted quintiles.

## 4. Research Area: Socioeconomic and Migration Context

Rome has the largest surface of any municipality in Italy (1285 km$^2$) and one of the largest in the EU. In order to characterise the territory of the city, it is useful to refer to three sub-areas determined on the basis of the aggregation of the 155 neighbourhoods: city centre, urban periphery, and outer periphery (Figure A1). The city centre and the urban periphery represent the 'urban core' of Rome, the most densely populated area located within the Great Ring Road (the Grande Raccordo Anulare (GRA)), the large freeway that surrounds the city, and include the districts of the 'consolidated' city built in the twentieth century (Figure 1). The city centre includes the historic centre within the ancient Aurelian walls, and has a very high concentration of managerial services, public administration offices, and tourist accommodation. In the urban periphery, the neighbourhoods furthest from the city centre are mainly residential but also include wide areas of public housing. The outer periphery includes vast portions of farmland (the Agro romano) and sparsely inhabited districts located outside the GRA that often lack services and public infrastructure. It contains the more recently built districts that were populated, particularly from the 1970s onwards, as a result of the urban sprawl from inner city neighbourhoods [42]. In the outer periphery, only some smaller neighbourhoods can be seen as walkable environments, also because these are often areas where residents live in detached houses and use cars to travel to stores and other services.

Indicators of social disadvantage and housing crowding by census tract provide a clear and detailed picture of the socioeconomic status of Roman neighbourhoods (Figures 2 and 3). The wealthiest neighbourhoods, which have low values on the disadvantage indexes, are mostly found along a north-west/south-east line including the city centre, the northern districts close to the centre, the north-western districts along the via Cassia, and the southern neighbourhoods of the EUR and along the via Appia Antica. The less affluent neighbourhoods are concentrated in the eastern quadrant, where there are many degraded public housing units, and in the western periphery, both inside and outside the GRA. In these areas, both the SDI and the level of crowding of homes are particularly high.

Real estate and rental prices reflect this picture and differ greatly between central and peripheral districts, even after the sharp decline experienced since 2013. Apartment prices are also affected by the high concentration of peer-to-peer accommodation and short-term rentals in the areas closest to the main tourist attractions [43]. The highest real estate values are in the historic centre (up to 8000 EUR/m$^2$ in the area of via del Corso) and in some other neighbourhoods of the city centre (up to 5400 EUR/m$^2$ in the neighbourhood of Parioli). In the urban periphery, the prices are highly differentiated and range from 4300 EUR/m$^2$ in the district along the via Cassia to around 2000 EUR/m$^2$ in some neighbourhoods of the eastern periphery close to the GRA, while in the outer periphery, the average prices drop to around 1800 EUR/m$^2$, but values are very heterogeneous.

Between the 1970s and the early 2000s, the urban core of Rome was strongly depopulated, in part due to peri-urbanisation. The urban sprawl was mainly driven by the cost of housing and was selective, mostly involving native and foreign young adults and families with children. After the 2008 and 2011 financial crises, the first signs of re-urbanisation emerged in the urban core, thanks to the sharp decrease in real estate prices that allowed many families to find a home much closer to the centre [44].

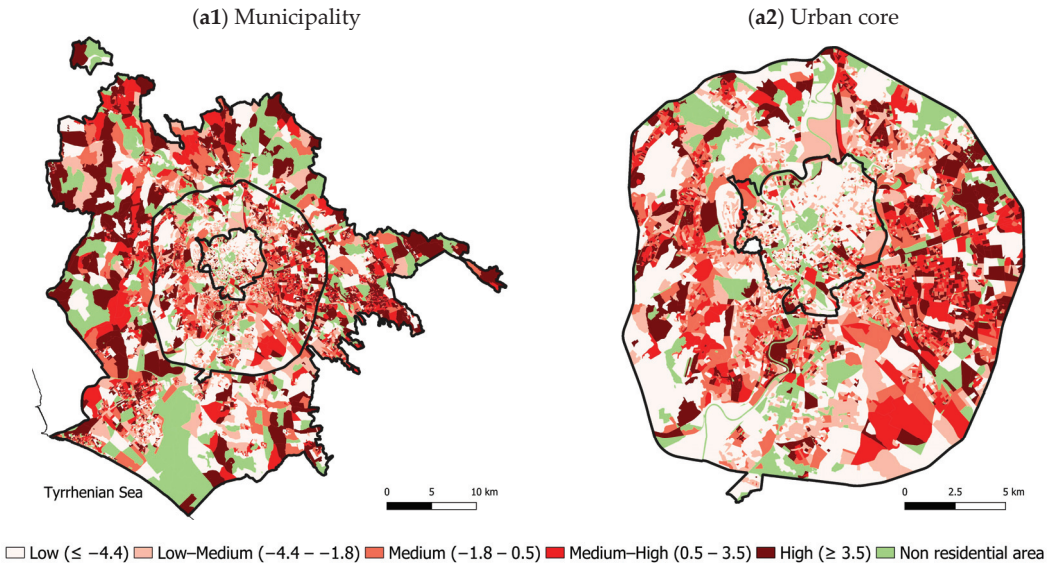



**Figure 2.** Social disadvantage index (SDI) by census tracts and urban belts, 2011. Source: Istat Census.

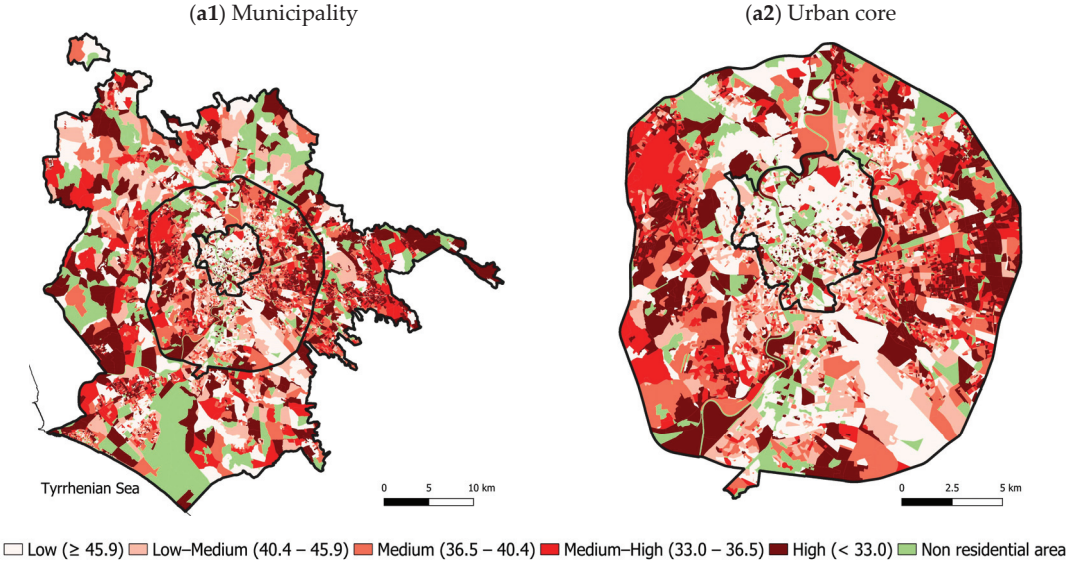



**Figure 3.** Residential crowding index (RCI) by census tracts and urban belts, 2011. Source: Istat Census.

Rome is at the centre of a long-lasting and heterogeneous migratory dynamic: as of 2020, 186 different nationalities were represented. The city is an important destination for immigrants due to its double role as Italy's capital and the seat of the Catholic Church, the promoter and coordinator of a wide territorial network of assistance and support for migrants. The majority of immigrants are concentrated in precarious and low-paid jobs. Occupational specialisations emerge based on gender and country of origin, with women very often engaged in domestic work and men in the construction business and the retail and restaurant sectors.

Between the 1970s and 1980s, Italy completed the transition from a country of emigration to one of immigration [16], and Rome was among the Italian cities absorbing the largest flows of economic migrants from non-DECs. In 1991, there were still only 48,000 foreign residents in Rome (Figure 4), but after the fall of the Berlin Wall, there was rapid growth, and in 2001, there were 98,000 foreigners, corresponding to 3.9% of the total residents [45]. In the 2000s, the foreign population grew rapidly, and in 2015 it exceeded 300,000. This increase was linked to the regularisation of many migrant workers following the 'Bossi–Fini' law (Law n. 189 of 30 July 2002) [46] and Romania's entry into the EU in 2007. The 2008 and 2011 financial crises did not initially slow immigration, and migrants continued to enter sectors of the labour market of Rome that were not directly affected, such as tourism and domestic work. After 2015, restrictive national migration policies helped to slow the increase in the foreign population, which numbered 361,000 in 2020.

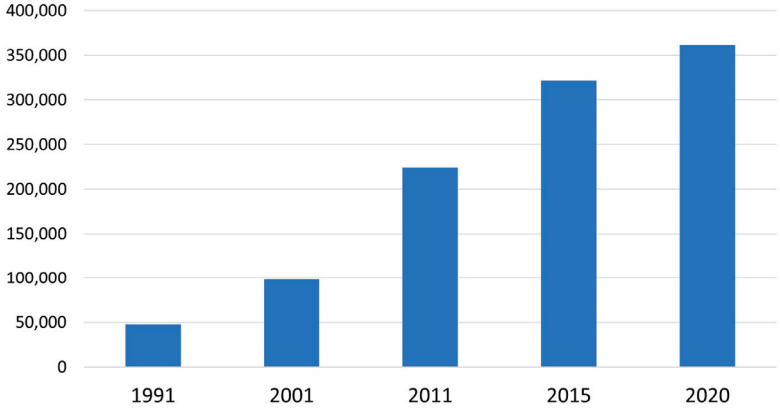



**Figure 4.** Foreign residents in Rome (absolute values), period 1991–2020. Source: 1991, 2001 and 2011 data are from population censuses (Istat); 2015 and 2020 data (1st of January) are from the population register (Municipality of Rome).

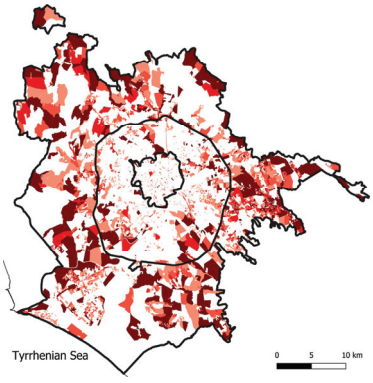
## 5. Descriptive Results: The Settlement Patterns of the Selected Ethnic Groups

In the municipality of Rome, the highest concentration of foreign minorities is seen in the eastern urban periphery, where rental and real estate values are lower (Torpignattara and Centocelle) (Figure A1). Other neighbourhoods with important levels of concentration are in the western (Primavalle), northern (Tomba di Nerone), and southern (Marconi and Pian Due Torri) urban periphery. In some cases, the concentration also reflects the presence of intensively built-up neighbourhoods with buildings of eight or more floors (Marconi and Don Bosco). In fact, the most widespread types of residential buildings in Rome are the four- or five-storey palazzina in the urban core and the one- or two-storey villas in the outer periphery [47].

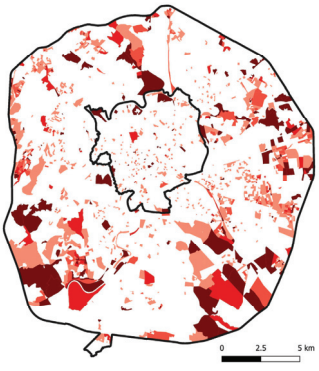
Romanians are the largest national group in Rome. Over the last 20 years, they have experienced very strong growth, from 9000 to 91,000 residents, a majority of whom are women (58.2%). Compared with other groups, they have the lowest DI (0.452) and have a marked peri-urban settlement pattern (Figure 5a and Table 2). Romanians are mainly concentrated in the less affluent eastern neighbourhoods and in the areas outside the GRA, principally along the via Casilina and the via Prenestina, where many lower-middle-class Italians moved to before the 2008 financial crisis [44]. Their more flexible residential localisation between the urban core and outer periphery is also due to widespread car ownership, which is essential for commuting towards the rest of the huge territory of the city and maintaining transnational ties with the country of origin [18,21]. Romanian women are often in domestic work, and the men work mainly in construction. The average

individual annual income of Romanians living in Rome (EUR 15,400) is slightly higher than the average for foreign nationals (EUR 14,900).

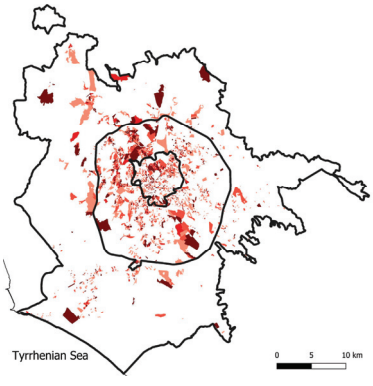
(**a1**) Romanians—Municipality



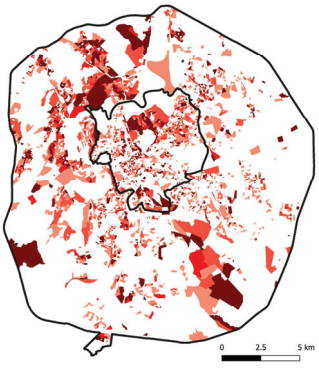

(**a2**) Romanians—Urban core



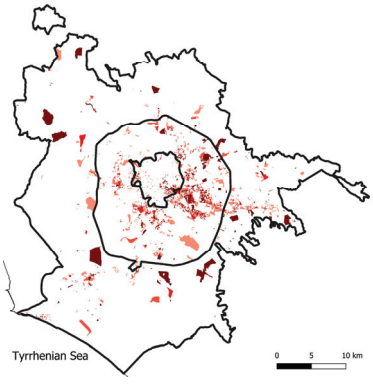

(**b1**) Filipinos—Municipality




(**b2**) Filipinos—Urban core




(**c1**) Bangladeshis—Municipality




(**c2**) Bangladeshis—Urban core


**Figure 5.** *Cont.*

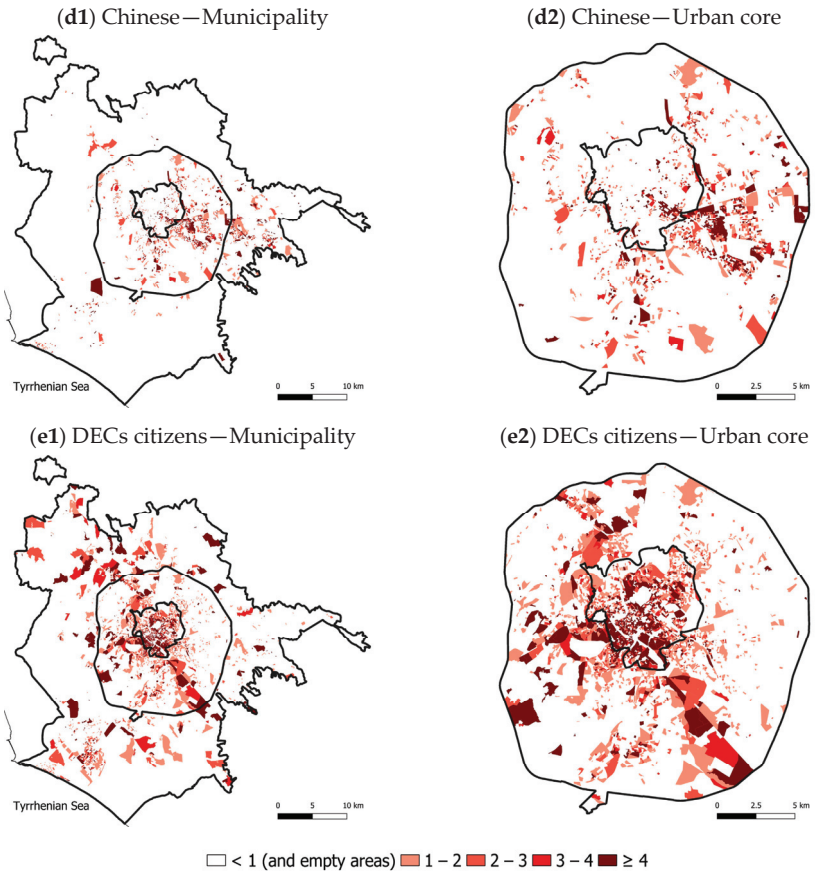



**Figure 5.** Location quotients (LQs) by census tracts, 2020. Source: Population register of Rome.

**Table 2.** Some characteristics of the selected ethnic groups.

| Citizenship | Total Population (2020) | Dissimilarity Index (2020) | Females (% Total Population) (2020) | Aged 55+ (% Total Population) (2020) | Singles (% Total Population) (2020) | Stayers 20+ Years (% Total Population) (2020) | Average Income (2018) |
|---|---|---|---|---|---|---|---|
| Romanians | 90,822 | 0.452 | 58.2 | 13.4 | 44.2 | 1.7 | 15,400 |
| Filipinos | 41,984 | 0.557 | 58.3 | 24.9 | 46.1 | 22.7 | 13,900 |
| Bangladeshis | 32,912 | 0.655 | 28.0 | 2.0 | 56.3 | 1.9 | 11,000 |
| Chinese | 19,478 | 0.693 | 50.3 | 13.9 | 55.7 | 8.7 | 14,000 |
| DECs citizens | 23,509 | 0.513 | 60.3 | 34.9 | 48.2 | 23.4 | n/d |

Source: Municipality of Rome.

Filipino migration to Rome started in the 1970s, and Filipinos are the second largest group (42,000 residents), a majority of whom are women (58.3%). They are traditionally concentrated in household and family care services [48] and live mainly in the most affluent neighbourhoods of the city centre (Parioli and the historic centre) and the north-western urban periphery (along the via Cassia), where they often live with their employers' families [49] (Figure 5b). In recent decades, they have spread across many lower-middle-class districts in the urban periphery (Marconi and Primavalle), often close to the areas

where their domestic work activities are concentrated, as part of a process of housing upgrading. The high level of integration of the Filipino community in Rome is also confirmed by the fact that a quarter of Filipino residents are over 55 years old, and more than a fifth have been in the city for more than 20 years. The average annual income of Filipinos in Rome is slightly lower (EUR 13,900) than the average for foreign nationals.

Bangladeshis are the third largest ethnic group in Rome (32,900 residents), and a large majority is male (only 28% are women) and young, with only 2% of Bangladeshi residents being over 55 years old. In fact, only one in 50 Bangladeshis has been a resident of Rome for more than 20 years. They have increased in number more than tenfold in the last 20 years (3000 residents in 2001), with men initially arriving alone and, in some cases, being joined by women later [50,51]. Bangladeshis traditionally prefer a central location in the less affluent eastern quadrant of the urban periphery (Figure 5c) and are concentrated in the neighbourhood of Torpignattara, consequently nicknamed 'Bangla-town' [52]. In recent decades, they have also spread to other semi-central districts (Marconi), where they often work in small shops (i.e., mini-markets). Despite this, their DI is still high (0.655). Bangladeshis' average income is much lower than the average for foreigners living in Rome (EUR 11,000).

Chinese are the fourth national group (19,500 residents) and have a balanced gender distribution that reveals the familial nature of their migration, although 56% of residents are reported to be single. They are involved in ethnic entrepreneurship activities, mainly restaurants, small stores, and wholesale clothing trade [46,53], and have an average income close to that of the Filipinos (EUR 14,000). Chinese have the highest level of residential segregation among the selected groups (DI = 0.693) and often show spatial concentration in overcrowded micro-areas. Their settlement pattern is similar to that of Bangladeshis, concentrated in the eastern part of the urban periphery in the Esquilino and Torpignattara neighbourhoods (Figure 5d), where many of their businesses are also based [17].

The group from DECs includes several culturally homogeneous nationalities. This group totals 23,500 residents, mainly women (60.3%), and has shown the least growth of all the groups considered over the last two decades. This group also has the oldest age structure, with more than one third of residents over the age of 55, and shows strong inclusion, with nearly one quarter having lived in Rome for more than 20 years. Among the most numerous nationalities in this group are migrants from France, Spain, and North America, who prefer to reside in the well-off neighbourhoods of the city centre or the adjacent districts (Figure 5e). These are often the most valuable and tourist-oriented areas of the historic centre of Rome—such as Trastevere or the areas near the basilica of Saint Peter and the Colosseum—or where their workplaces in high-skill sectors are concentrated [26]. The DECs group has socioeconomic characteristics similar to those of upper-middle-class Italians [46] and provides an interesting comparison to the other minority groups.

Figure 6 visualises more directly the differences across ethnic groups and the classification of census tracts based on their degree of segregation. As is evident, the distribution of the five minority groups by level of concentration in the census tracts provides some remarkable information regarding settlement patterns. The LQ index values highlight that the Romanians have the most uniform distribution on the territory of Rome of all the groups considered, with the under-representation category being most frequent (28.5% of the Romanians live in a census tract with an $LQ < 1$) and over-representation the second most frequent category (25% where $LQ \geq 4$). Chinese and Bangladeshis show a much higher percentage of residents in micro-areas with a very high concentration of compatriots (57.5% and 51.6%, respectively), while the share of those living in areas characterised by under-representation ($LQ < 1$) is much lower (8% and 9.3%, respectively). Filipinos and DECs citizens exhibit rather similar distributions, with a higher share of residents in the micro-areas where compatriots are concentrated (35.3% and 36.7%, respectively) and a still important share in the micro-areas where other national groups are more present.

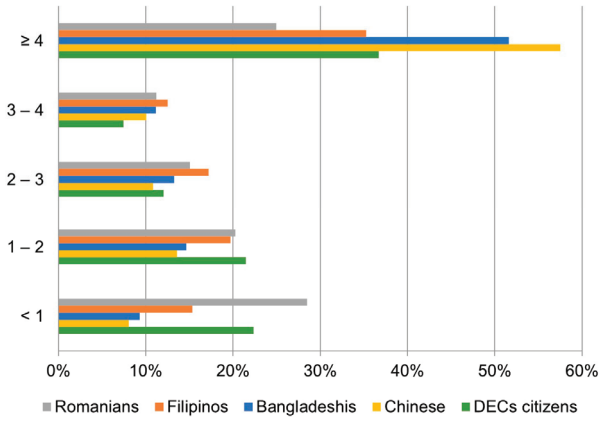



**Figure 6.** Distribution of the five ethnic groups in the census tracts by level of concentration (percentages), 2020. Source: Population register of Rome.

## 6. Multivariate Results: Highlighting Specificities of Ethnic Groups in the MSAs

This section intends to answer the research questions about the micro-segregation of minority ethnic groups through a descriptive and multivariate approach, using an original 2020 population register dataset on the population residing in Rome. Studying micro-segregation patterns is important because it allows for the emergence of social and spatial hierarchies that are often not evident within socially or ethnically mixed neighbourhoods [12,13].

In this study, we define an MSA as a micro-area where there is a very high concentration of an ethnic group (LQ $\geq$ 4) located within a neighbourhood where that group is under-represented (LQ < 1). Through a descriptive analysis and a series of detailed maps of the Rome area, the spatial distribution of MSAs between the centre and urban periphery and the main sociodemographic characteristics of residents are presented for each of the five selected ethnic groups. Then, bivariate logistic models are developed to highlight how the characteristics of individuals residing in MSAs differ from the characteristics of those living in micro-areas with high concentrations of co-nationals located within neighbourhoods that also exhibit over-representation. This approach makes it possible to characterise MSAs for each minority group, interpreting them with a key based on the groups' specific socioeconomic profiles.

The 723 MSAs that emerge based on our definition account for 5% of the census tracts in Rome, 35 of which are MSAs for two or more ethnic groups at the same time (Table 3). Despite differences in the demographic size of the groups, the MSAs are fairly evenly distributed among them, with Chinese having the most MSAs (174) and Romanians having the fewest (120). Ninety percent of MSAs are distributed almost equally between the urban periphery and the outer periphery, and fewer than 10% are in the city centre. Romanians and Chinese have a higher share of the MSAs in the city centre (18%) and, in general, have the largest share of MSAs in the urban core. Migrants from DECs, Filipinos, and Bangladeshis, on the other hand, have a high share of MSAs in the outer periphery, ranging from 48% to 57%.

The distribution of MSAs in each group is obviously conditioned by the spatial location of the neighbourhoods with over-representation (Figure 7), which explains the low percentage of Romanian MSAs in the outer periphery and Filipinos and DECs MSAs in the city centre. Observing the maps in Figure 7, one can see a strong heterogeneity in the area width of MSAs. The smallest MSAs correspond to a block, or even a portion of a block, and are concentrated in the areas of Rome where housing density is highest, especially in the urban core but also in the eastern (along the via Casilina) and southern (along the via del Mare) quadrants of the outer periphery. The MSAs with the largest area are mainly

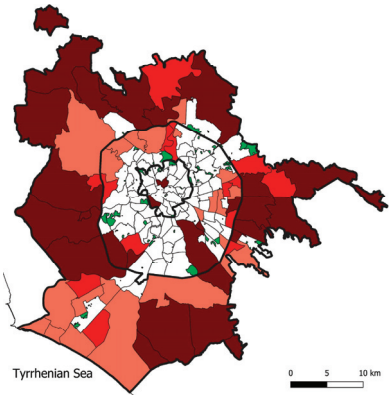
found in the outer periphery, and sometimes in the urban periphery close to the GRA, and correspond to very small urbanisations or scattered houses with large portions of agricultural land attached.

**Table 3.** Distribution of micro-segregated areas (MSAs) by citizenship and urban belts (percentages), 2020.

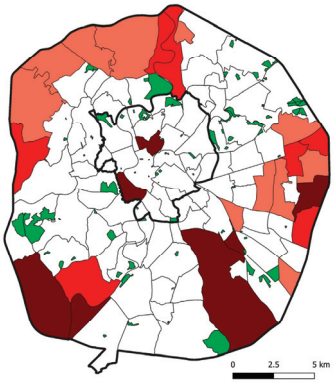
| Citizenship | City Centre | Urban Periphery | Outer Periphery | Total |
|---|---|---|---|---|
| Romanians | 18.3 | 54.2 | 27.5 | 120 |
| Filipinos | 1.6 | 48.1 | 50.4 | 129 |
| Bangladeshis | 5.6 | 46.4 | 48.0 | 179 |
| Chinese | 18.4 | 43.7 | 37.9 | 174 |
| DECs citizens | 0.8 | 42.1 | 57.0 | 121 |
| N * | 67 | 337 | 319 | 723 |

* Of the 723 total MSAs, 35 are found to be shared by at least two ethnic groups. Bangladeshis are the group that shares the most MSAs with another group (22), followed by Chinese (20), Filipinos (10), DECs citizens (10) and Romanians (9). Only one census tract is an MSA for three groups, namely, Romanians, Bangladeshis and Chinese. Source: Population register of Rome.

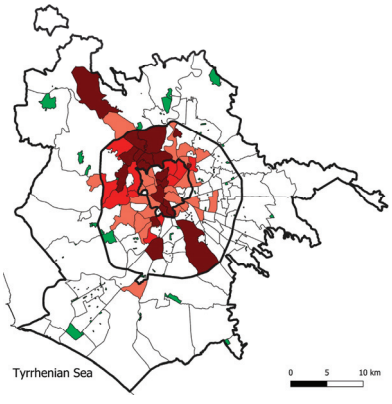
(**a1**) Romanians—Municipality




(**a2**) Romanians—Urban core




(**b1**) Filipinos—Municipality




(**b2**) Filipinos—Urban core

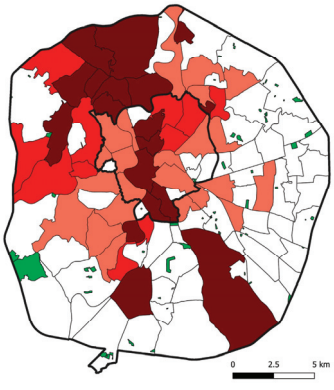



**Figure 7.** *Cont.*

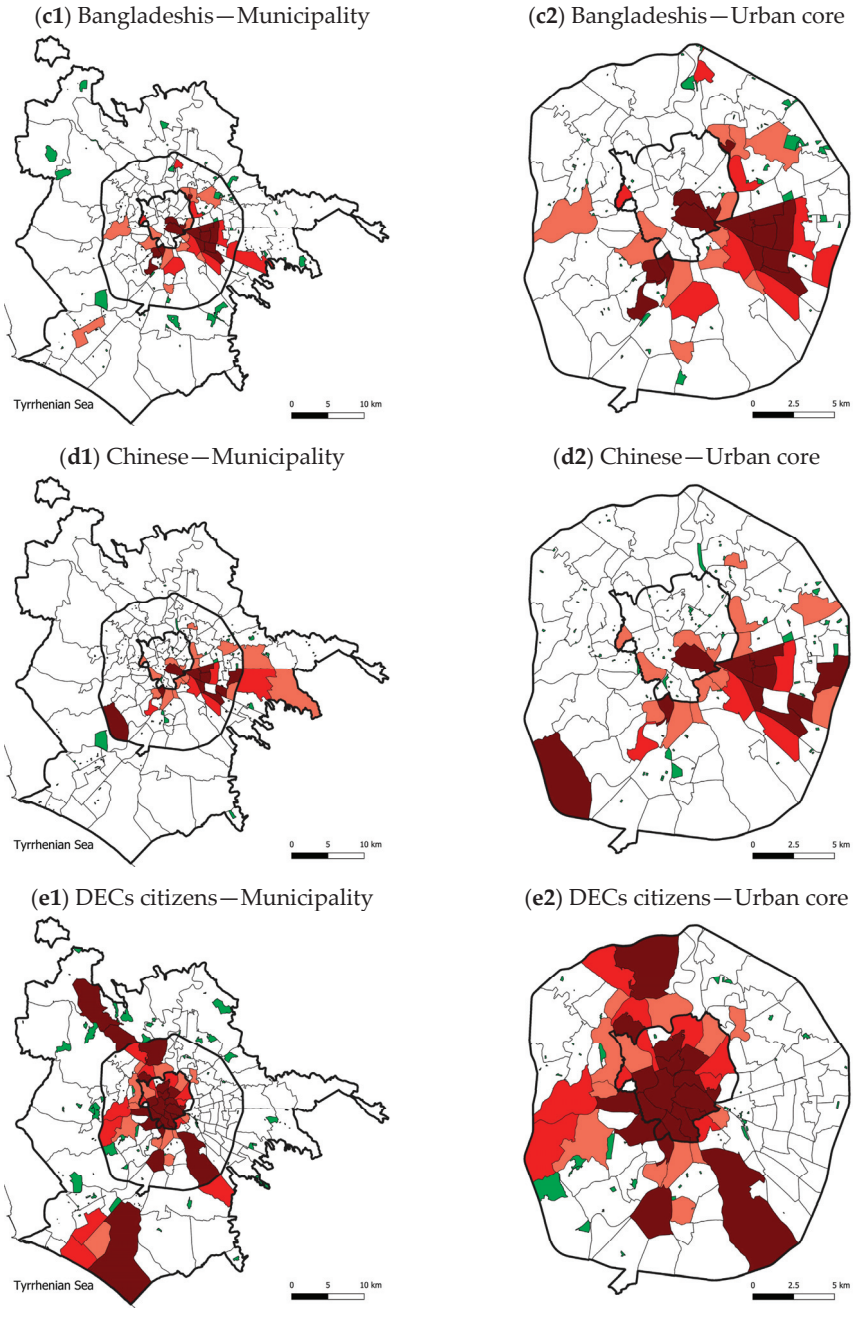



**Figure 7.** Micro-segregated areas (MSAs) and location quotients (LQs) by neighbourhoods, 2020. Source: Population register of Rome.

We employ binary logistic models to control the specific role played by individual and context characteristics with regard to the likelihood of living in an MSA. As individual covariates, we use sex, age, civil status, and length of stay in Rome (in years), while as context factors, we use the SDI and RCI. In all the models, the dependent variable is the same, that is, whether an individual lives in an MSA or in a micro-area inside a neighbourhood with over-representation of their own ethnic group. If the results point in the same direction, we may argue that these models, considered together, are a fairly strong argument for the existence of cross-national settlement and integration patterns; otherwise, we should consider different models valid for different ethnic groups. The models, therefore, allow us to examine whether the hypotheses are valid with respect to the assumed patterns of integration of the ethnic groups, such as the spatial assimilation and ethnic enclave theories. In particular, we explore whether the situation of micro-segregation of immigrants belonging to different ethnic minorities and having different duration of residence, changes independently of the cultural proximity to the native population and the socioeconomic status of the neighbourhood.

The spatial distribution of MSAs influences some of the results of the Romanians' model (Model 1). As we have seen (Figure 7a), the MSAs of the Romanians are mainly located in the central and semi-central areas of Rome, whereas the neighbourhoods with an over-representation of this ethnic group are in the suburbs farthest from the city centre. We could say that the Romanians' MSAs allow us to highlight some interesting exceptions to their well-known peri-urban settlement pattern [21]. The greater propensity of women to reside in an MSA (+14%) seems to be linked to the gender differences in market sectors and occupations, that is, to the fact that women are more constrained than men, living near the historic districts where there are more employment opportunities in domestic work and commercial activities. From this perspective, the spatial assimilation pattern seems to hold true for Romanians, in contrast to the other groups. In fact, the probability of living in an MSA increases with increasing age and when residence in Rome extends beyond 20 years (+75%). The socioeconomic characteristics of the micro-area of residence also yield some interesting results. The probability that Romanians reside in an MSA increases very significantly when the socioeconomic and housing status in the micro-area of residence is high.

Filipinos have the least-defined profile of all the national groups in regard to individual variables, although they are characterised by some interesting features (Model 2). With regard to age, only the 40–54 age group shows a significant odds ratio, with individuals in this age group being 20% more likely than the reference group (20–39 years) to reside in an MSA. As for marital status, single or divorced Filipinos are more likely to reside in an MSA. Moreover, Filipinos who have been residing in Rome for more than 20 years have a 25% lower probability of living in an MSA than those who have been there for under three years. There is no clear influence of the socioeconomic status of the micro-areas of residence, partly as a consequence of the rather varied spatial distribution of Filipinos' MSAs (Figure 7b), with some MSAs located within wealthy neighbourhoods in the southern quadrant and others belonging to the less affluent eastern periphery. High levels of housing crowding are associated with a greater propensity of Filipinos to reside in an MSA, probably because they tend to be concentrated in the wealthier neighbourhoods of Rome, which are characterised by larger flats and lower housing density.

Bangladeshis residing in Rome display a marked gender imbalance, with men accounting for approximately three quarters of the total population. Consequently, Bangladeshi men are most likely to live in an MSA (Model 3), either alone or in cohabitation with male compatriots; moreover, Bangladeshi women usually live in couples with or without children [51]. Considering the other individual covariates, young adults (20–39 years old) and those who have been in Rome for less than three years are most likely to settle in MSAs. In particular, as the length of residence increases, the probability of being in an MSA decreases, reaching its minimum for those who have been in Rome for over twenty years. This supports the hypothesis that Bangladeshis have a propensity to live in neigh-

bourhoods with a high concentration of compatriots, benefiting from the support of ethnic social networks, according to the ethnic enclave model [51]. In regard to context variables, when the level of socioeconomic disadvantage in the micro-area is low, Bangladeshis are more than twice as likely to be in an MSA than in a neighbourhood with a high concentration of compatriots. The RCI shows a less linear trend. Overall, the results of this model confirm the over-representation of Bangladeshis in some semi-central but poorer areas of the eastern quadrant of the urban core (Figure 5c). For Bangladeshis, residing in an MSA seems to correspond to a move outside the city centre, on the one hand (Figure 7c), and an improvement in the socioeconomic status of their neighbourhood, on the other. In this respect, our findings show that the Bangladeshis settling in Rome have not rigidly followed the usual ethnic enclave pattern observed in other European cities [50,51], and their MSAs are present almost all over the city.

For the Chinese (Model 4), as age and length of stay increase, the probability of residing in an MSA, rather than in a neighbourhood with an over-representation of compatriots, decreases. More precisely, the probability of residing in an MSA decreases by 25% from the 20–39 age group to older age groups and by 35% when the duration of residence extends beyond 10 years. Being married is undoubtedly associated with the propensity to live in an MSA (+25% compared to those who are single or unmarried). Looking at the contextual characteristics, the settlement of Chinese in an MSA is more than five times more likely when the social status of the area is higher, although sometimes these tracts are also characterised by a high level of housing crowding. Indeed, as we have shown (Figure 7d), the MSAs of Chinese are more often located in central or semi-central districts than those of other ethnic groups, so this migrant group often lives in conditions of overcrowded cohabitation with co-ethnics [46]. Here we have an indication that the MSAs of Chinese, even more than neighbourhoods with a high concentration of co-ethnics, tend to be within the urban core. This result suggests the influence of the relational and economic characteristics of the Chinese community on its settlement patterns and the lack of heterolocalism, a pattern consisting of operating businesses in the centre city and residing in the suburbs [21,49].

Finally, in the DECs group (Model 5), women show a much higher propensity than men to reside in an MSA (+43%). It should be recalled that most MSAs of DECs migrants are located in peripheral areas far from the city centre and the well-off neighbourhoods where they are over-represented (Figure 7e). Furthermore, as highlighted by other studies [45], the prevalent motivation for moving to Rome for men in this group is employment in high-skilled activities, while for women it is family. This may explain the greater propensity of men to settle in micro-areas located in central districts where the city's most valuable functions are concentrated. Family-related motivations may also explain why the probability of residing in an MSA is higher for young people still in school and pre-school (+60%) and for married individuals (+39%). When the length of stay exceeds ten years, the probability of living in an MSA increases by 30%, in line with the spatial assimilation hypothesis [54]. With regard to the context variables, the MSAs of DECs migrants are essentially confirmed as micro-areas of significantly lower socioeconomic status than neighbourhoods where they are over-represented. The settlement pattern of the DECs group seems to be very close to that of Italian nationals. Considering the MSAs, we could assume that they first settled in the central areas of the city and then moved towards the outskirts after starting a family [27].

In short, the results presented in Table 4 confirm that individual and socioeconomic characteristics of minority ethnic groups do indeed matter for residential choice and show the existence of different trends across the different national groups. The coefficients obtained for age groups and length of stay, as well as for the socioeconomic level of the neighbourhood, in the case of Romanians and the DECs group (Models 1 and 5), provide empirical support for the spatial assimilation model, whereas for Filipinos, Bangladeshis, and Chinese (Models 2–4), they seem to support the ethnic enclave model.

**Table 4.** Propensity of ethnic groups to reside in a micro-segregated area [1] (MSA), rather than in a very high-concentration census tract (LQ ≥ 4) within a very high-concentration neighbourhood (LQ ≥ 2).

| Variables | Model 1 Romanians | | Model 2 Filipinos | | Model 3 Bangladeshis | | Model 4 Chinese | | Model 5 DECs Citizens | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sex (ref. Female) | | | | | | | | | | |
| Male | 0.86 | ** | 1.04 | | 1.11 | * | 1.08 | | 0.57 | **** |
| Age (ref. 20–39) | | | | | | | | | | |
| 0–19 | 1.02 | | 0.95 | | 0.94 | | 1.11 | | 1.60 | *** |
| 40–54 | 1.04 | | 1.19 | ** | 0.79 | **** | 0.76 | *** | 0.82 | |
| 55 and over | 1.34 | ** | 1.03 | | 0.90 | | 0.73 | ** | 0.67 | *** |
| Civil status (ref. Single) | | | | | | | | | | |
| Married | 1.05 | | 0.83 | ** | 1.08 | | 1.25 | ** | 1.39 | *** |
| Widowed or divorced | 0.62 | ** | 1.09 | | 1.28 | | 1.27 | | 0.90 | |
| Years of stay (ref. 0–2) | | | | | | | | | | |
| 3–4 | 0.89 | | 0.99 | | 0.77 | **** | 0.88 | | 0.95 | |
| 5–9 | 1.11 | | 0.96 | | 0.76 | **** | 0.72 | **** | 0.73 | ** |
| 10–19 | 0.98 | | 0.96 | | 0.72 | **** | 0.64 | **** | 1.29 | * |
| 20 and over | 1.75 | ** | 0.75 | ** | 0.36 | **** | 0.65 | *** | 1.31 | * |
| Social disadvantage index (ref. High) | | | | | | | | | | |
| Low | 7.14 | **** | 0.32 | **** | 2.47 | **** | 5.43 | **** | 0.20 | **** |
| Low–Medium | 5.83 | **** | 1.09 | | 1.12 | | 1.02 | | 0.17 | **** |
| Medium | 4.42 | **** | 0.90 | | 1.00 | | 0.45 | **** | 0.39 | **** |
| Medium–High | 1.06 | | 0.67 | **** | 0.63 | **** | 0.67 | **** | 1.76 | **** |
| Residential crowding index (ref. High) | | | | | | | | | | |
| Low | 1.75 | **** | 0.31 | **** | 1.00 | | 0.58 | **** | 0.35 | **** |
| Low–Medium | 1.30 | ** | 0.30 | **** | 1.42 | **** | 0.65 | **** | 0.98 | |
| Medium | 1.06 | | 0.60 | **** | 1.29 | *** | 0.63 | **** | 0.47 | **** |
| Medium–High | 0.42 | **** | 0.54 | **** | 1.87 | **** | 0.51 | **** | 1.75 | **** |
| Constant | 0.04 | **** | 0.66 | *** | 0.19 | **** | 0.37 | **** | 0.57 | **** |
| N | 16,491 | | 8978 | | 12,224 | | 8195 | | 6791 | |

Note: * indicates $p < 0.10$, ** indicates $p < 0.05$, *** indicates $p < 0.01$, **** indicates $p < 0.001$. [1] A micro-segregated area (MSA) is a census tract with a very high concentration of co-ethnics (LQ ≥ 4) which is within a low–medium concentration neighbourhood (LQ < 1).

## 7. Discussion and Conclusions

In this paper, we studied the micro-segregation of selected ethnic minority groups in Rome. We defined MSAs as very small portions of territory, equal in most cases to a single block or a portion thereof, showing a strong over-representation of a specific ethnic group despite being located within a neighbourhood where that group is under-represented. This approach highlights how segregation can take on different connotations depending on the spatial scale used and allowed us to highlight interstitial micro-areas embedded in ethnically differently connoted neighbourhoods that can be considered inconspicuous and 'hidden' situations of high ethnic segregation. With this perspective in mind, it is possible to interpret ethnic groups' areas of micro-segregation as 'settlement exceptions', which may represent an evolutionary and innovative element with respect to their usual patterns of integration.

The consideration of five ethnic minority groups—from Romania, the Philippines, Bangladesh, China, and DECs—with heterogeneous characteristics in terms of socioeconomic status and migration history was helpful in bringing out the interplay between diversity of place of origin, social class, settlement patterns, and forms of residential segregation. In fact, the large cities of southern Europe are a mosaic of social zones which are

socially, ethnically, culturally, and economically differentiated, and the spatial distribution of the ethnic groups reflects the interaction between labour and housing markets, which act as filters for the selection of activities and social groups [55].

In Italy the public housing sector is very limited, and social housing is residual and stigmatised [32]. Among Italian families, there is a large predominance of owner occupation, which, in Rome, reaches 70%. Housing opportunities in the private market for poorer migrants are scarce and of low quality, and local housing policies are often non-inclusive [56]. These are all issues that limit immigrants' range of housing opportunities and contribute to slowing the process of spatial assimilation [57]. As a consequence, many differences in settlement patterns of the selected ethnic groups appear related to the interplay between real estate constraints and labour market specialisation. Romanians are mainly settled in suburban areas where real estate values are more affordable and where many lower-middle-class Italians moved before the fall in housing prices following the 2008 financial crisis [44]. Filipinos reside mostly in affluent downtown neighbourhoods where the families for whom they perform domestic work live. Bangladeshis and Chinese are clustered in the poor eastern urban periphery, where many of their businesses are also based. DECs citizens are more likely to reside in the affluent districts of the city centre, not far from their workplaces in high-skill sectors. Interestingly, in another south European capital, Athens, the same national groups show similar settlement patterns, conditioned by employment activities and real estate values, with the difference being that in the Greek metropolis, the most affordable apartments are found mainly in the urban core and much less in the first ring of the periphery [58].

The residents in MSAs, depending on the minority group to which they belong, have specific and different characteristics in relation to individual sociodemographic and migration profiles, spatial location between city centre and outer periphery, and socioeconomic status in the micro-area. The analysis showed a greater propensity for Romanian women to live in an MSA in the urban core than men, who are more suburban. This result may be explained by the high involvement in domestic work that constrains Romanian women to a residential location in well-off areas close to the centre where there are more job opportunities, including cohabitation with the employer's family. In contrast, Filipinos, who are usually concentrated in well-off areas where they perform domestic work, reside in MSAs that often have disadvantaged social and housing conditions. It is known that the organisation of the welfare and housing system in southern European countries assumes a major role in influencing the residential choices of ethnic groups and the marginalising of individuals with limited financial resources [59]. The Italian welfare state regime attributes a central role to the family in providing basic assistance, relying heavily on the commitment of women to work and care within the family. This model is under increasing pressure due to the growing involvement of women in the labour market and population ageing [60]. As a result, there is a strong demand for domestic work and care services, which is often met by immigrant women, especially in large urban areas such as Rome and Milan [61].

In order to offer a more in-depth interpretation of the settlement behaviour of the ethnic groups in the MSAs, the length of residence in Rome was considered to be positively correlated with higher levels of acculturation. In fact, the spatial assimilation model assumes that the years since migration have an effect on the level of spatial concentration and the chances of integration into the host society, corresponding to the length of exposure to the local community [62]. Consequently, the longer an immigrant lives in the host society, the greater their orientation towards this country, and thus, the lower the propensity to live in an ethnic enclave. In the specific range of models used in this work, the variable of years of stay reveals different propensities toward a gradual dynamic of spatial assimilation by ethnic groups. More specifically, on the one hand, Romanians and DECs citizens exhibit a strongly increasing propensity in the long term (10–20 years) to reside in an MSA rather than in a neighbourhood with a high concentration of co-ethnics. On the other hand, as far as Bangladeshis, Chinese, and Filipinos are concerned, the model does not offer any empirical support for the spatial assimilation hypothesis. The settlement in MSAs of these

three groups is much more likely to occur in the early years of residence in Rome, and with the passage of time, there is an increasing propensity to live in a neighbourhood where their ethnic group is over-represented rather than in an MSA. These findings are in line with the ethnic enclave perspective which argues that migrants' residential segregation tends to increase, rather than decrease with the time spent in the host country. More generally, the longer a person has resided in a certain place, the more likely they are to develop location-specific insider advantages [63,64], such as work and family ties, or place attachment [65], which constitute disincentives to move. Turning back to our case, newly arrived migrants from Bangladesh, China, and the Philippines may not yet have developed such attachments, and this would explain their greater propensity to settle in an MSA than their co-ethnics who have lived in Rome for a longer time.

In this paper, an attempt is made to determine the reasons for the settlement choices of ethnic groups based on the observation of demographic, socioeconomic, and housing characteristics and using an original and granular dataset from the population register of Rome. However, it should be pointed out that, compared with many other studies with similar aims carried out mainly in northern European countries [54], several limitations had to be faced, such as the availability of only a small number of individual and contextual variables and the absence of longitudinal data. More generally, the limitations of an approach based only on information from administrative records on population and housing should be highlighted. The use of a qualitative–quantitative mixed-method approach would allow for a more in-depth delineation of individual attitudes and preferences relevant to the decision-making process of migrants in the MSAs, bringing out additional explanatory elements that could also relate to place stratification theory [66].

The different settlement and integration patterns of the immigrant groups in Rome is a result of multiple socio-spatial micro-processes. Among these, the outcomes of this paper show the importance of the socioeconomic status of the micro-area of residence, which through its specific location in the wider city space, offers important information on the settlement behaviour of national groups. However, many other factors only hinted at in this work—demographic diversity, differential integration in the labour and housing markets, unequal integration prospects—might help to illuminate the multifaceted mosaic of immigration in the urban area of Rome.

The concern that a high spatial concentration of poor households with an ethnic background may have negative implications for social cohesion has led to the diffusion of mixed neighbourhood policies in a number of European countries [67,68]. The literature dealing with the social consequences of residential segregation and policies aimed at creating 'balanced communities' has generated several doubts about the actual usefulness of creating ethnically mixed spaces while also highlighting the potential social, cultural, and economic benefits for immigrants of living in an ethnic enclave [5,69].

Within this framework, micro-segregation studies allow us to examine residential segregation from a different perspective, one that highlights social and ethnic spatial differentiations, even in neighbourhoods characterised by a social mix. This perspective can help uncover situations of exception within specific ethnic groups that will be interesting to keep under observation and investigate. In particular, a future direction for this research will be to explore, through a survey and in-depth interviews within a mixed method approach[3], residential segregation patterns and reasons for moving or staying within a micro-urban context.

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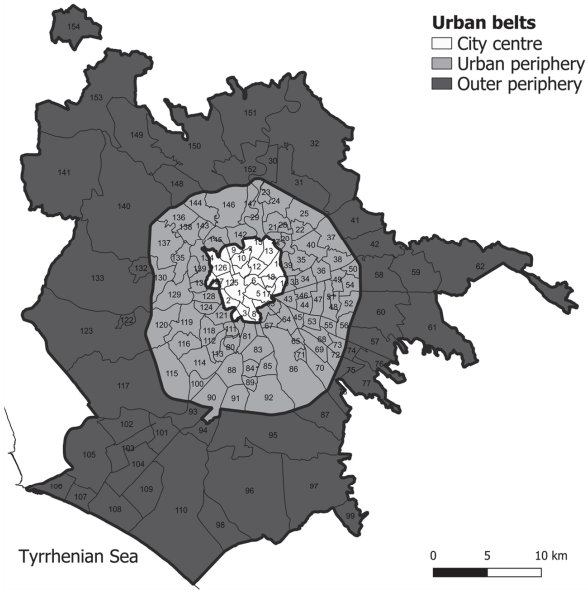
## Appendix A




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Centro Storico | 40 | Casal de' Pazzi | 79 | Ostiense | 118 | Colli Portuensi |
| 2 | Trastevere | 41 | Sant'Alessandro | 80 | Valco San Paolo | 119 | Buon Pastore |
| 3 | Aventino | 42 | Settecamini | 81 | Garbatella | 120 | Pisana |
| 4 | Testaccio | 43 | Torpignattara | 82 | Navigatori | 121 | Gianicolense |
| 5 | Esquilino | 44 | Casilino | 83 | Tormarancia | 122 | Massimina |
| 6 | XX Settembre | 45 | Quadraro | 84 | Tre fontane | 123 | Pantano di Grano |
| 7 | Celio | 46 | Gordiani | 85 | Grottaperfetta | 124 | Villa Pamphili |
| 8 | Zona Archeologica | 47 | Centocelle | 86 | Appia Antica Nord | 125 | Prati |
| 9 | Villaggio Olimpico | 48 | Alessandrina | 87 | Appia Antica Sud | 126 | Della Vittoria |
| 10 | Parioli | 49 | Tor Sapienza | 88 | Eur | 127 | Eroi |
| 11 | Flaminio | 50 | La Rustica | 89 | Villaggio Giuliano | 128 | Aurelio Sud |
| 12 | Salario | 51 | Tor Tre Teste | 90 | Torrino | 129 | Val Cannuta |
| 13 | Trieste | 52 | Casetta Mistica | 91 | Laurentino | 130 | Fogaccia |
| 14 | Villa Borghese | 53 | Centro Direzionale Centocelle | 92 | Cecchignola | 131 | Aurelio Nord |
| 15 | Villa Ada | 54 | Omo | 93 | Mezzocamino | 132 | Casalotti di Boccea |
| 16 | Nomentano | 55 | Torrespaccata | 94 | Spinaceto | 133 | Boccea |
| 17 | San Lorenzo | 56 | Torre Maura | 95 | Vallerano Castel di Leva | 134 | Medaglie d'Oro |
| 18 | Università | 57 | Giardinetti | 96 | Decima | 135 | Primavalle |
| 19 | Verano | 58 | Acqua Vergine | 97 | Porta Medaglia | 136 | Ottavia |
| 20 | Monte Sacro | 59 | Lunghezza | 98 | Castel Romano | 137 | Santa Maria della Pietà |
| 21 | Val Melaina | 60 | Torre Angela | 99 | Santa Palomba | 138 | Trionfale |
| 22 | Monte Sacro Alto | 61 | Borghesiana | 100 | Tor di Valle | 139 | Pineto |
| 23 | Fidene | 62 | San Vittorino | 101 | Malafede | 140 | Castelluccia |
| 24 | Serpentara | 63 | Tuscolano Nord | 102 | Acilia Nord | 141 | Santa Maria di Galeria |
| 25 | Casal Boccone | 64 | Tuscolano Sud | 103 | Acilia Sud | 142 | Tor di Quinto |
| 26 | Conca d'Oro | 65 | Tor Fiscale | 104 | Palocco | 143 | Acquatraversa |
| 27 | Sacco Pastore | 66 | Appio | 105 | Ostia Antica | 144 | Tomba di Nerone |
| 28 | Tufello | 67 | Latino | 106 | Ostia Nord | 145 | Farnesina |
| 29 | Aeroporto dell'Urbe | 68 | Don Bosco | 107 | Ostia Sud | 146 | Grottarossa Ovest |
| 30 | Settebagni | 69 | Appio - Claudio | 108 | Castel Fusano | 147 | Grottarossa Est |
| 31 | Bufalotta | 70 | Quarto Miglio | 109 | Infernetto | 148 | Giustiniana |
| 32 | Tor San Giovanni | 71 | Pignatelli | 110 | Castel Porziano | 149 | La Storta |
| 33 | Casal Bertone | 72 | Lucrezia Romana | 111 | Marconi | 150 | Santa Cornelia |
| 34 | Casal Bruciato | 73 | Osteria del Curato | 112 | Portuense | 151 | Prima Porta |
| 35 | Tiburtino Nord | 74 | Romanina | 113 | Pian Due Torri | 152 | Labaro |
| 36 | Tiburtino Sud | 75 | Gregna | 114 | Trullo | 153 | Cesano |
| 37 | San Basilio | 76 | Barcaccia | 115 | Magliana | 154 | Martignano |
| 38 | Tor Cervara | 77 | Morena | 116 | Corviale | 155 | Foro Italico |
| 39 | Pietralata | 78 | Ciampino | 117 | Ponte Galeria | | |

**Figure A1.** Neighbourhoods (zone urbanistiche) of Rome.

## Notes

1 The countries included in the DECs group are Andorra, Austria, Belgium, Denmark, Finland, France, Germany, the United Kingdom, Greece, Ireland, Iceland, Liechtenstein, Luxembourg, Monaco, Norway, the Netherlands, Portugal, Spain, Sweden, Switzerland, Japan, Israel, Canada, the United States of America, Australia, and New Zealand.

2 We adopt a consistent notation in Equations (1)–(4) that differs from that proposed by the cited authors.

3 In 2022 a research team of the CNR-IRPPS carried out a survey on settlement and residential mobility of Bangladeshis and Filipinos in Rome, through 500 face-to-face interviews with a structured questionnaire and 40 ethnographic in-depth interviews with families and key informants.

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# Controlling the Proximity of the Poor: Patterns of Micro-Segregation in Naples' Upper-Class Areas

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**Abstract:** Naples has been described as a symbol of the weak segregation of Mediterranean cities, which are marked by microscale segregation rather than neighborhood segregation. This paper focuses on the upper-class areas of Naples where, besides vertical segregation, other patterns of micro-segregation can be found and remain understudied. In such areas, Disadvantaged groups still concentrate into streets, blocks and enclaves of poverty that have resisted gentrification despite their location in the heart of upper-class nieghborhoods. Though self-segregation of the urban élite has sharply increased with globalization and postfordist capitalism, such patterns of segregation in well-off areas are largely unexplored. The paper is based on a mixed method. It uses census data to map the residential location of disadvantaged groups in Naples upper-class areas at the local scale. It also draws on ethnographic fieldwork to analyze the Neapolitan élites' attitudes towards the proximity of the poor. The paper shows that the spatial proximity of the poor has long been accepted and promoted by the city élite as a way of maintaining social control over their patronage. But it is increasingly stigmatized as this control through proximity becomes more difficult for the decaying traditional Neapolitan élite. Residential proximity is now associated with increasing segregation in the use of public spaces. The paper discusses the theory of élite Urban Secession in globalization. In Naples, rather than Secession, the élite play a game of proximity and distance with the poor, using space as a means of social control.

**Keywords:** élite; segregation; Naples; Mediterranean

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## 1. Introduction

Globalization has led to a sharp increase in the residential segregation of the upper classes. In North American and European cities alike, the highest rates of residential segregation are to be found among the social elites (Préteceille, 2006 [1]; Oberti and Préteceille, 2016 [2]). The advent of flexible capitalism seems to be accompanied by a significant—and voluntary—self-segregation of the upper classes, or even an urban secession of this population group, symbolized by the much-studied figure of the gated community and other forms of "citadels" for the rich (Marcuse, 1997 [3]; Marcuse and Van Kempen, 1999 [4]). However, the intensity of this elite segregation and the spatial forms that it adopts vary considerably according to the geographical context. Studies on urban segregation emerged in the United States between the two world wars, where they highlighted the importance of segregation by neighborhood, in a North American continent characterized by recent urbanization and considerable urban sprawl based on single-family housing and the increasing availability of motor cars. However, models based on North American cities do not apply well to older, denser urban contexts, such as European and Asian cities (Maloutas and Karadimitriou, 2022 [5]). In these cities, the density and age of the buildings in historic cores mean that a wide variety of populations live side by side in the heart of the urban area. The specific features of housing markets (spatial spread of social housing in Northern Europe, importance of family proximity in Southern Europe) have also limited segregation by neighborhood. Lastly, more recently in Europe, public policies have been developed

to promote social diversity by diversifying housing supply and residential status within a given neighborhood or housing block (Bridge et al., 2014 [6]; Bacqué and Charmes, 2016 [7]). Research into urban segregation has thus shifted the focus to the local scale and situations of spatial proximity between social and ethnic groups. The concept of "micro-segregation" has been proposed to designate processes of separation between social groups living in close proximity to one another, which thus concern not so much the place of residence as places of sociability, work, and education (Maloutas and Karadimitriou, 2022 [8]).

Mediterranean cities have been playing a central role in this debate over Micro-Segregation. In fact, they are characterized by a model of attenuated segregation (Leontidou, 1990 [9]; Allen et al., 2004 [10]) which takes place on a very local scale. Naples is thus one of the cities that best embodies "vertical segregation," based on cohabitation within a given building of the working classes, on the ground floor (in the city's famous *bassi*, semi-buried former warehouses that have been transformed into housing for the city's poorest populations), the upper classes, on the *piani nobili* (first and second floors above ground level), and the middle classes, on the upper floors (Luongo and Oliva, 1959 [11]; Laino, 2016 [12]; Dines and Mattiucci, 2022 [13]). Long assimilated to surviving Feudal society, destined to disappear in the capitalist city, this vertical segregation has proved resilient within post-industrial cities, whether in the Mediterranean region or elsewhere (Maloutas and Karadimitriou, 2001 [14]; Lepoutre, 2010 [15]). In Naples, it is still widespread not only in the historic center but also in the affluent neighborhoods of Chiaia and Posillipo. Indeed, a distinctive feature of Mediterranean Cities is that "attenuated segregation" also concerns the upper classes. In Naples, the élite has never totally abandoned the historic core of the city, and the upscale neighborhoods that have developed outside the city center since the end of the 19th century still include many poor streets and blocks.

However, in Naples and elsewhere, these forms of micro-segregation within affluent neighborhoods have been the subject of relatively few studies. The field of research on micro-segregation has mainly focused on gentrified neighborhoods or historic city centers, characterized by highly diverse populations. Little is known about the forms of micro-segregation in affluent neighborhoods, which are reputed to be more homogeneous or socially polarized. This is particularly true of the fashionable neighborhoods—*quartieri alti* in Italian, *beaux quartiers* in French—that emerged from the urban extensions of the late 19th and early 20th centuries, which transformed many European cities by creating a bourgeois centrality alongside the old city centers (London's West End, the Eixample in Barcelona, the western arrondissements of Paris, the *ampliamenti* of Milan, Genoa, and Naples…). These districts are deeply marked in their landscapes by the symbolic imprint of the upper classes, with their ostentatious architecture, large public gardens, select theaters and cultural venues, corporate headquarters, and private members' clubs (Pinçon and Pinçon-Charlot, 1989 and 2000 [16,17]), and so forth. In Italy, as in the rest of Europe, these types of neighborhoods are today home to record numbers of upper-class residents and have even seen a marked increase in their social homogeneity in recent years (Oberti and Préteceille, 2016 [2]). However, while the upper classes are still clearly overrepresented in relation to their proportion of the city population, they are rarely in the majority. The "spatial brand" (Pinçon and Pinçon-Charlot, 2000 [17]) of the bourgeoisie in these areas has helped to render invisible the middle and lower classes, who often represent between a third and half of the population. Wealthy neighborhoods also have their poor residents, and bringing them out of this invisibility is a major challenge at a time when social policies are increasingly territorialized and tend to focus on larger neighborhoods that have higher concentrations of poverty. They also form a particularly interesting terrain for understanding the relationship that the upper classes have with the city and its population as a whole.

This article is based on census data and two ethnographic field works conducted in Naples' *quartieri alti* (Chiaia and Posillipo districts) first in 2004–2007 and then in 2017–2018 [1]. It revisits the question of the "secession" of urban elites while demonstrating the specific forms that it takes in a context of close spatial proximity to the lower social strata. The first aim of the paper is to highlight the spatial patterns of micro-segregation and the residential

location of the poor in wealthy neighborhoods, using fine-scale cartographic processing of census data. In fact, in addition to vertical segregation—which has been extensively studied in recent years—these bourgeois areas of the city also feature other models of residential micro-segregation, which remain poorly understood. Such is the case of the opposition between aristocratic streets (*vie*), lined with *palazzi*, and working-class perpendicular lanes and alleys (*vicoli*) (Sabelberg, 1987 [19]; Pfirsch, 2011 [20]). This is also the case for the grouping of disadvantaged "enclaves" comprising several blocks and adjacent streets. The second aim of this article is to study, through ethnographic research, the social dimension of micro-segregation, and how it is seen, constructed, and managed by the city élite. The paper explores the links and representations that wealthy residents of upscale neighborhoods develop with the inhabitants of the poor enclaves within these areas. My study therefore builds upon the few works that have attempted in recent years to analyze "what the rich think of the poor" (Paugam et al., 2017 [21]) and how they control the physical proximity of disadvantaged groups. Thus, It also follows the footsteps of recent research that proposes a critical reading of social mix. Numerous studies have, for instance, shown that physical proximity between unequal social groups can be accompanied by a strong segregation of their uses of the city, and of their places of education and sociability, and does not necessarily have a positive impact on the social trajectories of the dominated groups (Bridge et al., 2014 [6]; Bacqué and Charmes, 2016 [7]). The effects of social mix are not positive per se but strongly depend on the local context.

How do Naples' elites manage the proximity of "their" poor populations? The article will show that the segregation of the city's elites cannot be characterized as a "secession," but rather as a "partial exit" strategy, based on a "game of proximity and distance" with lower social groups (Andreotti et al., 2015 [22]). In Naples, as in many European and Mediterranean cities, the elites have never totally left the urban core, and, rather than fleeing to distant outskirts, they have chosen to control the spatial proximity of the lower classes. Neapolitan elites do indeed distance themselves from lower strata of the population, but this does not need to involve complete physical segregation. They seek to distance themselves in certain social fields (schools, clubs, seaside resorts) but not in others (places of residence, workplaces, use of public spaces). It will be demonstrated that this game of proximity and distance is locally contextualized and socially variable. It is easier to play for the most legitimate and established strata of the elite: the higher, older, and more stable their position within city society and in high-status areas, the more acceptable and valued the spatial proximity of socially distant groups.

Section 2 outlines the mixed and indirect method used to shed light on the hitherto invisible case of poor populations that live in affluent neighborhoods, while the subsequent sections will present the -results of the survey. Section 3 analyzes the spatial forms of micro-segregation in upscale neighborhoods, precisely identifying the working-class streets and enclaves within them, and describing their landscapes and public spaces. Section 4 analyzes the social mechanisms of micro-segregation in the *quartieri alti*, highlighting two different ways of playing the game of proximity and distance with the disadvantaged groups that can be observed within the local elite: the "aristocratic" game, which values proximity to the lower strata, and the "bourgeois" game, which stigmatizes poor enclaves. Section 5 will take a more general approach, proposing a theoretical framework for thinking about the relationship between spatial proximity and social distance.

## 2. In Search of the Poor in Rich Neighborhoods: A Mixed and Indirect Method

In Naples, as elsewhere, the poor of the city's upscale districts are in many ways an invisible population, underrepresented in the media, insufficiently studied, and overlooked by urban policies. In fact, I discovered the extent of the lower classes' presence in Neapolitan inner-city neighborhoods somewhat unexpectedly during the course of my dissertation fieldwork, carried out between 2004 and 2007, which focused on family proximity among the city's elites (Pfirsch, 2008 [18]). The aim of my doctorate was not to study the poor, but rather the dynamics of self-segregation among the upper classes. What emerged from this

fieldwork, however, was the significant presence of lower-class populations in the middle of wealthy neighborhoods. I discovered that just a few dozen meters from the city's most exclusive streets were pockets of poverty with dilapidated housing, often nestled on the hard-to-reach slopes of the *quartieri alti*. In the interviews I conducted with families from the local élite, the proximity of poor populations—whether valorized or stigmatized—emerged spontaneously.

Accordingly, this article uses an indirect method, approaching the working-class enclaves of the *quartieri alti* from the standpoints of public statistics, the researcher's external observation, and the discourses espoused by the city's upper classes. I am fully aware of the limitations of such a method, which does not allow the voices of those primarily concerned to be heard, and studies them from the point of view of dominant groups. However, this indirect method also has the advantage of highlighting a rarely studied aspect: how the upper classes represent the poor and their place within the city, and more broadly how they justify their own self-segregation. This question is important because the upper classes play a structuring role in forms of residential segregation on a citywide scale: their control of land and greater freedom of choice in residential locations enables them to occupy—and at the same time create—the most prestigious positions, forcing other social groups to define themselves in relation to them (Oberti and Préteceille, 2016 [2]). Understanding the representations that the upper classes have of lower social groups is essential to understanding the mechanisms of contemporary urban segregation.

My method is also a mixed one. First, I adopt a cartographic approach on the fine scale of census tracts in order to pinpoint areas of poverty within the *quartieri alti*. This mapping is then complemented by an ethnographic survey to analyze the landscapes and public spaces of these working-class enclaves, on the one hand, and the attitudes of the upper classes with regard to the inhabitants of these enclaves, on the other. The cartographic aspect of my study is based on data from the 2001 Italian population census, processed using ArcGIS on the scale of census tracts within the municipality of Naples. This level of precision makes it possible to identify micro-concentrations of disadvantaged populations within a given street or housing block, and not just on the scale of administrative neighborhoods, as is often the case in studies of poverty in Naples and other Italian cities [2]. For example, in the latest cartographic studies of poverty in the Naples urban area, the two "affluent" districts of Posillipo and Chiaia appear as uniformly bourgeois, with maps showing no internal contrasts at the sub-neighborhood level (Morlicchio and Pratschke, 2004 [23]; Lelo et al., 2019 [24]). Pockets of poverty in affluent neighborhoods are well known and identified by Neapolitans in their daily life, but to date, they remain unmapped.

Using census data on the scale of census tracts does have its limitations, however, and does not allow for an exhaustive approach to forms of residential micro-segregation. These data do not include information on which floors are occupied by which residents, and therefore do not allow for mapping vertical segregation in the city. The few empirical studies of vertical segregation in Naples are based on door-to-door surveys on the scale of an individual street (Luongo and Oliva, 1959 [11]), neighborhood, or building (Laino, 2019 [12]), but there are no data available that enable the precise mapping of this phenomenon on a citywide scale, as is the case for Athens, for example (Maloutas and Spyrellis, 2016 [25]). The maps presented in Section 3 therefore focus on two other spatial forms of micro-segregation, which are clearly highlighted in the data for census tracts: concentrations of lanes and alleys, and concentrations of micro-neighborhoods. Another limitation is the low level of socio-professional data disaggregation at the local level. The residential location of the lower class can only be deducted indirectly, by identifying areas where the upper classes are underrepresented in the *quartieri alti* (Figure 1). They can also be determined using indirect indicators for which high-quality disaggregated data are available on a local scale, such as the unemployment rate, the percentage of large families (fertility varies considerably by social class in Naples), or the type and quality of housing (Table 1).

Because of these limitations, I chose to complement the cartographic approach with direct observation in the field. During the two fieldworks I mentioned in the introduction, I made regular observations in the streets and enclaves of poverty identified in the mapping process, and more particularly in four sectors within Naples' *quartieri alti*: Santa Maria Apparente, Santa Maria in Portico, and La Torretta in the Chiaia district, and Il Casale in the Posillipo district. I collected photographs and analyzed the use of public spaces in these sectors, as they not only contrast with the rest of the surrounding neighborhoods in terms of their social composition, but also stand out very clearly in terms of their architecture, population density, economic activities, and their residents' daily practices. The first fieldwork (2004–2007) took place soon after the 2001 census and the mapping process. The second one (2017–2018) was conducted 15 years later. It allowed me to analyze the changes in the landscapes and the uses of public spaces in the disadvantaged enclaves of Chiaia and Posillipo over the last decade, in order to identify possible gentrification [3].

Finally, during the three years I lived in Naples for my doctorate (2004–2007), I conducted 50 interviews with upper-class residents of the city's two most exclusive districts, Chiaia and Posillipo. The individuals interviewed belonged to the aristocracy, the bourgeoisie of the liberal professions, the business world, and the world of politics, and were selected on the basis of local prestige rather than income or profession [4]. The interviews focused on their residential strategies in the city and their families' geographical trajectories over several generations. The interviews also explored their representations of the city and their relationship with their neighborhoods, regularly addressing the question of the spatial proximity of the working classes. In addition to the interviews, I followed these families ethnographically over a period of three years, observing their daily practices and their uses of the city, which sometimes enabled me to see strategies of avoidance or distancing from disadvantaged enclaves that were not present in their discourse. The next two sections present the key results that emerged from the combination of these various methods.

## 3. Disadvantaged Streets and Enclaves: The Spatial Patterns of Micro-Segregation in Naples' Upper-Class Areas

Naples is one of the cities with the highest levels of socio-residential segregation in Italy; indeed, segregation indices are generally much higher in the cities of the Mezzogiorno than in those of Northern Italy (Barbagli and Pisati, 2012, p. 136 [26]). These high rates of segregation in southern Italian cities can be explained by the very high residential concentration of their elites. In Naples, segregation has historically been highest and occurred earliest among the upper classes. In the 2001 census, the two districts of Chiaia and Posillipo alone accounted for more than half of the municipality's upper classes [5] (Pfirsch, 2011 [20]). Within these districts, the upper classes were clearly overrepresented: in Posillipo, they accounted for 25% of the working population—three times the municipal average (Figure 1).

In 2001, Naples' two most affluent neighborhoods, Chiaia and Posillipo, were neither on the outskirts of the city nor in the historic core; rather, they formed a second city center—chic and bourgeois—adjoining the old town. In the second half of the 19th century, Naples was part of a wider European movement that saw the emergence of purpose-built upper-class neighborhoods, termed *quartieri alti* in Italian. Neapolitan elites had begun to congregate in the west of the historic center as early as the 16th century, around the Spanish viceroys' palace, but this westward flight accelerated with the deployment of the *ampliamenti*, the urban expansion plans that followed Italian Unity (1861) in the peninsula's major cities. In the 1860s, the city's elites began to urbanize the Bay of Chiaia, a former aristocratic resort area to the west of the historic core (Guidi, 1980 [28]; Macry, 1984 [29]; Pfirsch, 2008 and 2011 [18,20]). While the summer palaces of the aristocracy already occupied the waterfront—the prestigious Riviera di Chiaia—broad, upscale avenues were opened up behind the Riviera, in the lower part of the bay and the surrounding hills (such as Via dei Mille or Corso Vittorio Emmanuele). The relocation of the city's elites from the historic center to these fashionable western neighborhoods accelerated after the cholera

epidemic of 1884, and again after the Second World War, when the old town was destroyed. Today, these *quartieri alti* correspond administratively to the two districts of Chiaia and Posillipo, and stand in stark contrast to the historic center, both in terms of landscape and social composition (Figure 1).

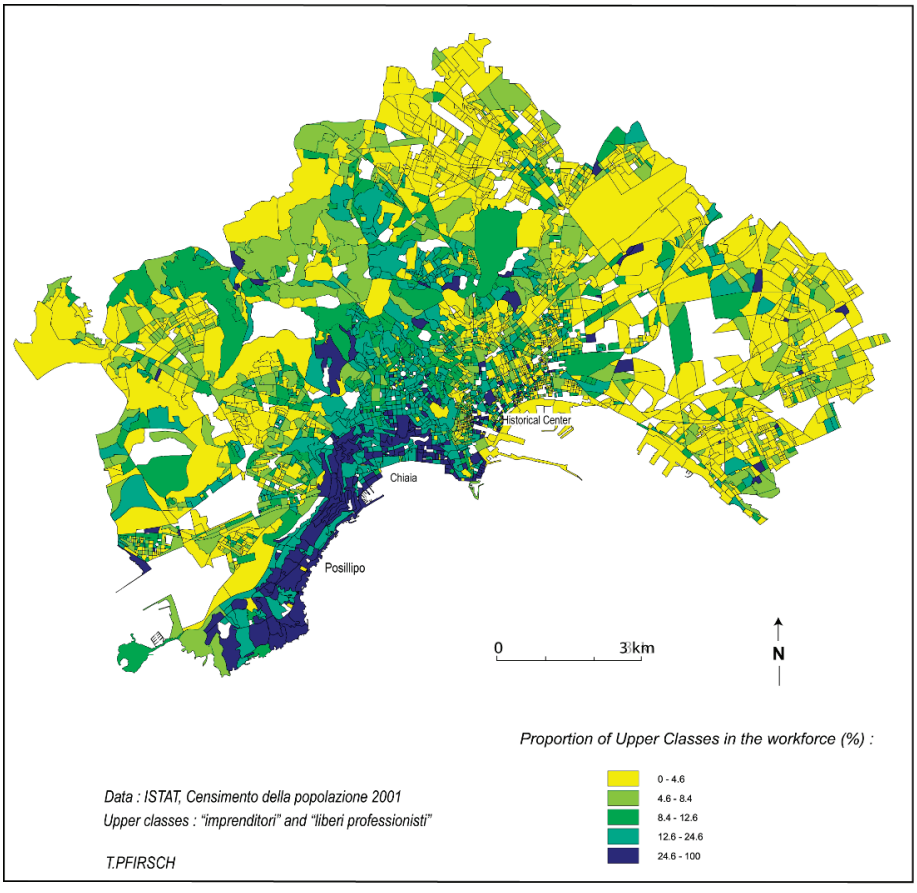


**Figure 1.** Naples' upper classes: a high concentration in the *Quartieri Alti* (2001).

Yet even though these neighborhoods are more affluent than others, they still have a significant proportion of lower strata residents, who accounted for over 30% of their population in 2001 (Pfirsch, 2011 [20]). Given the high population density of these neighborhoods—more than 41,000 inhabitants and a density of over 15,000 inhabitants per square kilometer in Chiaia—this represents several tens of thousands of people. Spatially speaking, these working-class populations in upper-class neighborhoods are not always dispersed throughout the city. They are typically grouped according to three models of residential micro-segregation. The first is vertical segregation between floors of the same building, as previously mentioned (see Section 1). In Naples, vertical Segregation traditionally opposes the ground-floor *bassi* occupied by disadvantaged groups and the upper floors inhabited by the wealthier classes. Such vertical segregation, while difficult to map and quantify in Naples (see Section 2 above), can still be clearly observed in the streets of the city's *quartieri alti* (Figure 2), even if it is today in decline.

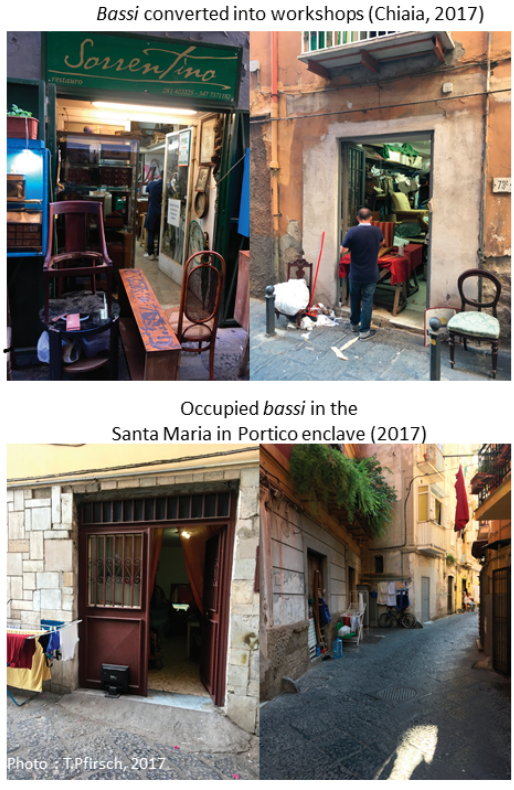


**Figure 2.** Declining Vertical Segregation? The Transformation of *Bassi* in the *Quartieri Alti*.

In the course of my observations in 2004–2007 and 2017–2018, I noticed that many of the *bassi* in the *quartieri alti* had been converted into shops, thus returning them to their original function. Today, cabinet-makers' workshops, antique stores, and luxury clothing boutiques are all located there, serving the needs of the affluent population of these neighborhoods. Some *bassi*, however, are still inhabited, notably in the oldest part of the Chiaia district, in the *vicoli* just behind the Riviera. Unlike the *bassi* in the old town, which are now home to an immigrant population (as in the case of Sri Lankan immigrants in the Quartieri Spagnoli), the *bassi* in the *quartieri alti* are still occupied by the local white—albeit aging—lower classes. Families have become rare, and isolated elderly people more numerous. That said, immigrants are not absent from the *quartieri alti*; on the contrary, in 2001, the districts of Chiaia and Posillipo had one of the highest concentrations of legal foreign nationals in the city (Pfirsch, 2008 [18]). However, these individuals, who are largely employed as domestic workers (Filipino and Sri Lankan babysitters, Ukrainian home helps, etc.), are generally housed with the families who employ them and are therefore widely dispersed residentially throughout the urban space.

In addition to vertical segregation, another form of micro-segregation that is common in the cities of the Mezzogiorno can be found in Naples' *quartieri alti*: the contrast between elegant villa-lined streets (*vie*) and immediately adjacent poor lanes and alleys (*vicoli* or *vicoletti*) (Sabelberg, 1987 [19]). This ancient structure, reflecting the ties of dependence between the aristocracy and its lower-class clientele under the Ancien Régime, has endured over time and still marks the urban fabric of the oldest part of Naples' *quartieri alti*. This is particularly evident in Chiaia, where the aristocratic *palazzi* of the Riviera di Chiaia stand in stark contrast to the much more disadvantaged *vicoletti* around them, running perpendicular to the waterfront (Figure 3).


**Figure 3.** Upper-class Streets (*vie*) versus disadvantaged alleys (*vicoli*). Aristocratic palaces of the Riviera du Chiaia (**left**) flank the disadvantaged alley of Via palasciano (**right**).

The third spatial pattern of micro-segregation in Naples' *quartieri alti* consists of urban enclaves, i.e., clusters of contiguous streets and blocks. These disadvantaged enclaves, color-coded yellow or light green, stand out clearly on the map of census tracts in the upscale districts of Chiaia and Posillipo (Figure 4). There are four main enclaves: Santa Maria Apparente, Santa Maria in Portico, La Torretta in Chiaia, and Il Casale in Posillipo [6].

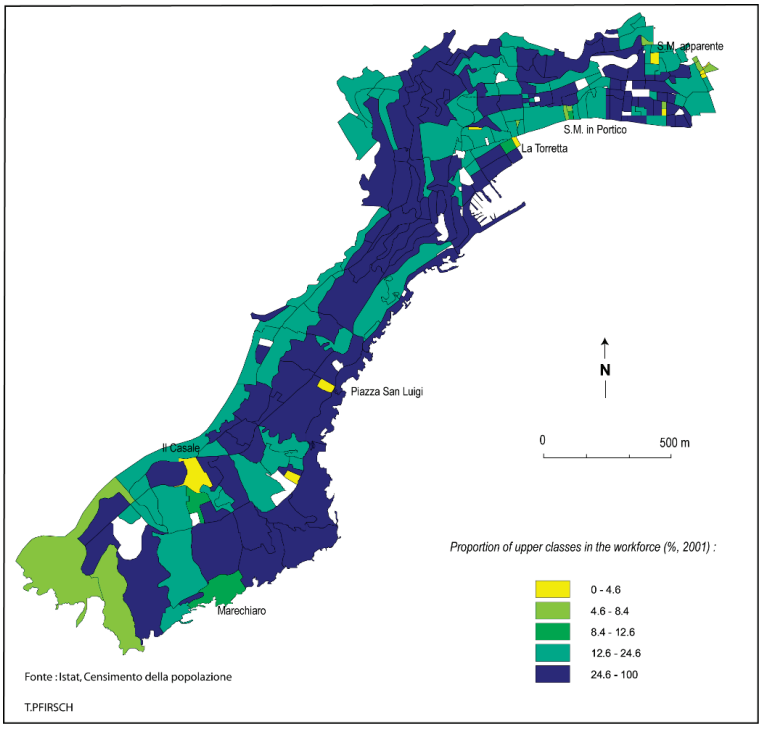


**Figure 4.** Disadvantaged enclaves in Naples' upper-class neighborhoods (2001).

The 2001 census data do indeed show a concentration of poverty and social difficulties in these four enclaves, which have a total population of just over 4000: the proportion of business owners and liberal professionals is far below the city average, while unemployed persons, large families, tenants, and small dwellings are all overrepresented in what are otherwise upscale areas with generally older populations, where large apartments and homeowners are the norm (Table 1).

**Table 1.** Disadvantaged enclaves: selected socioeconomic indicators (2001).

| Places | Population | Unemployment Rate (%) | Upper Classes in the WorkForce (%) | Occupied Rental Units (%) |
|---|---|---|---|---|
| La Torretta | 2244 | 21.0 | 16.7 | 63 |
| Santa Maria in Portico | 863 | 49.5 | 10.7 | 59 |
| Santa Maria Apparente | 404 | 59.3 | 2.9 | 74 |
| Il Casale | 613 | 24.2 | 9.0 | 62 |
| Chiaia | 41,779 | 15.8 | 24.7 | 29 |
| Posillipo | 23,673 | 12.1 | 26.1 | 27 |
| City of Naples | 1,004,500 | 31.4 | 9.9 | 44 |

Data: Istat, Censimento Generale della Popolazione e delle Abitazioni, 2001.

However, these official figures do not fully reflect the specific features of these areas, owing to numerous informal practices. In Naples, many of the officially unemployed actually work in small, undeclared service trades: street vendors in the port of Mergellina, parking attendants on the Riviera di Chiaia, and so on. In addition to the profile of their populations, these micro-neighborhoods stand out from the rest of the *quartieri alti* above all because of their specific socio-spatial systems. In particular, the architecture and morphology of these disadvantaged enclaves contrast with their surroundings. They may contain social housing blocks built in the 1950s and 1960s (as in the case of Piazza San Luigi in Posillipo, clearly visible in yellow in Figure 4). But social housing remains rare in the *quartieri alti*, and indeed throughout the rest of the city center. In Naples, such disadvantaged enclaves rarely correspond to social housing developments planned as part of social-mix policies, as is often the case in Paris or London's upper-class areas (Launay, 2011 [30]). Most of the disadvantaged areas in Chiaia and Posillipo are in fact former farming communities (Il Casale in Posillipo) or fishing villages (La Torretta and Santa Maria in Portico in Chiaia) that were overtaken by the city's growth. These are historic medieval or modern-era centers that have preserved their architectural structure despite their integration into the well-to-do *città bene*. Their narrow alleys, paved with Vesuvius lava slabs, and the density of their buildings contrast sharply with the wide streets of post-Unity extensions, and also with the speculative urbanization of the "Sack of Naples" years (1950–1960), which saw the heights of the city's *quartieri alti* covered with large modern buildings, often grouped together in gated residences. This is particularly true of Il Casale in Posillipo (Figure 5). Bypassed and surrounded by chic apartment blocks, these disadvantaged enclaves are also difficult to access, almost hidden away despite their immediate proximity to the select streets where luxury shops abound. Located close to a dangerous shoreline, they have an inward-looking architecture that turns its back on the sea, and are nestled into the sides of steep hills: they are accessed via staircase-like streets (known as *salite*, such as the Salità del Casale in Posillipo), which sometimes end at tufa walls that form physical barriers. This territorial enclosure contributes to the marginalization of these areas, which can easily be avoided by wealthy residents and ignored by tourists.


**Figure 5.** Il Casale, Posillipo: a formerly rural village hemmed in by upscale residences.

A final specificity of these enclaves concerns their public spaces, marked by deterioration and informal uses. Here, we find practices typical of the historic center of Naples: private colonization of the street, illegal commercial occupation by temporary stalls, widespread unauthorized parking, degradation of façades and poorly maintained communal areas of buildings, and so forth. These informal uses are sometimes complemented by illegal activities. Because of their proximity to the sea, Chiaia's former fishing villages (La Torretta and Santa Maria in Portico) have long made a living from smuggling contraband, particularly cigarettes, up until the early 1990s. Smuggling has also attracted organized crime and the Camorra, and most of these poor areas have their own clans and bosses, reinforcing their territorial identity and their stigmatization as marginal zones. All in all, these disadvantaged micro-neighborhoods within upscale Naples resemble "enclaves" (Marcuse, 1997 [3]), i.e., areas where a minority population is concentrated, seeking to maintain its cohesion within a quite different surrounding territory. The specificity of these poor enclaves in Naples is that they historically preceded the affluent urban environment in which they are embedded, and have demonstrated remarkable sociospatial inertia: they have preserved their own practices with regard to public spaces, without experiencing any major gentrification processes. This historic longevity is largely due to the fact that these enclaves are indeed also marginal areas, that is to say, places that are simultaneously set apart from and integrated into a territory. They have long functioned in a relation of complementarity with the neighboring upper-class districts, providing a clientele for the wealthy employers of Chiaia and Posillipo, and were accepted as an integral part of local life. This becomes clear when we study the discourses and attitudes of Naples' elites with regard to the disadvantaged populations living in "their" neighborhoods, and the social mechanisms that produce micro-segregation.

## 4. Proximity under Control? How the Neapolitan Elite Deal with "Their" Poor

This section analyzes how the discourses and everyday practices of the upper classes produce and legitimize the segregation of the lower-class groups in their neighborhoods. In the discourse of local elites, disadvantaged enclaves are always presented as places that are both foreign to and integrated into the *quartieri alti*:

> "Every neighborhood in this city has its negative counterpart. Here, for instance, we have the Quartieri Spagnoli as our kind of negativity as, as a neighborhood that has not always had a good reputation; Il Vomero has Il Petraio, it's a bad neighborhood, Il Petraio, that's what it's known for [. . . ]; and Posillipo has Il Casale".
>
> (Silvana, company director, born in 1939).

Indeed, for a long time, these enclaves were accepted by the local elites as part of a traditional system based on clientelistic ties, which ensured strong social control over lower groups. However, the decline of the city's traditional property-owning elites has been accompanied by a change in the discourse regarding the disadvantaged enclaves: the traditional discourse valuing the proximity of the poor has now been replaced by one justifying their exclusion. This proximity is accepted as long as it remains under control, thanks to a "game of proximity and distance" (Andreotti et al., 2015 [22]). I draw a distinction between two ways of playing this game of proximity and distance among the local elite: the "aristocratic" game, which values the proximity of the working classes and controls it through detailed knowledge of the local context, and the "bourgeois" game, present within the more recent fraction of the Neapolitan elite, which stigmatizes the working-class enclaves and seeks to sideline them from the public spaces of *quartieri alti*.

### *4.1. The "Aristocratic" Game: Distinction through the Promotion of Social Mix*

The interviews conducted reveal first of all a traditional discourse concerning Naples that idealizes the residential proximity between elites and commoners, accepted as normal and presented as a typical feature of the city (Allum, 1973 [31]).

> "There are still a few *bassi* here, but there used to be many more. Now they have almost all been turned into shops. Because it is precisely the *basso* economy that has disappeared, people who knew you, who said hello to you in the morning. Now, if you continue along Via Santa Maria in Portico, there are still a few, because this was where all the smugglers in the neighborhood hung out. [. . . ] As Naples has always had this characteristic of the bourgeoisie living in close contact with the proletariat, there was an interweaving. There was this close link with the smugglers".
>
> (Maria, university lecturer, born in 1947).

Thus, even the illegal activities of these poor enclaves (such as smuggling) are accepted, as long as they do not fall into the category of serious crime, with respondents distinguishing between "good" and "bad" illegal activities in an astonishing transposition of the classic distinction between the deserving and undeserving poor. However, in certain discourses, proximity is not only accepted but is valued and even put forward as a distinctive element, particularly among the oldest and most "legitimate" upper classes, who find it a way of distinguishing themselves from more recent "parvenus":

> "Some neighbors complain about baby gangs riding around on scooters, but I don't mind. I'm used to it. My family has been living here for over 200 years, and it has always been like this. I would never go and lock myself away in one of those awful modern gated estates in Via Petrarca, that is not my world, that is not my, my, vision, of life, of Naples".
>
> (Francesco, architect, born in 1947).

> "In old Naples, there was a lot of this idea of the *Signore* and the common people living side by side. The idea of detachment from the people is a typically bourgeois, 19th-century idea. There was this contact, but which has been lost, it doesn't exist anymore. Now they're strangers to one another. I don't like that. I think, on the contrary, that society needs to be more united, without arrogance".
>
> (Bruno, lawyer, born in 1946).

This way of playing the proximity–distance game concerns 17 out of 50 respondents. It is referred to as "aristocratic" by respondents but does not involve only people of aristocratic origin. It includes all people with stable positions at the top of the local social hierarchy, often descending from landowning families. Most of them belonged to the highly select *Canottieri* club or the Rotary, but none was a member of the *Rari Nantes* Club. Within this group, the spatial proximity of socially distant groups and lower-class populations is not feared. Rather, it is valued as a status symbol—as in the discourse of Francesco, cited above, who belongs to one of the most prestigious aristocratic families of Southern Italy and values the proximity of the poor to distinguish himself from the residents of Via Petrarca, which is a symbol of the "new money" in Naples… For the upper strata of the Neapolitan elite, made up of "old families" whose fortune has been legitimized by time and social recognition, their social prestige is unquestionable and cannot be "blurred" by their residential location.

However, this is an idealizing discourse that smoothes out conflicts. It masks the asymmetrical relationships of dependence between affluent residents and those living in the working-class enclaves of the *quartieri alti*. Many of the respondents playing the "aristocratic" game exercise strong social control over the working classes living on their doorstep. They sometimes employ servants from the disadvantaged *vicoli* of Chiaia, or even domestic staff who have remained in the service of the same family for several generations. Some are also multiple property owners, with dozens of tenants in neighboring poor enclaves, whom they control through the setting and collection of rents. Last but not least, many of them exercise significant power in local institutions (neighborhood councils, boards of directors of port companies, etc.), which means they are in a position to negotiate to ensure they are spared from local petty crime, in exchange for favors and services. In addition to wealth and social position, residential seniority in the neighborhood and local rootedness also distinguish this group of respondents, who value spatial proximity to the working classes. Their intimate knowledge of the power relations in the *quartieri alti* enables them to keep their distance from the potential nuisances generated by proximity to disadvantaged enclaves.

It is also their local rootedness that gives these "legitimate" families of the Neapolitan elite access to the most exclusive social venues in the *quartieri alti*. Indeed, the residential proximity of the working classes is all the more accepted among the old families of the local elite, as they are also in a position to benefit from access to the most exclusive clubs and social venues in the area. The Bay of Chiaia is home to many elite clubs, which remain extremely select, and are located mainly on the waterfront: the *circolo tennis* on the Riviera di Chiaia is one of the most exclusive in Italy, as are the nautical clubs grouped together near the Castel dell'Ovo (in particular the *Canottieri*), and the many beach clubs in Posillipo where access to the sea is privatized and very expensive, and *de facto* out of bounds for the Neapolitan lower classes. Finally, most of these people are part of multi-residential systems and mobile modes of living, alternating between their primary residence in Naples and their holiday homes on the islands of the Gulf of Naples, on the Amalfi coast, or in the mountains of Abruzzo, which are essential places for the reproduction of their social capital (Pfirsch, 2010 [32]). In these circumstances, the "old families" of the elite can therefore afford to share residential areas and public spaces with the local poor, because they also have access to highly separated places for more strategic social activities, such as exclusive clubs and holiday homes for the reproduction of their social capital and power.

In this milieu of old families, it is the proximity of the nouveau riche, rather than proximity to the poor, that frightens them, precisely because "parvenus" have access not

only to the most prestigious residential spaces but also to the places of sociability and power of the local elite:

> "I mean, before, this used to be the neighborhood of the solid upper middle class [Via dei Mille], of the liberal professions, and it still is to some extent, but there are also a lot of nouveaux riches who want to come and live here. To give you an idea, last year a Camorra boss bought a superb apartment in Piazza dei Martiri, just imagine".
>
> (Giulia, university lecturer, born in 1952).
>
> "I haven't renewed my membership at the Rari Nantes [a select yacht club in Naples' *quartieri alti*], it's really gone downhill. Full of nouveau riche, people who are only there to show off their wealth…".
>
> (Stefania, company director, born in 1954).

Echoing Veblen's theory (Veblen, 1899 [33]), Neapolitan elites fear the spatial proximity of socially close groups of reference (such as "nouveaux riches"), who can undermine their power, rather than the proximity of socially highly distant groups (such as the local underclass). However, the extracts quoted above also evoke practices in decline. The "aristocratic" game has become a minority approach among respondents—who are fully aware that this is the case—owing to the economic decline of the old families and significant turnover among local elites. Specifically, Naples' elites are characterized by a high degree of segmentation and constant renewal, as the city's political and clientelistic system changes (Savonardo, 2003 [34]). The erosion of the fortunes of the old families has been accompanied by the rise of entrepreneurial or managerial elites linked to politics and public procurement, who have taken over the residential spaces—and also the schools and clubs—of the traditional elites, and have a different relationship to the disadvantaged enclaves of the *quartieri alti*.

*4.2. The "Bourgeois" Game: Keeping the Local Poor Invisible*

The second way of playing the distance–proximity game is referred to as "bourgeois" by respondents but actually involves those strata of the elite that are most socially mobile, either upwardly or downwardly, or newly arrived in Naples' high-status neighborhoods. This group constitutes a majority of respondents (26 out of 50 [7]). They are the proximity of the poor, which is not valued but rather perceived as a threat to their prestige and social position. The poor enclaves of the *quartieri alti* are stigmatized as dangerous places, as part of a rhetoric that is above all security-oriented. These spaces are described by the respondents in question as ugly and plagued by micro-criminality, and are clearly avoided in everyday practices:

> "I never go to Il Casale, absolutely never. It's a bad neighborhood, you know, and dangerous. It's really another Posillipo entirely, another town, working-class and ugly […]. Or you only go there when your car is stolen, you know how things work here? […] Naples is this fantastic city where, when your car is stolen, you have to go to the local boss, but not to the police".
>
> (Federico, business owner, born in 1952).
>
> "I don't stop at Il Petraio [author's note: the funicular station serving a working-class enclave of the chich neighborhood of Il Vomero] anymore. There are still some really bad areas around Il Petraio. They say it has changed, but last year Veronica had her bag stolen at 7 p.m. No, it's a very bad neighborhood, with a bad population and criminality".
>
> (Carla, company director, born in 1939).

Among this group of respondents, the interviews are peppered with accounts of micro-conflicts over the sharing of public spaces, and reflect a growing sense of insecurity in the *quartieri alti*. The local poor are branded criminals and culturally othered as "uncivic", in

line with a long tradition of essentializing the "culture of uncivicness" of the Neapolitan "plebe" (Dines, 2012 [35]):

> "We aren't the ones in charge in this neighborhood [author's note: Chiaia]. If you want to know who's in charge here, you have to go to Mergellina in the evening… And… you'll see all these awful people, all these, all these young people who aren't afraid of anyone, who'll block your path with their scooters. I don't go there alone anymore. They've taken over the city, they take it back at night".
>
> (Emanuela, company director, born in 1958).

This security-oriented vision reflects objective transformations in Chiaia's pockets of poverty: the shift of organized crime to the edges of the city has led to an upsurge in micro-criminality (De Leo, 2008 [36]). However, this security-based discourse also reflects the fears of the less-established fractions of the upper classes, who feel their social position is more fragile and worry about losing control over their spaces. For these more recent—or less rich—elites, the residential position is an essential dimension of their social standing, which is why they tend to cling to their residential spaces and are keen not to lose control of the neighborhood's public spaces, which are the guarantors of the area's positive image and high property prices.

For this group of respondents, the "bourgeois" game of proximity and distance consists first and foremost of avoiding interaction with the inhabitants of the lower-class enclaves. They do this through the selective use of public spaces, as described in the excerpts above. However, they also employ a strategy of micro-distancing and residential enclosure. Many of them moved from traditional *palazzi* in lowland sections of the *quartieri alti* to newer hilltop gated estates (called *parchi*), developed in the 1970s and 1980s. There is a strong landscape-related, social, and symbolic opposition between the older, socially polarized lower part of the *quartieri alti*, epitomized by Via Posillipo (where the oldest families live alongside disadvantaged enclaves), and the upper reaches of these districts, epitomized by Via Petrarca, where the more recent elites are homogeneously grouped together, often in gated condominiums encompassing several dozen apartment buildings and villas.

The second component of this "bourgeois" game is to try to make the poor residents of the *quartieri alti* invisible by campaigning against their use of public spaces (illegal street occupation and the "alley economy" in particular), in the name of restoring civic-mindedness. Unlike the "aristocratic" game, which often relies on informal channels, this "bourgeois" game relies on local institutions, through strong activism in residents' associations. The *cittadinanza attiva* group recently played an important part in opposing the seafront restructuring program (2012–2017), which attracted lower class and disadvantaged populations to the newly pedestrianized *lungomare* of Chiaia, which in the past used to be a more select promenade. The local poor are accepted as long as they remain invisible in the neighborhood's public spaces, which have to retain the symbolic markers and social uses of the elite.

## 5. Conclusions: Theorizing Elite Micro-Segregation

This case study of Naples allows us to draw more general conclusions about theories of contemporary urban segregation and to qualify the thesis of the urban secession of elites in the context of globalization. In Naples, elites have not fled to the periphery, but neither have they reconquered the city center; they have created a bourgeois centrality juxtaposed to the historic center, and encompassing numerous pockets of poverty that have resisted gentrification. Rather than secession or flight, it is more appropriate to speak of micro-segregation: the upper classes are never physically far from disadvantaged groups, but this residential proximity is accompanied by mechanisms of social control and distancing in other social fields, such as places of sociability and the uses of public spaces.

This article reveals the sociospatial mechanisms of this micro-segregation in elite neighborhoods, from the point of view of the dominant classes. Spatially, it takes the form of residential concentrations of the working classes in streets and blocks in the heart

of upscale districts. Whereas in north-western Europe, pockets of poverty in affluent neighborhoods often correspond to social housing estates planned as part of social-mix policies, or to run-down city blocks subject to intense gentrification, the specificity of Naples' situation lies in the fact that these are old working-class villages that have demonstrated a remarkable sociospatial inertia despite their integration into the city's upscale districts, and resemble veritable "enclaves" endowed with a strong territorial identity. The proximity of these disadvantaged enclaves is not a source of flight or reappropriation on the part of the upper classes in the *quartieri alti*. Their proximity is either accepted as socially controlled and deemed "distinctive", or circumvented and avoided through practices of micro-distancing and residential enclosure.

The most important thing for Naples' elites is therefore to keep the proximity of the poor under control. This control is based on a highly variable "game of proximity and distance" within the local upper classes and relies essentially on three factors. First, it relies on social distance with reference groups. According Veblen (Veblen, 1899 [33]), the greater the social distance, the more positive the value and the greater the acceptance of spatial proximity of other social groups. Neapolitan old elites fear the spatial proximity of socially close groups of reference (the "parvenus") rather than the proximity of socially highly distant groups (the disadvantaged enclaves' residents), who are not in a position to threaten their social power. Second, attitudes toward the proximity of the poor depend very much on the intensity of social mobility within the elite and the whole urban society: the more stable the social hierarchy, the more valued the proximity of "social others". Indeed, as Tocqueville noted, the spatial proximity of socially distant groups is typical of the highly unequal feudal societies, where social hierarchies are perceived as fixed and social positions are therefore neither threatened nor blurred by residential positions and spatial proximity (Tocqueville, 1848, p. 12 [37]). In capitalist societies, on the other hand, where social mobility is valued, and where social hierarchies are more uncertain, the spatial proximity of socially "inferior" groups can be perceived as threatening. Residential positions can then serve to reaffirm social positions by clustering in socially homogeneous neighborhoods, as was the case with the expansion of North American suburbs or the development of affluent peripheries in Europe. In Naples, the older families and the aristocratic fraction of upper classes have partially inherited the "feudal" and conservative vision of a static social hierarchy. Thus they value the old and long-lasting proximity of the poor, and fear the spatial closeness of the "new money" that can change the socio-spatial order. Lastly, local rootedness matters: the greater the intimate knowledge of the local urban context, the greater the power of control over proximity. Using Norbert Elias's categories (Elias and Scotson, 1965 [38]), I would say that for the "established" elites (who are able to mobilize informal local networks) the game of proximity and distance is easier to play than for "outsiders" (who have to rely on institutions and public policy). The old families of the Neapolitan élite have developed a symbiotic and mutually beneficial relationship with the residents of the enclaves over time. Their local rootedness and intimate knowledge of the power relations in the *quartieri alti* enable them to turn the proximity of the poor into a key social resource. Reversely, the more recent fractions of the city élite and those who newly arrived in Chiaia and Posillipo, have not developed such local networks yet, and therefore they are impacted more and reap fewer benefits from the proximity of disadvantaged groups. In conclusion, the higher, older, and more stable the position within the city's elite and within its high-status areas, the more acceptable and valued the spatial proximity of disadvantaged groups. In Naples, as in many other places in the world (Paugam et al., 2017 [21]), the rich fear the proximity of parvenus and nouveaux riches more than the proximity of the poor, who are too socially distant to threaten their position and privileges.

The indirect method used in this article was firmly positioned on the side of the dominant groups, revealing how the rich produce, control, and legitimize micro-segregation. I hope that other works will make the voices of those who are subjected to this micro-segregation—but who also circumvent and resist it—heard by studying the experiences

of the poor in wealthy neighborhoods, who are largely overlooked by public policies and academic research alike.

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## Notes

1 The first field work consisted of a three year ethnographic survey (2004–2007) in Naples during my Ph.D. (Pfirsch, 2008 [18]). The second field work was conducted during a sabbatical in 2017–2018 and was based on three one-month surveys in the same neighbourhoods of Naples' *quartieri alti* I explored for my Ph.D. (Chiaia and Posillipo).

2 In Italian censuses conducted by ISTAT till 2011, census tracts (*sezioni di censimento*) were originally designed to each comprise the same number of resident families, in order to facilitate the door-to-door work of census civil servants. Thus, the dimension of census tracts is highly variable according to population density. In central Naples, which has one of the highest population density in the world (over 20,000 hbts/km$^2$), census tracts are very small and often correspond to housing blocks (*isolati*).

3 Unfortunalely, the 2011 census data was not available at the census tract scale at the time of the second fieldwork, and the remapping of the micro-segregration in Chiaia and Posillipo has not been possible.

4 In line with recent sociological works about the upper-classes (Pinçon and Pinçon-Charlot, 2000 [17]) I selected the respondents according to their place of residence (Chiaia and Posillipo) and their social prestige (or "symbolic capital" in Bourdieu's perspective) rather than economic capital. Thus, 38 out of 50 respondents (25 women, 25 men) were members of clubs, schools and select institutions of the local élite, others were friends and relatives of club members of former local élite schools students (liceo Umberto). The Neapolitan « clubs » are highly select and accessible through co-optation, according to the reputation and «social prestige» of applicants (seniority of the family in the local élite etc…). Theses clubs are highly stratified, opposing the « canottieri » for older families descending from landowning aristocracy and the «rari Nantes», for example, which is the club of «new money», while the Rotary has members from diversified fractions of the upper class. This unequal and stratified access to the clubs was used as a proxy to measure the social prestige of the respondents. 13 out of 50 respondents belonged to the liberal professions (lawyers, physicians, architects…), others were academics (10), top managers (7), company directors (9) or unoccupied high-net worth (11). 15 defined themselves as «aristocrats».

5 Here, I have used the conventional typology of Italian socio-professional classes established by Antonio Schizzerotto (Schizzerotto, 1993, [27]), in which the upper classes correspond to three categories: business owners (company directors undertaking no manual work and whose companies have at least 10 employees), liberal professions, and *dirigenti* (senior public- and private-sector managers).

6 These enclaves are defined as follows: (1) Santa Maria Apparente is composed of Salità Santa Maria Apparente, Vico Vetreria, Salità Vetreria, and Vico Santa Maria Apparente (census tracts 5202671, 5202771, and 5202781); (2) Santa Maria in Portico is formed of a group of *vicoletti* that run perpendicular to the Riviera di Chiaia: Via Santa Maria in Portico, Vico Magnoni, Via Palasciano, and Via della Croce Rossa (census tracts 5201631, 5201661, 5201641, and 5201651); (3) La Torretta is similarly formed of narrow cross streets (*vicoli*) that run perpendicular to the Riviera di Chiaia: the "Y" shape formed by Via Santa Maria della Neve, Via Cupa Caiafa, and Via San Filippo (census tracts 5201551, 5201821, and 5201831); (4) Il Casale, in Posillipo, is a formerly rural village centered on Via Case Vecchie and Via della Piazzetta Solofrano (census tracts 6522911 and 6522931).

7 7 respondents did not mention the disadvantages enclaves and their residents during the interviews.

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*Article*

# Imposing 'Enclosed Communities'? Urban Gating of Large Housing Estates in Sweden and France

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**Abstract:** Gated communities and gated housing enclaves have primarily been identified as elite spaces of privilege that support self-imposed disaffiliation and spatial and social withdrawal by the affluent. Over the past decade, however, European countries have also seen a rise of gating in large housing estates. Drawing on previous research and a comparative case study that includes interviews, observations, and mapping, this article analyses policies and practices of gating in large housing estates since 2010 in Malmö, Sweden and since 2000 in Paris, France. We argue, first, that gating is legitimised by policy arguments about 'defensible space', by a critique of the modernist design, and by a perceived need for diversification. Secondly, we expand the notion of urban gating and identify four types of enclosure: complete enclosure, semi-enclosure, enclosure through densification, and enclosure of parks and playgrounds. We conclude that the notion of the welfare state has changed, not only in financial terms but also as an urban form, leading to the micro-segregation of housing and land, which makes visible the social stratification within large housing estates. Gating of large housing estates thus leads to 'enclosed communities' rather than 'gated communities'.

**Keywords:** gated communities; enclosure; housing estates; micro-segregation; France; Sweden; urban gating

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## 1. Introduction

Gated communities and gated housing enclaves have primarily been identified as elite spaces of privilege, supportive of self-imposed disaffiliation and spatial and social withdrawal by the affluent. Disaffiliation has been analysed as a fear of crime and a privatisation of services, amenities, and public space due to a deliberate 'successful' secession of the upper- and middle-class [1–5]. Elite gated communities have been more common in countries with high socio-economic inequality and have been understood as driving forces of inequality [6]. Furthermore, the gated community is based on the urban morphology of the neighbourhood in the U.S., where it originated. As practices of gating have spread across the globe, gating has encountered other urban forms and planning regimes and has morphed into new patterns of neighbourhood segregation and micro-segregation [7–10]. In European countries with strong welfare states and a long history of investing in housing for all, such as Sweden and France, an equivalent of the elite gated community has so far not been adopted, even though elite housing areas do exist. Various cities, such as Paris in France and Malmö in Sweden, have, however, seen an increase in gated housing in social housing areas and poor housing estates in recent decades. In France, the gating practice known as *résidentialisation* emerged in large housing estates at the end of the 1990s and was included in the urban renewal programme launched in 2003 [11–14]. In Sweden, the gating of large housing estates started as a practice of privatisation during the 2010s [15,16]. Recent gating practices thus suggest a new form of segregation: a new pattern of gating in poor housing estates in welfare states, which may have detrimental consequences on social stratification and may lead to new forms of micro-segregation. Based on an investigation

of large housing estates in Sweden and France, the aim of this article is twofold. First, the aim is to analyse the changes in housing provision in the two countries, and secondly, the aim is to analyse the spatial layouts and social consequences of gating as a form of micro-segregation. What are the main political–ideological arguments driving the process of gating large housing estates? Which forms of spatial layouts and types of gating are implemented, and how do residents and local actors respond to gating? We argue, first, that the gating of large housing estates is legitimised by three main policy arguments: the need to create a 'defensible space' that is supposed to reduce stigmatisation, a critique of the modernist design, and a perceived need to diversify housing tenure in order to attract middle-class residents. Secondly, we identify four types of urban gating at the level of individual buildings and blocks. Third, we argue that urban gating is not chosen by but rather imposed on residents. We conclude that the notion of the welfare state has changed, not only in financial terms but also as an urban form, reflecting a trend towards housing privatisation. Urban gating of large housing estates is a form of micro-segregation that leads to 'enclosed communities'. This article contributes to research on residential segregation by not only analysing the policy arguments underpinning the rise of gating in large housing estates, but also by taking into consideration how gating materialises in complex patterns of micro-segregation. In line with a body of international research [3,10,17–20], the results also contribute to deepening the understanding of the political and socio-economically differentiating gating practices that evolve around the globe.

### *1.1. Self-Segregation and Disaffiliation of Middle-Class and Elite Groups*

The 'gated community' is primarily associated with the gated enclaves in which the middle-class and the elite self-segregate [1,2]. One reason for privileged groups to self-segregate is to exert control over the local environment. This may include private services; guards that ensure privacy; extensive recreational amenities; local regulations of property, appearance, and behaviour [2]; and, importantly, the displacement of crime [21,22]. A second reason to gate is to maintain property values [23] and to secure the production of club goods for residents [24]. The search for community is another prominent feature of the gated community [2]. It has been suggested that the proliferation of gated communities leads to a 'fortress city' [22] built up of gated enclaves based on a fear of crime and the perceived need for increased security. According to this line of thought, material gating in the form of walls, gates, and fences has come to reflect and reinforce hierarchies of racialisation, wealth, and power [6].

Neither Sweden nor France has directly imported the spatial layout or local governance systems of the U.S. gated community. Even so, the disaffiliation of wealthy groups into gated enclaves has spurred research and debate on gating and gated communities. In France, the building of gated housing complexes began in the 2000s in the suburban areas around cities in the south of the country [5,25]. This kind of gated housing is defined as 'closed residential enclaves' of private housing rather than as gated communities. It is developed as a real-estate product for the middle class [26] and is thus driven by developers more than by residents. Nevertheless, these gated enclaves reflect a fragmentation of space and a middle-class strategy of isolating from social housing and, despite regulations, privatising car parks and streets to restrict access [27]. The gating of private housing can be understood in relation to a public withdrawal from the management of public space, leading to forms of 'private cities' and 'private urbanity' [28]. Sweden, meanwhile, does not have gated communities based on the U.S. model, but the country has seen a rise in the disaffiliation of wealthy groups in the metropolitan regions [15,16]. The rise of the 'residential hotel' [4,9] started with a luxurious gated housing complex in Malmö, and the concept has since spread to other cities. The residential hotel is an urban, serviced, and gated housing complex similar to the gated housing enclaves of inner-city Gdansk or luxurious condominiums in New York [18]. Like France, Sweden also has planning laws that regulate access to public space, but, even so, large, enclosed properties have been gated off from public use. The most recent development, however, is that both countries

have also seen an expansion of gating around poor and vulnerable housing estates and in social housing.

### *1.2. Urban Gating—A Form of Micro-Segregation*

As several scholars point out, the Anglo-American concept of the 'gated community' poses challenges when it is applied to the analysis of gating in differing urban contexts. One problem is that it may influence different cultural understandings of housing and way-of-life norms in housing [29]. A second problem is that it ignores the different material urban forms and legislations that exist in various parts of the world [30,31]. A third problem is that it is based on the neighbourhood as the basis for analysis, thus assuming homogeneity of residents and ignoring spatial scales and urban forms of segregation other than the U.S.-based 'loop-and-lollipop' urbanism.

Residential segregation in both Sweden and France has been reinforced over the past two decades by a process of social and geographical polarisation [32,33] with an increasingly racialised pattern. Patterns of residential segregation, or the 'residential separation of social and ethno-racial subgroups within a wider population' [34,35], are found on the scale of urban districts or quartiers but also on the scale of individual buildings and urban blocks. This pattern thus differs substantially from the 'neighbourhood' as the physical basis for the analysis of gating practices. According to Maloutas and Karadimitriou [10], the term *micro-segregation* was identified to capture and analyse how social hierarchies are constantly rebuilt in space, even at the building level. Micro-segregation refers to 'micro-segregated urban milieus below the neighbourhood level, where individuals living in spatial proximity occupy unequal positions according to their socioeconomic status or ethno-racial identity' [10]. The term micro-segregation also aims to stress that social mix is not an alternative to segregation, because socio-spatial hierarchies are rebuilt at micro-spatial scales even if social mix on a neighbourhood level is achieved. Research on micro-segregation investigates spatial patterns, how housing markets influence patterns of segregation, and the consequences for social inequalities. While the vertical segregation of residential towers is the most analysed form of micro-segregation [30,36], the patterns of gating of poor housing estates follow individual buildings, blocks, and entrances.

In line with the criticism by research on micro-segregation, the term *urban gating* was developed to capture the fragmentation process evolving from the increased use of fences, locks, and codes around individual buildings and blocks. Urban gating is a form of gating at the scale of individual buildings and single blocks (not on a neighbourhood level); it is a disperse form of gating that takes place in socio-economically different areas across cities (not connected to either super-rich or impoverished neighbourhoods). Urban gating restricts access to land that was previously accessible to the public, and it is a process that both parallels and materialises an ongoing polarisation of the metropolitan regions [4,30]. Although some research exists, we can nevertheless conclude that few studies have sought to investigate urban gating in poverty-stricken housing areas in Europe. The gating of poor neighbourhoods was originally mentioned early on by Blakey and Snyder [2], who identified the 'security zone community' as one of the three categories of gated communities. In poverty-stricken U.S. neighbourhoods, fences, gates, and security systems were implemented by residents, developers, and local authorities alike. Irrespective of which group initiated gating, it was 'less of a choice than a necessity' due to gang activity, drug dealing, and other crime, according to the authors. Similarly, Atkinson identifies 'ghettoized poverty' as one form of 'incarceration', i.e., the strongest form of segregation [7]. In Europe, one of the first studies of gating in large housing estates showed that gating was implemented in Britain in the late 1980s as a means to prevent delinquency [37]. In France, gating is embedded in the urban restructuring of large housing estates and public efforts to increase housing diversification. It is mainly associated with safety measures in deprived housing estates [11–13,38]. In Sweden, gating emerged from policies of mixing and diversification and from the privatisation of housing [4,15,16]. In Sweden and France, research has focused on the displacement of the poorest households and the social fragmen-

tation resulting from social mixing through housing diversification [39–41]. However, few studies have explored the spatial layouts of this micro-segregation and the development and prevalence of gating in large housing estates, despite the growing number of fences.

We situate our analysis in the context of urban gating and micro-segregation as an apt framework for critically unpacking how gating has emerged in poor, urban neighbourhoods. In order to identify types of gating in large housing estates, we use the term '*enclosure*'. Enclosure in this context refers to a building, block, or area surrounded by a barrier, such as a fence and gate, which is part of a process of privatisation and fragmentation of public space. In line with research on micro-segregation, we analyse how changes in housing provision influence the social stratification and the spatial patterns of residential segregation.

## 2. Materials and Methods

This article is based on previous research conducted in Sweden and France, including policy analysis, mapping, observations, and interviews with stakeholders. In order to strengthen the comparison between Malmö and the Paris region, a cross-complementary investigation was added.

In Malmö, gating was investigated in 2019 through a case study of the urban districts of Rosengård and Annelund [42]. These two districts were selected using an information-rich selection process [43]. Both districts were built as modernist housing areas, Annelund with buildings of four floors and Rosengård with building heights of six, nine, and fifteen floors. Furthermore, both districts have experienced a rapid increase in fences during the past decade. The variation of spatial layout and privatisation of individual buildings has led to diverse forms of enclosure. Fences and gates were identified and drawn on maps in ArcGIS. The fences were categorised according to height and types of locks, and photos were taken of all the fences and gates. In parallel to mapping, a questionnaire [44] was distributed to 50 respondents in each of the two districts. Questions included why respondents thought gating existed; how it might influence segregation; and what they thought about the increase in gating. In addition, respondents were asked to give written comments on potential positive or negative aspects of gating. The responses to the questions have been translated by the author from Swedish to English. In Paris, the aim was to analyse the impact of gating on the inhabitants' representations and practices of space in large housing estates in the Parisian suburbs of Athis-Mons and Orly [41,45]. Social housing landlords and cities have extended gating to all existing and new social housing. The two Parisian districts were selected using an information-rich selection process [43] based on three main criteria. First, the scale of demolition, restructuring, and rebuilding in Orly, a large housing estate of 5400 units that has been under renovation since the 1980s. Secondly, Athis-Mons, a housing estate of 1500 units, is an example of résidentialisation where the local actors specifically aimed at involving the inhabitants in the enclosure of their buildings. Third, the two housing estates are complementary in their urban form, as they comprise high-rise buildings of ten to fifteen floors in Orly and four to six floors in Athis-Mons, which has resulted in diverse forms of enclosure. The process of résidentialisation was investigated through documents and interviews with social housing managers and urban planners who were proactive in disseminating the re-design of public and private spaces. In addition, five in-depth interviews with local actors and twenty-five interviews [44] with tenants influenced by gating were conducted in 2004. The interviews were recorded, transcribed, and, for this article, translated from French to English by the authors.

In 2019, cross-complementary observations and mapping were carried out in the same four districts in order to analyse and compare how gating had evolved. Site visits were made to the four districts and the types of enclosures were developed, compared, and found to coincide. Materials from this investigation include the photographs and drawings presented in this article. In addition, data that have not previously been made available for an international audience, such as quotes from interviews, are included in this article to highlight residents' perceptions of gating.

In all, this rich material from the three investigations forms the basis for the analysis. The data collected were analysed thematically [46]. Clearly, the Swedish and French investigations differ in methodology and data as well as in the time period under investigation. Nevertheless, a comparison is both relevant and feasible because the empirical materials exhibit substantial similarities, as do the political contexts. We propose to use this heterogeneous but complementary data to analyse the common development of gating in large housing estates in two European welfare states with a similar history of housing. We compare housing provision models and policy rationales for gating in the two countries. Based on this cross-comparison, we then identify the spatial layouts and consequences of the implementation of urban gating in large housing estates.

## 3. Results

### *3.1. Models of Housing Provision and Policy Arguments Underlying the Gating of Large Housing Estates*

#### 3.1.1. Large Housing Estates in Sweden and France: Similarities of Models for Housing Provision

In Sweden and France, as in many other European countries, large housing estates were built in the mid-twentieth century with the aim of eradicating the housing shortages of that time [47–50]. This goal was achieved, and in 2020, the large estates still provided a major part of the lower-cost housing in both countries. Even though the housing contexts in Sweden and France are not identical, there are similarities in the shift from universalist approaches to housing to restructuring policies aimed at social mixing through diversification and privatisation.

The housing provision models in France and Sweden were—in spite of differences in the numbers of units constructed—quite similar compared to other European countries [51]. Both models were aimed at all people, not just the poor. In Sweden, this was defined as a 'universalist' model, and in France, this was defined as a 'generalist' model, in which income ceilings were applied. A second common feature was the industrial mass production of housing and the design of modernist and functionalist layouts to include high-rise housing, traffic separation systems, and an enclave-like urban form [52–55]. Although the housing shortage was successfully eradicated, the large housing estates were criticised by architects and planners for being large-scale, homogenous, and monotonous; in Sweden, they were described as a 'newly constructed slum' [54] and in France they were criticised for creating 'urban isolation' [49]. Furthermore, segregation patterns in both Sweden and France have been reinforced over the past two decades by a process of social and geographical polarisation [32,33] with an increasingly racialised pattern, as low-income migrants have been relegated to primarily low-status housing estates [39,56,57].

Like other European countries, Sweden and France have implemented restructuring and social mixing policies to reduce segregation [58]. In France, the first renewal efforts to renovate estate housing were undertaken in the mid-1970s through the policy of 'Social Development of Neighbourhoods'. Sweden followed a decade later, launching its so-called 'Building Mix Policy' in the 1980s. A succession of area-based policies followed in both countries, targeting housing estates that were characterised by high unemployment rates, a foreign-born population, low income, and low education levels [59]. From the 2000s on, the aim of social mixing through mixed-tenure housing came to heavily define restructuring policies in both countries [41,60].

While the two countries initially identified housing as a key aspect of the welfare state, both have experienced—since the 1990s in Sweden and beginning in the 2000s in France—a process of housing deregulation and marketisation [55]. At the beginning of the 1990s, a paradigmatic shift took place towards deregulation, the abolishment of subsidies, and the rise of privatisation in Sweden [61]. In 2006, Swedish state housing subsidies were completely abolished, and the municipal housing companies were re-regulated from non-profit-driven to profit-driven and based on 'business-like forms' [62]. In France, privatisation was mitigated and did not begin until a decade later in the 2000s. Social

housing was preserved and expanded, albeit with a reduction in—but not the abolition of—state subsidies [63].

In conclusion, restructuring, privatisation, and area-based development in both Sweden and France have been criticised for failing at the goal of de-stigmatisation while leading to gentrification and the displacement of relocated households [57,64,65]. Research on social-mixing strategies through housing diversification has also highlighted limited social interaction between poor inhabitants of the neighbourhoods and newcomers, with both leading parallel lives [66]. Thus, the old residents do not benefit from the influx of new social groups, except for those who move upwards from social housing to buy one of the new flats [40,67]. In France, the location of the new private developments at the fringes of neighbourhoods—where new buyers can obtain tax reductions—increased social and spatial distance [14,39]. This re-highlights and concurs with research conducted in the 1970s and 2000s showing that spatial proximity of heterogenous social groups does not reduce social distance and may increase conflicts [68,69]. Adding to this criticism, we argue that these strategies of the 2000s also led to the rise of gating.

#### 3.1.2. Policy Arguments Underlying the Gating of Large Housing Estates: Safety, Modernist Critique, and Social Diversification

The gating of large housing estates is not a policy per se but rather a design practice that is embedded in urban restructuring policies. In France, it was formalised with the concept of résidentialisation at the end of the 1990s and officially included in the first urban renewal programme in 2003. In Sweden, the gating of large housing estates developed later, in the 2010s, and occurred as a consequence of area-based policies of diversification rather than as a direct policy. Despite these differences, the Swedish and French rationales and implementations converge in some respects, and they also have resonances with other European countries [70,71]. Our analysis shows that these rationales are structured around three different issues related to gating: safety, through the creation of a more 'defensible space'; a new urban design that was opposed to the 'dysfunctional' modernist architecture and planning and intended to contribute to a form of social de-stigmatisation; and social mixing through diversification.

The first argument is inspired by the 'situational crime prevention' theory that developed mainly in the United States and Britain in the 1980s and 1990s. Architects and scholars argued that spatial planning and design play an important role in crime prevention by discouraging offenders to act [37,72,73]. According to Newman [73], the separation of private and public space into clearly identifiable entities supports control over space and shared responsibility among residents. According to this line of thinking, smaller blocks and fences are considered a form of crime prevention. In both Sweden and France, crime prevention has been an argument for physical as well as social measures taken to counteract vulnerability and the stigmatisation of large housing estates. Résidentialisation clearly employed gating as a means of crime prevention. According to Bougenot [74], 'originating from the word résidence, résidentialisation aims at fighting against degradation and insecurity in large housing estates'. The rise of gating in poor and vulnerable areas was embedded within a wider expansion of safety measures in urban planning [11]. Résidentialisation in France was clearly inspired by British examples and by mutual visits of social housing managers through European networks that supported the dissemination of the practice [38]. In order to justify résidentialisation as a practice to make social housing safer, the notion of 'defensible space' was explicitly referred to in a public report [75]: 'It is necessary to make places more uncomfortable for offenders and produce not only aesthetics spaces but also manageable and defensible spaces'. Social housing corporations thus promoted gating as a safety measure. The aim was to control access to their buildings, restrict access to inhabitants only, avoid vandalism, and prevent youth from loitering on the premises. Swedish policy did not include fences and gates as a safety measure, but even so, safety and crime prevention were central issues for the government's 'Metropolitan Development Policy' of 1985–1994. The social problems arising from housing segregation were seen as threats that

could lead to 'social tensions, insecurity and crime'. Projects launched to upgrade large housing estates during the 1980s and 1990s alluded to ideas of supporting integration and defending space [59]. Typically, this involved physical safety measures, such as restricting accessibility by adding key cards and safer locks and improving visibility around stairwell entrances [60]. In both Paris and Malmö, physical measures to control behaviour and restrict access were supplemented by social measures that involved residents. Thus, the physical restrictions of résidentialisation often went along with a reorganisation of the management of housing and gardening projects [38]. In Malmö, resident participation in gardening and maintenance was highlighted as a means to decrease crime and to increase social control. In addition, the physical upgrading of public spaces in the Swedish estates was central [60].

The second argument for gating evolved from a critique of the modernist, urban design of large housing estates. This line of criticism draws on the work of scholars, such as Jane Jacobs [76] and Jan Gehl [77], who argued against modernist architecture and urban design while supporting the traditional town with grid plans and pedestrian streetscapes. The 'lively street' supports a positive 'life between buildings' and 'eyes on the street'. Modernist urban designs were criticised for creating spaces with little sense of 'neighbourhood identity' among residents. In addition, the large housing estates drew critique for their lack of diversity in urban functions and their lack of integration in the wider urban fabric [33,47,78]. In France, this approach has been defended mainly by architects, urban planners, and local mayors who have promoted gating as a way to clarify the difference between public and private spaces and to convert the open, public spaces to mixed use [70]. The aim is to clarify who the owners, managers, and users are. Gating is included in a wider restructuring of outdoor spaces to transform modernist urban plans and to introduce the design of a 'traditional city', reflecting a normative social representation of what a city should be. Streets, squares, and private gardens are at the core of this spatial redesign. One of the underlying assumptions is that large open spaces do not favour residents' appropriation. Instead, intermediate spaces created between the street and the building, designed as small front gardens, are thought to provide spaces for appropriation by residents. In Sweden, the 'Building Mix Policy' of the 1980s initiated the redesign of the large estates into more varied and mixed neighbourhoods [79]. 'Mixing' referred to mixed forms of tenure and mixed housing design, urban plans, and mixed populations [60]. Since the 1980s, strategies and projects have aimed to construct infill housing in the buffer zones between modernist areas and to reconnect wealthy and poor neighbourhoods through bike and pedestrian paths in order to support a lively streetscape [80]. In addition, plans to upgrade modernist housing estates suggest a design that would change the open urban form into enclosed courtyards as a way to introduce a 'traditional urbanism' believed to be more supportive of integration.

The third argument for gating evolves around the perceived need to increase social diversity in vulnerable housing areas, including the large estates. Restructuring policies in both countries note the need for a mix of social groups. Achieving social diversity through mixing is embedded in the same rationale as the abovementioned policies and practices of increasing the overall 'mix' of the housing estates. Foremost, social diversity means attracting middle-class residents to the large estates. This is achieved by introducing private housing through municipal housing associations, developers, and social housing corporations. In France, social housing corporations promote gating as a way to reduce the stigmatisation of neighbourhoods by adapting to the design of private housing. Both old and new social housing as well as new private housing developments, produced for tenure diversification, are gated. Gating forms part of a kind of diversification by design [13,14]. In Sweden, gating is being used around privately owned housing located in large housing estates with rental housing. Gating becomes a sign of 'private property', 'security', and 'keeping unwanted groups out'. Thus, even though gating has not been supported by local government (nor has it been counteracted), it can be understood as a consequence of the privatisation process. In order to diversify large estates both by attracting middle-income

residents and by providing housing for residents with higher incomes, local authorities have sold off rental housing and provided land to developers. This has increased the number of privately owned housing associations [30] who gate their properties.

Similar arguments and rationales regarding challenges and solutions can thus be found in both Sweden and France. In both countries, gating seems to be understood as a practical solution intended to answer the social and institutional challenges posed by large housing estates. The rationales for gating imply that positive social change can be achieved through urban planning and design, which is in line with the notion of the 'spatialisation of social problems' [81]. Altogether, the issues of 'defensible space', the 'dysfunctional' modernist architecture, and 'diversification' tend to support micro-segregation [10] in that they lead to differentiations below the neighbourhood scale.

### *3.2. Spatial Layouts of Urban Gating in Malmö and Paris: Four Types of Enclosure*

In addition to the similarities in the arguments underlying the development of gating, some principal similarities in the implementation of gating have also been found. Our comparison of urban districts led us to identify four types of *urban gating: complete enclosure; semi-enclosure; enclosure through densification;* and *enclosure of parks and playgrounds*. The first three examples are forms of urban gating around buildings, while the fourth example is a form of gating that encloses green spaces. Common to all of these forms of gating is that they comprise an enclosure of previously public space.

To begin with, 'the fence' represents the main symbolic act of gating in large housing estates. Unlike in affluent gated communities, where the 'gate' and the 'wall' are the symbols of the disaffiliation of wealthier groups, in vulnerable housing estates, enclosure is represented by the metal fence. The fence serves as protection against outsiders by means of locks and digital systems and with a height ranging between 2.5 and 3 metres. It also serves as a symbolic boundary between private and public space and as a legal property line dividing the public space managed by local authorities from the private space managed by the housing complex.

#### 3.2.1. Complete Enclosure

The primary form of urban gating is *complete enclosure* of housing (see Figure 1). In both Malmö and Paris, large urban housing estates typically take the form of freestanding slabs set in park-like environments. In both the Swedish and French estates, this type of gating comprises fences that completely enclose the entire housing complex. The French process of résidentialisation literally means 'changing social housing into middle-class residences'. Modernist urban plans are transformed into 'street-plot-block' planning, imitating urban row housing and thus creating smaller residential units. In large housing estates, each entrance of the original slabs is gated. This means that each entrance, serving approximately twenty to thirty flats, has fences towards the neighbours, fences and gates towards the street, and, sometimes, fences at the back of the building as well (see Figures 2 and 3). The underlying assumption is that fragmentation into smaller differentiated units will lend a specific 'socio-spatial identity' to each of the created units [82]. According to one social housing manager, '. . .this will make people feel at home/. . ./we should create more privacy and scale down' (respondent in Athis-Mons, 2007). In the case of Malmö, the first gated housing complexes in large housing estates belonged to private housing associations that decided to gate their properties. Here, as in other complexes that later followed their example, there is one main fence, with one gate, that completely encloses the entire complex, including the green areas (see Figure 2). In contrast to the Parisian practice, there is no subdivision by entrance. One reason is that one private housing association often owns one housing complex—one entire building. Thus, the fences are constructed at the property limit towards streets and neighbouring properties. The consequence is a fragmented urban space in which some housing slabs are gated while others are not. This leads to a distinct identification of which housing complexes within the large estates consist of rented housing, and which ones are private housing associations. It should be noted that the fences in

the Swedish large housing estates are visually very strong features. According to one resident, the fences made his housing complex 'look like a prison' (young man, Malmö, 2019). Another resident stated, 'I walk past fences with barbed wire every day. It is brutal. Ugly' (young man, Malmö, 2019). Unlike the wooden 'picket fences' found in wealthier parts of the city, the fences in estate housing are chain-like metal fences, sometimes with the addition of barbed wire and serrated metal above the gates [42]. Gating drastically changes the spatial layout, as fences and gates enclose previously public land or (as is sometimes the case in France) land without a clearly defined owner, in both cases fragmenting the modernist, open, park-like environment.

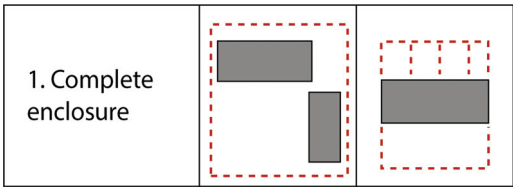


**Figure 1.** Schematic drawing of the spatial layout of complete enclosure.

**Figure 2.** Complete enclosure: example from Rosengård, Malmö. The entire property is gated, including the housing complex, playground, and green space. The gated entrance (**left**) and the fence along the property border (**right**).

**Figure 3.** Complete enclosure: example of résidentialisation in Athis-Mons, Paris. The entire slab is gated along the street (**left**) and the back garden, and there is a subdivision of each entrance (**right**).

3.2.2. Semi-Enclosure

The second form of urban gating in large housing estates in Malmö and in Paris is the *semi-enclosure* of spaces (see Figure 4). These fences cut across green spaces between individual high-rise buildings without comprising a complete enclosure. Still other fences are constructed between cycle paths and playgrounds and between cycle paths and housing. These fences function as a way to slow down mopeds and cyclists and to reduce the potential flow of pedestrians through the space in proximity to the individual housing (see

Figure 5). The protective aspect of fences is appreciated by some residents. One resident said, 'It is good for children since it keeps them from running out into the street' (young mother, Malmö, 2019). There are also cases where people do not accept complete enclosure and the fences are destroyed, making a space for people to pass through (see Figure 6). This may occur when an often-used pathway has been gated off and residents re-appropriate it, when the fence is a form of protection needed in only one direction, or when gates are left open or entirely dismantled. Whether the gating built is partial from the beginning or dismantled over time, what results in both cases is the same: a semi-enclosed space.

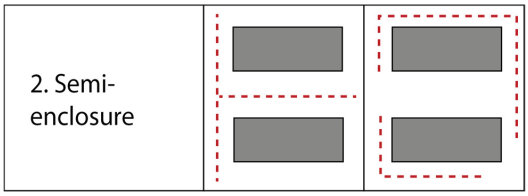


**Figure 4.** Schematic drawing of the spatial layout of semi-enclosure.

**Figure 5.** Semi-enclosure: example of a fence between a green space and the street in Rosengård, Malmö.

**Figure 6.** Semi-enclosure: example of a pathway where a fence has been taken away in Athis-Mons, Paris.

#### 3.2.3. Enclosure through Densification

Yet another influence on the spatial layout of the large estates is *enclosure through densification* of large estates (see Figure 7). Densification has been identified as necessary to achieve more sustainable cities, both in national and local policies and in urban development plans. The large housing estates are selected for densification projects due to their seemingly spacious layout in park-like landscapes. In combination with area-based policies, housing owned by private housing associations is added, often in block-like urban form (see Figure 8). In the French urban context, the new middle-class housing is gated, sometimes with several layers of fences (see Figure 9). Thus, the practice of urban gating does not solely target the slabs of the housing estates but has also been extended

to include new buildings. In the French urban restructuring projects, all buildings that replace demolished slabs are gated, and they are smaller units composed of 60 to 150 flats in one building with three to six floors. In Malmö, densification is a policy and practice in urban renewal that has led to the addition of privately owned multi-storey housing to the city's large estates. But, in contrast to the modernist plans, the new urban plan is designed around principles of the traditional and enclosed urban form. As urban gating is strongly related to privatisation, the prevalence depends on which housing is owned by private housing associations because they are the ones driving the process. This fact was not lost on young residents, who stated that gated housing equals 'private ownership' (young man, Malmö 2019). We observed the same perception among the residents in Athis-Mons, who associated urban gating first with private buildings and second with private car parks. In both Malmö and Paris, we found examples of housing that has been added to large housing estates as a form of urban gating and as a means of increasing urban density.

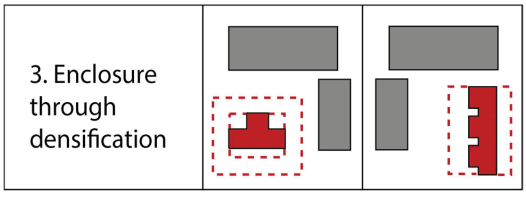


**Figure 7.** Schematic drawing of the spatial layout of enclosure through densification.

**Figure 8.** Enclosure through densification. Street with estates and addition of new private housing (**left**). New, private, and gated housing added to the large housing estate of Athis-Mons (**right**).

**Figure 9.** Enclosure through densification. Example of several layers of fencing in new, private housing in Athis-Mons.

### 3.2.4. Enclosure of Parks and Playgrounds

The fragmentation of public space is primarily related to urban gating around housing. In addition, however, there is a fourth form of gating that we call *enclosure of parks and playgrounds* (see Figure 10). This type of urban gating can be a solitary enclosure in the midst of a public green (see Figure 11) or an enclosure adjacent to the fences surrounding housing (see Figure 12). In the large French housing estates, the small residential units are an entry

point to also introduce participatory design and shared use of small community gardens and small public spaces. Landscape architects, planners, and social housing landlords who practice this type of enclosure are convinced that a small unit is more supportive of social interaction. Furthermore, people's participation is thought to ensure sustainable appropriation and social control of use and access. Similar urban gardening projects have been implemented in Malmö, although they have not been gated. Instead, playgrounds and small gardens tend to be located behind the gates of the private housing associations. The playground can be seen from the street, but in contrast to before, not all children can enter. In both Paris and Malmö, we find examples of gated parks and playgrounds in the middle of a green surrounded by housing.

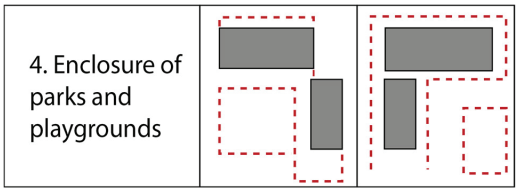


**Figure 10.** Schematic drawing of enclosure of parks and playgrounds.

**Figure 11.** Small enclosed park in a previously open, public space in Athis-Mons.

**Figure 12.** Small playground privatised for residents of gated housing in Rosengård.

3.2.5. Urban Gating of Large Estates: Towards a New Generative Model?

Urban gating in the large estates comes in many forms and shapes. These differences can be related to the adaptation of gating to the urban morphology, to the design of buildings and public space, but also to the management scale of social housing. Above, we have identified four types of gating, which all have in common that they comprise the enclosure of previously publicly accessible space (see Figure 13 below for a compilation of the four types).

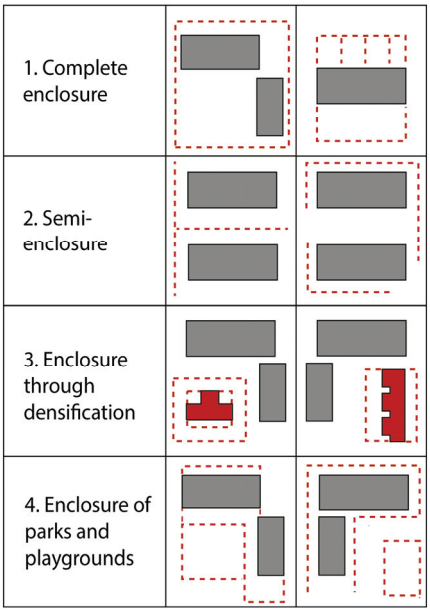


**Figure 13.** The four types of gating identified.

One consequence of urban gating is that it walls out the public from previously accessible places in the large housing estates. The fact that fences and gates act to wall out the public may seem self-evident. The paradox is, however, that the fences and gates are walling out the public from spaces they could previously access. Urban gating leads to a drastic reduction in the overall amount of public space. As a result, access is restricted, or denied, to greens, courtyards, passages, and in-between spaces that were previously available to the residents. Another consequence is that the urban gating of large housing estates leads to a significant change of morphology. It transforms the original modernist urban design of buildings in a park and fragments, subdivides, and privatises previously shared spaces. All of the forms of enclosure we have identified contribute to the fragmentation of public space, each by themselves and all together. The subdivision of modernist space into gated enclosures indicates that the notion of the traditional urban form dominates both in policy as well as in the implementation of upgrading and renewal projects. An urban design based solely on the two entities of the street and the block can be said to promote a generative model for cities, one which clarifies private and public spaces and produces smaller 'residential units' that can be sold to private developers. As a form of micro-segregation [10], the fences and gates materialise and make visible the social stratification between residents inside and outside certain buildings and blocks.

## 4. Discussion

*Imposing Urban Gating and Spatial Fragmentation of Large Housing Estates*

Urban gating is imposed on the residents of large housing estates. It is a process that is bound in policies and strategies developed outside the housing areas. The consequence of urban gating is a fragmentation to the scale of individual buildings and blocks, which influences residents' daily movement patterns.

In the large housing estates we investigated, urban gating is *imposed on residents* rather than being a choice of 'disaffiliation and withdrawal' [7] from society, as is the case in the gated community. To begin with, in both Sweden and France, urban gating emerged from national policies to 'improve' stigmatised housing, i.e., from outside the estates. Gating does not emerge as a spontaneous practice or a spontaneous demand from the inhabitants of

large estates. Instead, social housing landlords, public authorities, planners, and landscape architects use it to their own ends: partly to transform the urban form of the estates, but also to defend their own property. Gating is believed to solve 'social problems' in deprived areas, such as petty crime and lack of social control. Secondly, due to densification through private ownership, urban gating reflects the differences between social groups within the large housing estates. One might argue that there is a difference between the top-down policy imposed in France and the laissez-faire policy of Swedish authorities. It is correct that private housing associations in Sweden gate their own buildings, which may be seen as a form of withdrawal. But again, this is a consequence of restructuring policies and of adding private housing by densifying the estates. The process of densification thus reflects the differences between communities within the estates. While residents in gated communities supposedly share norms and lifestyles, the 'community' of the large estates is culturally heterogeneous. This was expressed in a comment made by a young woman in Athis-Mons: 'The residence is something private, quite strict while a cité [large estate] is a place where there are a lot of young people who do a lot of shitty things. This will never be a residence'. Third, the wall around a gated community is constructed to provide a safe space for a homogenous and socially dominant group, while the fences around large estates divide the shared space of a heterogeneous, deprived population into smaller spaces. Security in poor, deprived districts is a matter of national policy and the enforcement of police presence. Gating is based on a negative diagnosis of daily practices in deprived neighbourhoods. Urban gating is supposed to generate new social practices: avoidance of young people gathering but also more social control of the uses of the space and a better appropriation by the local residents. The impact on safety, however, is not obvious, even if gating does provide a feeling of security for some inhabitants [14,38]. One could argue, and rightly so, that residents see the necessity for reduction of crime, but gating is rarely the most efficient measure. Previous research in the UK and in the U.S. shows that gating in fact did not reduce crime and vandalism, but instead increased the amount of empty spaces, thus calling into question the relevance of space fragmentation as a form of crime prevention [11,83,84]. In Sweden, the implementation of restructuring policies for mixed forms of tenure and diversity of income groups, along with the construction of gating, has not led to a decrease in crime, as national police register statistics show. On the contrary, there has been an increase in what are referred to as 'especially vulnerable areas' on a national level [78]. In the estates we studied in Malmö, a new police station had been constructed even as the number of fences increased. Residents also question the securitisation of large estates by destroying fences they have deemed useless or counterproductive for local daily use. We saw similar tendencies both in France, where many fences have been destroyed, especially those that limit pedestrian access and mobility, and in Sweden, where gates are also left open and fences are destroyed.

Urban gating in large housing estates also means that public space is *fragmented down to the scale of the individual entrance or building*. First of all, there is an important difference of scale between the gated community and the gated estate. The gated community is often an entire neighbourhood, an area composed of several freestanding dwellings. The loop-and-lollipop urbanism common in the U.S. makes it possible to gate an entire area simply by gating the main access street leading into the community. The gated communities are criticised for fragmentation on an urban, city-wide scale [20,22], but in large housing estates, gating fragments the neighbourhood itself. As shown above, public space is fragmented into smaller units, from the tiniest front gardens to property boundaries around entire housing slabs, following the ideas of Newman [73] and planning ideals from the early twentieth century [85]. Secondly, the fencing strategy of urban gating appears to proliferate in large estates, especially around private housing built for diversification. As many as three separate layers of fences can be deemed necessary: one fence around the entire block, a second fence around the unit, and a third fence restricting access to the front garden and main entrance. Some respondents even interpreted urban gating as marking a shift towards greater distrust in Swedish society. A young man in Annelund said that gating 'tells of a

society where people don't trust each other, and even if the opposite is a utopia, it is still very sad'. Urban gating tends to create a new design for social and rental housing that risks adding a material expression of stigmatisation instead of reducing it. In the Malmö large housing estates, there is a visible demarcation between who lives in rental housing (is poor) and who lives in a private housing association (is better off), making polarisation manifest in a very visually apparent way. Third, space is also shared differently inside gated communities and gated estates. In affluent gated communities, sports facilities and open spaces are provided to residents. In contrast, public land in large housing estates is divided and fragmented and thus made less accessible and less useable for shared activities. A young woman in Malmö complained that she was shut out of places: 'I feel that it is so un-welcoming it makes me sick, especially since I used to play there as a child'. In large housing estates, (too much) public space is thus believed to promote violence and crime. Finally, the fragmentation of space also influences the daily movement of residents. Urban gating implies a sort of standardisation of use and behaviour. Interviews show that gating forces more controlled behaviour and restricts movement. A middle-aged woman in Athis-Mons explained: 'There were no fences before, we went ringing the bell at Pierre, Paul, Jacques... Now it is a pain in the ass... And these mail boxes... What do you do if you want to post a letter? You cannot enter directly into the stairwell...' In the large housing estates, residents have longer routes to take their children to the playground or park, and they may need to travel further to access goods and services that are no longer available locally.

## 5. Concluding Comment: Imposing 'Enclosed Communities' through Planning?

In conclusion, urban gating of large housing estates is a form of micro-segregation [10] that leads to 'enclosed communities'. As shown above, Sweden and France show similarities in the rationales for, and ideology behind, urban gating that tend to support micro-segregation in that it leads to differentiations below the neighbourhood scale. The pattern of micro-segregation that is materialised in fences and gates in the large housing estates investigated makes visible the social stratification between residents inside and outside certain buildings and blocks. Urban gating reinforces segregation patterns that already existed and that urban renewal has increased, but on a micro level, as it transforms the daily practices and movement of residents. Research on social-mix policies in France and in Sweden has highlighted positive outcomes for newcomers and middle-class groups. Young couples found housing opportunities through these new developments. However, being apart and physically distant from the 'cité' and the run-down rental buildings is something of a pre-condition for newcomers to move to these stigmatised large housing estates [86]. Gating is part of this process of distancing.

Urban gating of large housing estates can be seen as a practice of imposing 'enclosed communities' through planning. Rather than being 'gated', the large housing estates are 'enclosed' by policies and regulations formed outside the large estates. While the 'community' of the gated community is (at least in principle) based on some aspect of similarity between residents, the community of the large estates is a heterogeneous group of residents. The undoing of modernist urban space has political as well as material underpinnings. Clearly, there has been a political shift away from the old model of the welfare state in the provision of housing for the people of Western Europe [87]. The neoliberal restructuring policies of housing provision have paved the way for a social-mixing paradigm that has transformed the large housing estates. Materially, the modernist urban form, in which large open spaces were provided for residents, is now being gated into increasingly smaller units. The modernist idea of open space as a catalyst for neighbourly interaction has changed to a perception of open spaces as a catalyst for crime. This perception gives rise to a determinist view of physical design that gating is part of. Research that established a determinist relationship between physical design and criminality was developed decades ago, first in the U.S. [73] and later in the UK [72]. Critics argue that poverty is part of a wider social and managerial process [84,88] and not solely a matter of physical design. In spite of this

criticism, cities and social housing landlords use the same arguments forty years later to justify gating. The withdrawal of the welfare state, the social-mixing paradigm, and the determinist view on design result in new patterns of micro-segregation, designed as a continuous social standardisation of poverty-stricken zones through gating.

In spite of criticism from scholars and planners alike, gating of housing with socio-economically contrasting positions appears to be increasing and spreading. A growing body of international research shows how gating practices need to be analysed in their respective political and socio-economic contexts [3,4,17–20] in order to deepen and expand our understanding of gating. The contexts of Sweden and France analysed in this article show similarities in policies, spatial layouts, and the consequences of gating. Whether and how gating of poor urban districts in Europe and across the globe follows a similar standardisation process, and how their residents perceive these gated spaces, are important matters for future research.

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# The Construction of the Visible and Invisible Boundaries of Microsegregation: A Case Study from Szeged, Hungary

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**Abstract:** The concept of microsegregation has gained increasing popularity among researchers dealing with socio-spatial disparities in cities. This is because urban space has become increasingly multifaceted over recent decades, and the boundaries of socio-spatial segregation have also become increasingly subtle, often taking invisible forms below the neighborhood level. This study contributes to the literature on microsegregation by exploring small-scale forms of social disparities in one of the neighborhoods of Szeged, a second-tier city in Hungary. We used both quantitative and qualitative research methods to capture visible and invisible forms of microsegregation in the study area. An analysis of census data confirmed the coupling of socio-economic diversity and polarization at the census-tract level in three different forms as a result of various underlying factors, among which the sorting effect of the housing market plays a leading role. The results of in-depth interviews with experts and residents suggest that although the overall perception of the neighborhood is good and that serious conflicts do not occur, there are palpable socio-spatial differences and signs of segregation at the micro scale. The weak sense of segregation can be partly linked to the lack of public spaces where daily encounters between people from different social groups could take place.

**Keywords:** residential segregation; microsegregation; social mix; intersectionality; diversity; mapping microsegregation; post-socialist city

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## 1. Introduction

The seminal work of Burgess (1923), published 100 years ago, not only laid the foundations of human ecology but also focused the attention of researchers on urban segregation [1,2]. The city of Chicago, where the first urban social theory was developed, had large and noticeable segregated spaces [3]; therefore, early observations on segregation referred to large-scale horizontal spaces with distinct ethnocultural variations. Ever since, new approaches have appeared in the study of segregation, ranging from behavioral to structural theories, and, most recently, from examining the welfare state to political theory, with emphasis on different underlying forces of segregation [4]. However, the proliferation of theoretical approaches has, to some extent, overshadowed the relevance of the geographical scale. Segregation is a multiscale process that should not be overlooked by researchers.

Segregation in cities has been discussed in the literature, mainly in the context of racial, ethnic (religious), and socio-economic (class) characteristics [5–8]. Such forms of segregation usually manifest at visible boundaries on the macro scale (i.e., neighborhoods, districts, and larger urban zones), and they are reaffirmed via distinct features of the built environment, such as certain roads, fencing, gating, or landmarks of different cultures (e.g., churches). However, the social geography of cities has changed tremendously over the past few decades, which may be linked to the increasing professionalization of the urban workforce, intensification of migration, the mixing of different groups of people, rising levels of income inequality, and—at least in the countries of the European Union—systematic policies aimed

at enhancing social and ethnic mixing within urban neighborhoods. As a consequence of recent urban regeneration programs and multifaceted urban development, higher-income households tend to informally colonize neighborhoods that were previously considered less attractive and inhabited mostly by lower-class people. This means that statistically, social mixing increased in neighborhoods [9]; nevertheless, the coexistence of the rich and poor strata in certain areas of cities does not necessarily mean that daily interactions occur between residents, or that a cohesive local society exists. Conventional approaches to segregation fail to capture those situations where parallel societies coexist; therefore, in highly diversified neighborhoods, the boundaries delineating segregation often remain invisible [10]. To unpack such microscale differences in urban space, social geographers need to adopt new theoretical and methodological approaches.

The concept of microsegregation refers to urban milieus below the neighborhood level, where individuals living in close spatial proximity occupy unequal positions according to their socio-economic status or ethno-racial identity [11,12]. Contemporary urban processes, such as gentrification, the vertical expansion of cities, the spread of gated communities, and systematic policies to enhance social or ethno-racial mixing in neighborhoods, provide numerous opportunities for various forms of spatialized social hierarchy on a micro scale. Even though this type of segregation is not a primary issue for current urban policies, it is a persistent form of social hierarchy that affects the everyday life of most of the world's urban population. Another concept that deserves attention is intersectionality; this term has been used by scholars to describe an analytical framework of social justice [13–15]. Intersectionality has recently been employed in research focusing on issues relating to race, age, gender, and social class as it exists in urban space; hence, it is a useful tool for mapping and understanding both individual and intersectional structures of inequality and power.

The main objective of this study is to add to the literature on microsegregation by studying microscale forms of social disparities in one of the neighborhoods of Szeged, a second-tier city in Hungary. In this study, we used both quantitative and qualitative research methods to capture visible and invisible forms of microsegregation in our case-study area, and we attempted to explain the underlying factors of small-scale inequalities.

In the remainder of the study, first, we discuss the most relevant literature on microsegregation, followed by the introduction of the study area, a discussion of our research methods, and the main results of the research. Finally, we discuss the main findings and conclude our study.

## 2. Materials and Methods

Even though the concept of microsegregation has only recently become popular in the literature, the phenomenon was observed and documented much earlier in major European cities such as Naples and Paris [16,17]. Over the past 30 years, the relevance of the concept has increased in urban social theory as research on various aspects of microsegregation has intensified, and an increasing number of cities (e.g., Athens, Shanghai, and Tel Aviv) have become subjects of investigation [18–20]. Despite the growing number of studies that aim to capture and understand small-scale social segregation, there is still an immense gap regarding its definition, forms, and possible conceptual and methodological approaches.

The first studies on microsegregation focused on vertical residential segregation in Athens [21,22]. These were followed by more recent studies in Bucharest [23] and Marseille [24]. Vertical segregation is one of the most classic forms of microsegregation; however, it is not the only possible manifestation of the phenomenon that is worth studying. As the topic has gained growing attention, researchers have started to explore other types of microsegregation, such as horizontal segregation below the neighborhood level and small-scale gentrification [25–27]. The authors have concluded that the spatial manifestation of microsegregation depends very much on local specificities, such as social stratification or the role of the state in the housing market [23,24]. According to previous research results, microsegregation can be seen as the outcome of the interplay of the conscious decisions of people at the micro scale and the framework conditions, primarily housing policy, sustained

by the state at the macro scale. These factors change over time (e.g., due to globalization and migration) and may give rise to new forms of microsegregation. In this respect, following Simandan's recent analytical work [28], our study traces the transformation of space and society on a geographical scale, juxtaposing personal change and wider societal change.

Research on (micro)segregation has revealed most often the ethnic/racial/cultural aspects of the phenomenon; however, very little has been said about its socio-economic aspects (e.g., occupation and income). Recent research on small-scale segregation in schools has focused on exploring differences on a micro-geographical scale, and results suggest that family background is a basic factor of children's segregation within schools and that intermixing families with different socio-economic backgrounds does not necessarily result in good neighbor relationships between them [29–33].

Numerous studies suggest that microsegregation, described in different countries and cities, can manifest in a great variety of ways, and the main disadvantage of this diversity is that no single, commonly accepted definition has been developed yet. A key aspect of the most commonly used definition of microsegregation is scale, where the upper limit of the study area(s) tends to be at the neighborhood level, but small-scale census tracts are also often studied, while the smallest units of analysis are at the building/block level. Most recently, in their study on Hong Kong, Ho and Yip [34] introduced the concept of nanosegregation, which refers to the coexistence of multiple households with different socio-economic statuses in a single apartment. Despite these recent developments, we believe that the importance of understanding the neighborhood should not be overlooked in segregation studies. Neighborhoods as "lived-in" spaces provide an opportunity for geographers to study the everyday interactions of residents, their lived experiences of the neighborhood, and concomitant spatial formations [35]. The spatial formation of the neighborhood is multiscalar, which provides geographers with an opportunity to study who lives in a neighborhood and how invisible boundaries of residential segregation are created [36]. Another challenge in the study of microsegregation is that even though the process shares many similarities with the large-scale horizontal segregation of neighborhoods, the methodology of the latter is not fully applicable because more attention needs to be paid to small-scale dimensions of space (e.g., verticality, streets, and blocks). As a result of microscale mechanisms, segregation and social isolation within buildings, streets, and blocks become detectable, and urban space becomes much more variegated than the previous observations by researchers in the context of spatial segregation at the macro-urban horizontal level.

A common feature of previous studies on microsegregation is that they have been carried out in major cities at the top of the urban hierarchy, focusing mostly on the ethnic aspects of segregation, and particularly on vertical residential segregation in the skyscrapers of US and Asian cities [19,37]. Both the ethnic/religious aspects and verticality are present in studies focusing on microsegregation in European cities (see e.g., [8]); however, the majority of studies lag behind the US and especially Asia. This can be explained by the historical pathway of European urban development, long-term urban traditions, and stricter regulations regarding building heights and verticality. However, European countries are not homogeneous either; the development of the former state-socialist Central and Eastern European countries diverged from the Western pattern of urbanism after World War II (e.g., the dominance of the state in the housing market). State socialism could be characterized by high levels of employment, homogenization, and egalitarianism in the labor and housing markets as the main principles of societal life [10]. This system was disrupted abruptly in 1989/90 with the collapse of state socialism. In the early 1990s, the dismantling of central planning and the shift to a market economy resulted in a widening gap in income distribution within these societies, which was intertwined with social differentiation of urban space, including the upgrading and downgrading of neighborhoods, gentrification, and ghetto-formation, and the emergence of poverty and wealth [38,39].

All these processes have been present in Hungary since the early 1990s, which turned the attention of researchers to urban social segregation and resulted in a growing number of

investigations. The marginalization of low-income groups, including the Roma population, and their distinct presence in the cityscape, has been the subject of several studies [40–43]. Research on segregation in Hungary has not only covered the fields mentioned above but has also focused on segregation at work and in schools. The concept of microsegregation has not been neglected in Hungary either, with studies focusing on Budapest (and comparing it with Athens and Bucharest) [44–46]. However, these studies deal exclusively with Budapest, the capital city of Hungary. The main advantage of cities at the top of the urban hierarchy is that they are not only destinations for domestic but also international (global) migration, providing various opportunities for distinct (visible) forms of segregation. The size and diverse societies of global cities make them popular locations regarding (micro)segregation research, whereas research on segregation, especially on the micro forms of the phenomenon, in cities at lower levels of urban hierarchy, is largely missing [47].

Szeged is the third most populous city in Hungary, situated on the southern periphery of the country [48], and it is one of the rare examples where the process of ethnic segregation has been studied intensely in recent years [41,49–51]. Publications in the field reflect the fact that segregation of different socio-economic and ethnic groups is an equally important issue at the lower levels of urban hierarchy. In the early 2010s, research on school (de)segregation in Szeged addressed the conditions of pupils in the school system in depth [52]. Several studies have been published examining segregation in Szeged; however, the phenomenon of microsegregation has not yet been addressed.

Therefore, the main objective of this study is to address the aforementioned gaps, providing evidence about different forms of microsegregation in a relatively small neighborhood at the lower level of urban hierarchy.

## 3. Research Design

### *3.1. The Study Area*

The study area, Rókus, is one of the neighborhoods in Szeged, the third largest city of Hungary, located in the southeastern part of the country adjacent to the border with Serbia (Figure 1). According to the Hungarian Central Statistical Office (HCSO), the city had a total population of 168,000 on the eve of the 2011 census, and it is the primary administrative, economic, and cultural center of southeastern Hungary [53].

The study area is the home of approximately 9300 inhabitants (2011), i.e., about 5.5% of the city's population. In terms of the age and physical parameters of the building stock and the socio-demographic characteristics of the residents, the neighborhood is highly diversified. The inner part of the quarter, close to the city center, has a traditional, small-town character, with apartment buildings of two–three stories, mixed with terraced houses and semi-detached houses built predominantly at the turn of the 20th century. Architecturally, the buildings follow a simpler version of eclectic and Art Nouveau styles. Its original population came from traditional farms in the surrounding area, and due to widespread pig breeding, the area was called "Kukoricaváros" (Corn City), and its inhabitants were called "Kukoricapolgár" (Corn Citizens). By the beginning of the 20th century, the area became dominated by lower-rank officials, artisans, soap makers, and pig farmers. After World War II, the neighborhood was affected by rapid transformation and upgrading. As part of the state-socialist housing policy, some of the traditional, single-family houses were demolished in the northwestern part of the neighborhood and were replaced by multistory, prefabricated residential buildings as part of a large housing estate. The 1970s and 80s brought about further densification and transformation of the neighborhood with new public (e.g., schools, kindergartens) and commercial functions, and, consequently, its rural appearance gradually changed into a high-density and high-rise urban landscape [54].

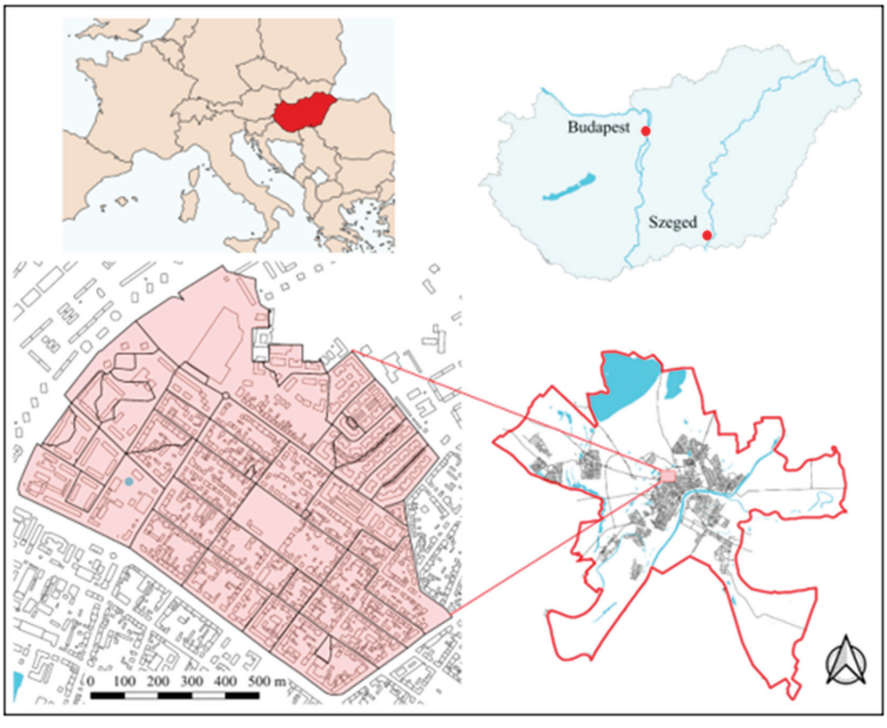


**Figure 1.** The study area: the Rókus neighborhood in Szeged, Hungary.

The transformation process of the traditional Rókus neighborhood continued even after the collapse of state socialism in 1990. The old housing stock deteriorated rapidly, and some of this was replaced by newly built, high-quality condominiums after the turn of the millennium. The latest housing development in the area is the "Franciahögy" residential park, an upmarket gated community built on the former site of the Rókus cemetery. The new infills and the gated community resulted in an influx of upper-middle-class families to the area and gave impetus to the rise of its prestige. All these developments resulted in the rapid change in the building stock of the neighborhood and the transformation of its society. Today, the neighborhood can be considered one of the most diverse areas of Szeged with the potential to manifest various forms of microsegregation (based on age, education, ethnicity, socio-economic status, etc.). However, due to its complexity, the segregation of the area cannot be interpreted in the traditional sense of neighborhood-scale segregation; instead, it is manifested at the lower geographical scale, at the block and street level.

### *3.2. Data and Methods*

This study approaches microsegregation from a new methodological perspective, employing a mixed-methods approach. During the study, we used both quantitative and qualitative research methods to unpack different forms of microsegregation in the neighborhood of Szeged.

As part of the quantitative analysis, the housing and socio-economic data of residents were obtained at the census-tract level from the Hungarian national census of 2011. The last census of Hungary was held in November 2022 (due to a postponement caused by COVID-19 in 2021), but data with fine spatial resolution are not yet available. However, we think that the 2011 census data, collected by the HCSO, are sufficient to capture microscale socio-economic differences within the neighborhood under investigation. The focus of the study was on the positions of residents in the occupational structure and their demographic

and household characteristics. Notably, we used the International Standard Classification of Occupations 2008 (ISCO08) to group active earners according to three broad categories, namely Managers and Professionals (higher ISCO08 categories 1 and 2); Technicians, Office Employees, and Service Workers (intermediate ISCO08 categories 3, 4, and 5); and working-class categories comprising manual laborers in industry, construction, transport, etc. (lower ISCO08 categories 6, 7, 8, and 9). These three ISCO08 categories roughly reflect the socio-economic status of residents. In addition to occupational data, we used other variables (e.g., demographics, size, and comfort of housing) from the census to depict microscale boundaries of segregation in the study area.

To examine the internal heterogeneity of the study area, we used the Shannon–Weiner Species Diversity Index for the ISCO data at the census-tract level. The diversity index is widely used in biology, and it is a quantitative measure that reflects how many different types of species there are in a community. It is calculated by taking the number of each species, the proportion of each species of the total number of individuals, and summing the proportion times the natural log of the proportion for each species.

$$H = -\sum_{i=1}^{s} \ln p_i * p_i$$

where $H$ is the species diversity index, $s$ is the number of species, and $p_i$ is the proportion of individuals of each species belonging to the $i^{th}$ species of the total number of individuals. Higher values reflect higher diversity in the area; the lower the value, the more statistically probable the dominance of one or two social groups. Diversity and polarization should be interpreted in the following way. Although diversity refers to a heterogeneous social environment that contains various social groups, polarization means that heterogeneity is the outcome of the presence of two opposing groups in the area, i.e., in this case, the top and bottom occupational groups.

To detect diversity and polarization simultaneously, we also took into consideration if the diversity of a census tract is caused by the presence of the highest and lowest ISCO categories together. To capture polarization within diversity, a three-fold legend was created labeling the low, average, and high values. The higher the H-index value, the more diverse the census tract in terms of the different ISCO groups. The lower the H-index value, the higher the probability of the presence of a dominant ISCO group; therefore, a lower $H$-value can also mean a more polarized census tract. However, we were interested in polarization, which was caused by the simultaneous presence of both the low and high ISCO groups. This also meant that the dominance of two specific ISCO groups could result in lower diversity values in some of the census tracts.

To determine when diversity and polarization coexist, we considered the share of the two opposite ISCO groups (ISCO 1, 2 and ISCO 7, 8, 9 occupational groups), and we compared their distribution to a perfectly equal distribution (where each group has the same number of individuals). Since the upper-status occupational group represents two categories and the lower group represents three categories, we looked for cases where the share of ISCO 1 and 2 exceeded 20% and ISCO 7, 8, and 9 exceeded 30%. Only two census tracts met this strict condition. Subsequently, we examined whether the values within each group exceeded the average values measured in all census tracts. This allowed us to identify tracts that are not only diverse but also show both ISCO groups to be above or very close to the average value. Thus, we established the final delineation of the census tracts.

The quantitative analysis was elaborated by qualitative data collection. This phase of the research was based on semistructured in-depth interviews with experts and residents. First, we conducted structured interviews with experts who are familiar with the area and have insight into its social processes. The interviewees included teachers, school psychologists, and real estate agents. Second, we interviewed residents of the neighborhood who experienced its social and community processes from the inside. Altogether, 16 interviews were conducted between March and June 2023. The interview-based research had three main focal points.

The primary focus was on the spatiality of social segregation. At the beginning of the interview, we asked respondents whether they observed any form of social segregation in the neighborhood and whether there were noticeable spatial boundaries as regards the socio-economic status and attitude and lifestyle of the residents. This question aimed to validate the quantitative research findings with qualitative data. Additional questions also focused on mental boundaries and whether any perceived boundaries were caused by experiencing fear or harassment in the area. Concerning segregation and dividing fault lines in the sample area, we were also interested in whether respondents experienced or heard about any conflicts between different social or ethnic groups, and if there were any visual (graffiti or wall writings) or spatial (avoided streets) manifestations of such conflicts. The final set of questions focused on the general socio-economic characteristics and lifestyle of the interviewees. This aimed to determine whether there was any difference in terms of the use of space, everyday activities, and use of services. Based on the answers, we tried to define the invisible boundaries of social segregation and their construction in the study area.

We were also interested in whether the delineation of census tracts may hide certain forms of microsegregation at the street or block level from a statistical perspective, making them invisible simply by drawing boundaries. Therefore, we paid special attention to those areas where, based on previous experiences and a preliminary field survey, the occurrence of microsegregation was adjudged possible. We treated these areas as a priority in the qualitative survey to gather evidence of boundary drawing that might blur microsegregation.

## 4. Results

### *4.1. Quantitative Aspects of Segregation in Rókus*

Population and housing statistics from the 2011 National Census reflect high diversity in the study area of Rókus within the city. The demographic structure of the population is younger, and the share of active earners is significantly higher than the city's average (Table 1). Taking into account the level of education, the ratio of people with tertiary education is also well above the city's average and consequently, the share of the top socio-occupational categories (ISCO1–2: Managers and Professionals) is also significantly above the overall value of Szeged. Conversely, the share of lower socio-economic groups (ISCO7–9: industrial workers, machine operators, unskilled workers) does not deviate much from the city's average. This implies higher-than-average socio-economic diversity and polarization within Rókus. Polarization is also confirmed by data on the local housing market. The share of old housing (built before World War II) is similar to the average of the city; however, the share of the new housing stock is much higher. More than half of the local housing stock was built after the political changes of 1990. The higher share of new housing indicates that the ratio of smaller (one-bedroom) dwellings is nearly double the city's average. We can conclude that basic statistics from the last census reveal a high level of mix regarding both the socio-economic profile of residents and the housing stock in the area. Now, it is an intriguing question how unevenly different housing forms and socio-economic groups are distributed in the area and what types of microscale inequalities can be detected in Rókus.

As Figure 2 shows, old, pre-socialist housing stock (in multistory apartment buildings built before 1946) prevails in the southeastern part of the neighborhood. This part of the study area also contains some public rental units, which are scattered throughout the census tracts and are of generally low quality (see (1) of Figure 3). Post-World War II socialist-era housing in the form of prefabricated 4- and 10-storey blocks occupies the northwestern part of the neighborhood with standardized architecture and homogeneous quality [55] (see (2) of Figure 3). This part of the neighborhood was reconstructed between 1978 and 1990 in three phases when old low-quality and low-rise buildings were demolished and replaced by high-rise housing built by the state with prefabricated panel technology. The level of comfort rose, uniform two-room apartments with bathrooms and central (district) heating became dominant, and consequently, the living conditions of residents also improved

significantly. As some of the literature has noted in the housing estates of the 1970s and 80s, the proportion of less-educated working-class people was higher among the new residents compared to the previous decades when the allocation of new state-built housing was more elitist [56,57]. Therefore, we expect above-average social mixing in this part of the local housing stock.

**Table 1.** Population and housing characteristics of Szeged and Rókus.

| | **Szeged** | **%** | **Rókus** | **(%)** |
|---|---|---|---|---|
| Population | 168,048 | 100.00 | 9237 | 100.00 |
| Age group 0–14 years | 21,860 | 13.01 | 1552 | 16.80 |
| Age group 65+ years | 27,258 | 16.22 | 833 | 9.02 |
| Tertiary education | 36,551 | 21.75 | 2242 | 24.27 |
| Active earners | 61,699 | 36.72 | 3917 | 42.41 |
| ISCO1–2 | 20,965 | 12.48 | 1381 | 14.95 |
| ISCO7–9 | 18,247 | 10.86 | 973 | 10.53 |
| Housing | 70,821 | 100.00 | 4018 | 100.00 |
| One-bedroom dwellings | 5988 | 8.46 | 569 | 14.16 |
| Four+−bedroom dwellings | 13,701 | 19.35 | 653 | 16.25 |
| Built before 1946 | 8919 | 12.59 | 487 | 12.12 |
| Built after 1990 | 13,425 | 18.96 | 2043 | 50.85 |
| Low-comfort dwellings | 1876 | 2.65 | 119 | 2.96 |

Source: Hungarian Central Statistical Office (HCSO), National Census 2011.


**Figure 2.** Share of housing built before 1946 (1), between 1946 and 1990 (2), and after 1990 (3) in Rókus (Szeged), Hungary.


**Figure 3.** Different built-up forms in Rókus (Szeged), Hungary. Source: Hungarian Central Statistical Office, National Census 2011.

Between the two edges of the neighborhood, a transitional zone can be identified where the relative density of new, post-socialist housing, built after 1990 is high. This transitional zone where old (pre-WWII) and new (post-1990) housing are intermixed consists of two parts, namely the northeastern tracts, where the Franciahögy residential park is located, and the southern tracts, where old tenement blocks are mixed with new, upmarket infills. This type of development is also well-documented in other post-socialist countries [47,58]. Franciahögy was the first gated residential complex to be constructed in Szeged between 2000 and 2007 when this form of housing started to mushroom in Hungary at the turn of the new millennium [59]. It was developed with relatively dense, uniform, and monotonous apartment buildings, adhering to building regulations by making intensive use of the rooftops (see (3) of Figure 3). Thus, despite the buildings appearing to be 1–2 stories in height, there are two additional levels of living space underneath the tall and complex roof structures. Franciahögy is well-known both in the public consciousness and the real estate market in Szeged, and it is generally identified as a high-status, new housing development built for middle-class families. In the south of Franciahögy, in the center of Rókus, we find heterogeneous housing stock where pre-WWII and post-2000 apartment houses are mixed. New housing construction in the past two decades took place in the form of upmarket infills on vacant plots and as a replacement for old housing after demolition (see (4) of Figure 3).

Figure 4 shows that socio-spatial inequality within the study area is relatively high. Members of the top occupational categories (Managers and Professionals) tend to be concentrated in the southeastern part of the neighborhood (see Figure 4A), while lower socio-economic groups (laborers in industry, construction workers, machine operators, and other "elementary occupations") are overrepresented in the northwestern part of Rókus, where the housing market is dominated by multistorey prefabricated buildings (see Figure 4B). We were interested not only in the spatial segregation of the top and

bottom occupational categories but also in the level of diversity and polarization within census tracts.

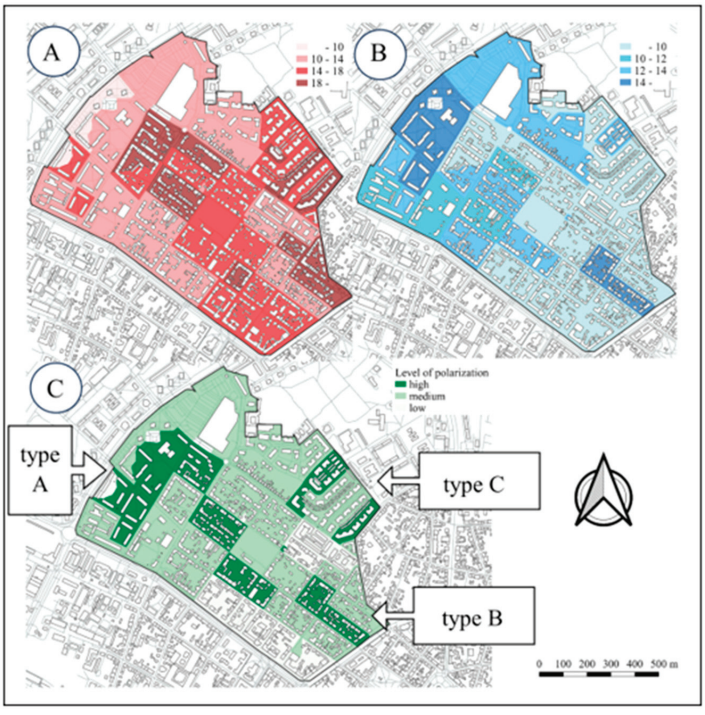


**Figure 4.** Share of top (**A**) and bottom (**B**) occupational groups, and the level of social polarization (**C**) in census tracts in Rókus (Szeged), Hungary. Source: Hungarian Central Statistical Office, National Census 2011.

As a result of diversity calculations, three distinct (see Figure 4C) areas could be identified in the sampled area. For each census tract, we examined whether there is a coincidence of social diversity and polarization, i.e., the above-average presence of the top (ISCO 1–2) and bottom (ISCO 7–9) occupational categories. Research results showed that diversity and polarization go hand in hand only partially. With a high level of diversity, in some cases, we also experienced lower levels of polarization between the ISCO groups. However, we found three distinct areas that were not only diversified but also polarized with higher shares of the top and bottom ISCO categories. These census tracts were depicted on our map in dark green.

The first type (A) is associated with prefabricated high-rise housing estates from the state-socialist period. As a result of the socialist housing allocation policies aimed at equalization, both top and bottom ISCO groups are concentrated with above-average shares in the area. In addition to easing housing shortages, the main aim of the development of large housing estates was to reduce spatial segregation within the society, allowing working-class and white-collar workers to mix in the newly erected housing estates. The results of these efforts are still noticeable today. Notably, prefabricated housing estates in general provide a good entry point for young families to the housing market as such smaller apartments can be obtained at an affordable price level. This, in turn, leads to the mixing of different social groups from both the top and bottom ISCO categories.

The second type (B) is represented by the transforming and dynamically changing area with a mix of historical civic houses and infill developments. In census tracts with infill-type developments, it is common to find two very different types of buildings (old

and new) on the same street. Furthermore, these stark contrasts regarding the age, quality, and aesthetic appearance of buildings may be observed next to each other. One building may be well-maintained, modern, and visually pleasing, while the next may be neglected or dilapidated. New buildings are integrated into the existing, already heterogeneous environment where different architectural styles and building qualities intersect. Such microscale disparities have consequences for the everyday life of residents, the level of interactions between them, power relations, and social cohesion.

The third type (Type C) is related to the Franciahögy residential park, which was built as an upmarket residential development some two decades ago. Here, a peculiar mix of horizontal and vertical segregation can be observed at the microscale due to the type of construction. According to real estate experts, apartments on lower levels are bigger and relatively more expensive, while attic conversions are smaller and less desirable due to the risk of leakage, stairs, and a smaller usable floor area. This creates vertical segregation within the buildings. In addition, buildings located on the edges of the residential park experience disadvantages as they are more exposed to traffic noise and vibration, resulting in lower property values. This type of pattern leads to both vertical and horizontal segregation in Franciahögy on the microscale.

### *4.2. Qualitative Aspects of Segregation in Rókus*

The main aim of the in-depth interviews was to capture the invisible boundaries of social segregation, how they are perceived by the residents, and how they are constructed. Concerning the visible differences manifested in the urban fabric (described above), we were interested in how interviewees perceived the differences observed in the built environment of the neighborhood. According to the interviewees, in terms of physical appearance, the socio-spatial segregation of different areas in the multifaceted district is not so evident. The most distinct profile is attached to the Franciahögy residential park, and according to the interviewees, the residential park stands out from the rest of Rókus in both architectural and social aspects. In the residential park of Franciahögy, it is noticeable that families move in because of the small green gardens and playground [which reflect their lifestyle-driven preferences for real estate], says one interviewee. As mentioned earlier, the Franciahögy development differs from other parts of Rókus both in terms of the real estate market and social indicators, and this difference is confirmed by the interviewees. According to one high school teacher, it is becoming increasingly common for parents/students to choose a school near their place of residence. Many students come from nearby high-quality schools, thanks to the residential park in the area. More young families are living in the park, and they send their children to this school. Regarding the general perception of schools, a teacher at a low-status technical school observes that few students from the nearby residential park come to the technical/vocational school, whereas significantly more students come from the housing estate environment to the institution. This indicates that residents of the residential park, who are wealthier, tend to choose the higher-ranked grammar school, which creates segregation invisibly in the area.

In other parts of the neighborhood, which differ in physical character (prefabricated high-rise buildings and single-family houses), there is no perceptible socio-spatial segregation according to the respondents. Franciahögy is considered a divisive area among buyers due to the quality of the buildings and its previous function (cemetery), says a real estate interviewee; however, there is no strong opinion regarding the other areas. Although the study area is characterized by more valuable and less valuable parts from a property market perspective and streets to be avoided, the sense of a diverse community and the diverse composition of the population is more prevalent, which is also reflected in the real estate market value. The third part [mixed residential part of Rókus] is completely mixed, and the buyers cannot be delineated by a single type. One interviewee explains that the transforming area, between Hétvezér Street and Tavasz Street, is not among the popular destinations, but there are differences within the streets, says another interviewee. Therefore, in the case of Rókus, socio-spatial segregation is based not on larger spatial units,

such as census tracts or blocks, but rather on some smaller microscale entities (e.g., specific streets or territorial clusters). One interviewee also points out that generally, the higher the share of people living in municipal rental housing (IKV) within the block, the worse it is, indicating that housing tenure and the related socio-economic conditions also influence the perception of the area. The different merits and people's perceptions of various parts of the study area became evident from the interviews. Although some respondents generally find the neighborhood beautiful, livable, and safe, there is a growing concern regarding the area being noisy when closer to the main road.

The sense of segregation in the neighborhood is more influenced by the visible factors (appearance), and condition of the built environment rather than the other way around. This inverse relationship is reflected in the responses of the interviewees as they believe that socially lower-status households tend to live in low-quality and older buildings. According to one real estate agent, the study area can be divided into separate subareas with different buyer profiles. The vicinity of the boulevard, the mixed-use area, and the panel buildings can all be considered more affordable housing, the former because it is located slightly farther from the city center and the latter due to its general perception.

As the results of the interviews showed, there is no significant segregation based on ethnicity in the Rókus neighborhood. The respondents mentioned the presence of Roma people in the area, but there is no noticeable contrast. The interviewees consider the neighborhood to be safe, and they do not have a sense of fear. There are certain streets where Roma people are more prevalent; however, the respondents believe that it is possible to avoid those areas. Some interviewees mentioned that people in the neighborhood are divisive, indicating a diverse population. One respondent who lives in the mixed part of the neighborhood appreciates the sense of inclusion brought about by the mixing of social groups: I believe it prevents anyone from being marginalized, including the homeless and the poor. When asked about conflicts arising from ethnic differences, only one respondent reported a verbal conflict involving Roma people, but they do not consider the area dangerous or prone to segregation. They mentioned that the Roma people were shouting and begging on the street. Some interviewees mentioned that the area is affected by the presence of homeless people and individuals struggling with alcoholism, both men and women are among them. In addition, there is a person with mental health issues residing in one of the panel buildings, who has been threatening the residents. Unfortunately, the residents have not received any assistance in resolving this situation. The presence of a mixed population is demonstrated by an interviewee stating that neighbors were harassing each other, which is a sign of conflicts related to land use.

A primary school teacher mentioned that the local primary school has students from different (lower) social groups every year, but their number is small, and their peers are accepting of them. Another interviewee stated that the lack of a secure social background and stable family represents segregation within schools. This underpins that the multiple family factor is the reason for potential segregation in schools, and it is not only the ethnicity or the color of skin. Even though people perceive no strong segregation, some interviewees mentioned that "the Roma community tends to keep to themselves away [from the majority when using public spaces]", which could be seen as a form of mild segregation. They also noted that there is no real interaction with the Roma, and therefore, their presence in the neighborhood was not causing any problems. The income situation in the neighborhood is indicated by an interviewee who mentioned, "There are few truly impoverished individuals [...but] income does not determine the dynamics of the student community". Another interviewee did not emphasize ethnic divisions, but rather, highlighted differences caused by wealth disparities. She stated, "Roma children do not cause a problem in school; they perform well, but there is an increasing number of young influential parents [...] segregation becomes noticeable not only among parents but also among children; snobbishness tends to emerge". Some of the interviewees perceive segregation and "cliques" among both the wealthier and the poorer groups; however, at the end of the day, most respondents

have a good relationship with their neighbors and actively initiate conversations within the neighborhood.

To assess possible forms of social segregation manifested in lifestyle, we asked interviewees for reflections regarding their leisure activities, hobbies, and living conditions. Based on the responses, regardless of their workplace position and occupational status, there were no significant differences in how they spent their free time. Furthermore, the diverse hobbies reflect, to some extent, their income status. The most common hobbies mentioned include reading, sports (such as tennis, home workouts, team sports, cycling, and Pilates), hiking, and pottery making. In addition to these pursuits, interviewees also expressed concern about the lack of community spaces and playgrounds, which limits the outdoor activities in the neighborhood.

According to the statistical analysis, the study area has no highly segregated parts and is not endangered by severe forms of segregation. This is also influenced by the territorial division of census tracts. The territorial units are established at the local level, and they divide the problematic streets, Tavasz and Hétvezér. Therefore, the higher proportion of the Roma population might not be reflected in the area due to the way the census units were defined. As confirmed by one real estate agent interviewee, it is observed in every neighborhood in Szeged, including Rókus, that there is at least one less safe street, and if you go one street further or around the corner, it is already considered a good neighborhood. One interviewee highlights the process of filtration and a small-scale concentration of Roma people. "[Roma population] tends to cluster in smaller focal points within the city, such as certain houses or blocks. Houses where only Roma people lived were considered more turbulent areas [. . .]; however, these buildings were demolished, and new ones were built in their place".

Based on the experiences from field visits and interviews conducted with real estate experts and residents, the changing character of the area is also sustained by population change. It is often observed that in the vicinity of older and poorly maintained buildings, new multi-apartment condominiums are being constructed as infill developments. As a result, within the area, the sense of a diverse social community mentioned earlier is formed among the locals. In addition, the social polarization of the neighborhood is visibly and partially perceptible as a parallel process. The condition and character of the buildings influence the perception of the property and its surroundings. One real estate agent mentions several factors that contribute to the lower value of old, historical civic houses and newly built attic apartments. A ground-floor or a first-floor property is not as bright as a top-floor one, as they lack sufficient sunlight, making them more challenging to sell and only at a lower price. Concerning top-floor apartments, many people fear that the roof might leak, which also devalues and lowers their prestige in the eyes of buyers. All these affect the target market as well.

## 5. Discussion and Conclusions

This study aimed to investigate existing forms of microsegregation in a selected neighborhood of Szeged (Hungary) with a complex methodology. Socio-economic data from the last census (2011) revealed clear differences between the census tracts regarding the level of education, occupational status, and housing conditions of the residents. The Franciahögy residential park is a very distinct and highly segregated area within the neighborhood, which was confirmed both by statistics and interviews. However, our results also showed that even within this microsegment of the study area, further manifestations of microsegregation exist both in horizontal and vertical terms. Outside Franciahögy, the study area can be considered rather heterogeneous but less segregated.

The findings highlighted the interplay of diversity and polarization in two different ways. Higher diversity generally reduces the likelihood of polarization; however, when the presence of two opposite groups (top and bottom ISCO categories) is the source of diversity, the level of polarization is also high. In the sample area, we identified three distinct areas that fall in the latter category. They represent three distinct types of urban

fabric that are the results of past and present housing policies. One of them is connected to the prefabricated high-rise estates from state socialism, another represents the postmodern gated-community-like built-up area, and the third is manifested by infill developments embedded in a transitional area. The reasons behind the higher potential for polarization are multifold in all cases; nevertheless, all three provide good examples of microsegregation in both horizontal and vertical terms. One of the main findings of our research is that different forms of microsegregation can coexist even in one relatively small neighborhood due to the intersectionality of different factors; however, common in all three cases is that the sorting effect of the housing market is prevalent.

The boundaries of segregation are constructed through the interplay of visible and invisible elements, as demonstrated by the statistical analysis and qualitative research findings (Figure 5). The visible factors contributing to segregation include the distinct and unique building stock of different blocks, urban fabric, and the overall character of the neighborhood. The boundaries of perceived segregation within the neighborhood can be attributed to several factors. First, the neighborhood has distinct internal boundaries as far as the built-up areas and architectural dividing lines are concerned. The most distinct boundaries are related to the post-socialist residential park (Franciahögy) and the socialist prefabricated housing estate. The interviewees confirmed the diversity of the neighborhood, but instead of highlighting the ethnic aspect of segregation, the common interest development residential complex, Franciahögy, was mentioned as a higher-class enclave, which also produces clear-cut educational segregation.

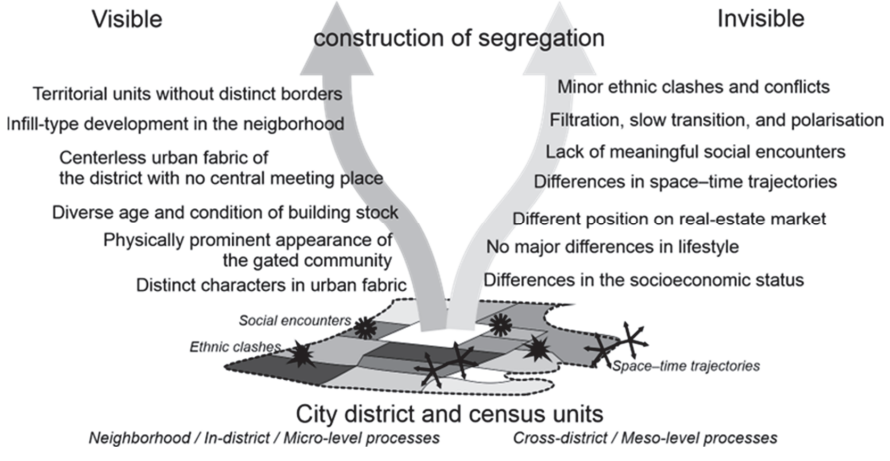


**Figure 5.** The making of boundaries of microsegregation.

These visible boundaries play a crucial role in the mental maps of individuals regarding segregation. In their absence, it becomes difficult to delineate areas that are distinct from others based on different physical and social factors. Moreover, it is important to consider that the boundaries between these microspaces are not always clearly defined but, rather, diffuse with areas often transitioning into one another. In addition to the absence of clear boundaries, the study area has undergone a dynamic transformation in recent decades, i.e., a step-by-step upgrade thanks to numerous infill-type developments. Being in the transitional zone of the city, the local building regulations do not impose strict requirements on the built-up character. The gradual renewal and transformation of the building stock of the neighborhood hinders the delineation of distinct areas. Moreover, since there are no larger units with distinct social and architectural characteristics apart from the Franciahögy residential park and the prefabricated housing estate, identifying boundaries of microsegregation is also a challenge for the residents.

The lack of a sense of segregation has been reinforced by the interviewees in that in the neighborhood it is not possible to perceive differences partly due to the lack of public spaces where daily encounters between people from different social groups could take place. The main square in the middle of the neighborhood comprises a soccer field with a small playground, serving very specific functions, and their use varies greatly among different social groups over time. The lack of encounters prevents everyday interpersonal and intergroup interactions that could provide a basis for negative stereotypes and more pronounced segregation [60]. Therefore, the socio-spatial differences demonstrated by statistical indicators remain invisible due to the absence of encounters.

The lack of infrastructure for meaningful social encounters highlights that it is equally important to recognize the invisible factors at play in segregation. These invisible factors include social dynamics, historical contexts, socio-economic disparities, systemic inequalities, and mental and cognitive perceptions of the residents. According to our findings, wealth disparities linked with occupation are the main source of microsegregation. Such invisible factors often remain unnoticed or hidden; however, sometimes they are tied to the visible (i.e., built-up) elements. The infill redevelopment leads to a displacement process where younger and better-off households are gradually becoming overrepresented in certain blocks and streets, while people of long-term lower status are disappearing. The increasing number of young and influential parents in the neighborhood contributes to the segregation of children in school, paralleled by the emergence of snobbishness among both parents and children. In addition, the perceived differences in property values also contribute to the invisible segregation process. Although ethnicity does not play a significant role in the life of the local community, some minor ethnic tensions (between the Roma and Hungarians) contribute to a conscious segregation process, influencing the space–time trajectories of residents and shaping the local pattern of microsegregation. This brings us to the topic of social justice—a key principle underpinning much work in contemporary social geography [61,62]. Our study on the lived experiences of social inequalities and microsegregation demonstrates how tensions between social justice and everyday city life can arise and provides an opportunity to consider what policies might be put in place to make social justice a reality. In this respect, we propose three considerations for policymakers.

1. The concept of segregation at the local level should be redefined. In the study area, segregation processes do not manifest statistically because Hungarian legislation treats segregation as a fundamentally ethnic-based process. This approach should be changed and other factors such as income, educational level, occupation, age, gender, and other factors of segregation should be considered in local planning and policy documents.
2. Part of the observed microsegregation processes in the neighborhood can be attributed to the lack of social connections and encounters. To change this situation, communal spaces within the neighborhood that provide encounters and places for interactions between diverse socio-economic groups should be developed. In addition, community programs and cultural events organized within the neighborhood could facilitate interactions and coexistence between various societal groups and enhance social cohesion. Involving local communities in decision-making processes and dialogue can also contribute to collaboration and understanding between different groups.
3. A further challenging issue in the neighborhood under study is the resurgence of lifestyle- and wealth-based segregation processes in educational institutions. Initiatives such as awareness campaigns and educational programs emphasizing social equality could help reduce prejudices and promote acceptance among young people.

Our research findings suggest that while the overall perception of the neighborhood is good, without greater tensions, there are obvious socio-spatial differences and signs of segregation at the microscale. The daily experiences and perceptions of respondents shed light on these nuances and indicate that while the area may appear cohesive, several factors contribute to socio-economic and cultural disparities in the area and the emergence of the boundaries of segregation. Moreover, our study confirmed the importance of considering

both the macrolevel uniformity and microlevel differentiations when discussing segregation in a particular neighborhood. Understanding segregation requires a multiscalar and interdisciplinary approach that combines statistical analysis with qualitative insights. This holistic perspective may help to shed light on the complex and nuanced nature of segregation, allowing further academic debate on microscale segregation processes.

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# Spatiotemporal-Behavior-Based Microsegregation and Differentiated Community Ties of Residents with Different Types of Housing in Mixed-Housing Neighborhoods: A Case Study of Fuzhou, China

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**Abstract:** As a kind of urban neighborhood with strong internal heterogeneity, mixed-housing neighborhoods have attracted wide attention from scholars in recent years. Strengthening community ties in mixed-housing neighborhoods is of great significance for increasing neighborhood social capital, cultivating a sense of community, and promoting sustainable development of the neighborhood. The neighborhood activities of residents are an important factor in promoting community ties. However, different housing groups in mixed-housing neighborhoods may have differentiated or even segregated overall daily activities, which may impact their neighborhood activities and call for differentiated planning strategies. In this study, we conduct an empirical study in Fuzhou, China, to identify the spatiotemporal-behavior-based microsegregation and differentiated community ties between residents of different types of housing. The data were collected in 2021 and included residents' activity diary data and questionnaire data about neighborhood interaction and community ties. Through an analysis of the daily overall activity space and activities within the neighborhood areas, the spatiotemporal-behavior-based social segregation of various housing groups is depicted. Furthermore, a multigroup structural equation modeling method was used to analyze the relationships among residents' spatiotemporal behaviors, neighborhood interactions, and community ties, and the heterogeneous influence effects across housing groups. The results show that the more residents' activity spaces overlap with the neighborhood area, the more out-of-home time they spend within the neighborhood, and that the more types of activities are conducted within the neighborhood area, the stronger their community ties are. In addition, neighborhood interaction played a linkage role in the relationships of residents' spatiotemporal behaviors and community ties. Our research aims to further the understanding of microsegregation at the neighborhood level and provide references for the development of mixed-housing neighborhoods and urban land use.

**Keywords:** spatiotemporal behavior; mixed-housing neighborhood; microsegregation; community ties; Fuzhou

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## 1. Introduction

The enhancement of population heterogeneity within urban neighborhoods has been an important background in urban research in recent decades [1–3]. With rapid urbanization worldwide, the population structure of urban neighborhoods has undergone dramatic changes [4]. The operation of the market economy has expanded the inequality of individuals in socioeconomic backgrounds such as income and education [5]. Increasing labor mobility and migration have strengthened population mobility [6]. At the same time, the gentrification and urban renewal in the inner city have gradually deepened [7]. This profound structural change has made many heterogeneous populations gather and coexist in

neighborhoods, which has enhanced the population heterogeneity of urban neighborhoods. Additionally, different neighborhood relationships and gradually decreasing interpersonal trust have appeared. These factors have led to the possibility of social segregation at the neighborhood level and unprecedented challenges for neighborhood social capital [8,9].

Community ties, also known as bonding social capital, are important forms of neighborhood social capital, referring to the intensity of interactions between people who share the same space [10]. The formation of community ties is influenced by neighborhood activities, personal trust propensities, and individual socioeconomic attributes, such as education, income, race, family size, and length of residence [11]. The ties formed by social connections aggregate people and resources within neighborhoods. The higher the level of social connections, the stronger the community ties form [12]. This may benefit the establishment of personal social networks and neighborhood management [13]. Therefore, in the context of the widespread increase in heterogeneity within urban neighborhoods, strengthening community ties is of great significance.

As a kind of urban neighborhood with strong internal heterogeneity, mixed-housing neighborhoods are formed under the promotion of governments [14]. Since its inception, it has attracted widespread attention from both academia and urban policymakers. In the early stage of the construction of affordable housing, most affordable housing was centrally constructed in urban fringes as separate neighborhoods [15]. However, it has been found in numerous studies that this situation causes inconvenient living conditions for affordable-housing residents and a series of social-segregation-related problems, such as limited access to job opportunities, long-distance commuting, lack of neighborhood activities, loss of community sense, poverty agglomeration, and even polarization [16–18]. Since the 1970s, some countries have proposed mixed-housing policies, such as France's municipal quota policy for social housing [19]. China also began implementing a mixed-residence policy in approximately 2010 [20]. The goal of mixed-housing policies is to mix affordable housing and market housing in the same neighborhood. The underlying assumption is that promoting the proximity of residents with different socioeconomic attributes will improve the living conditions of affordable-housing residents, promote interactions between different social groups, and enhance community social connections [21].

As observed from the perspective of historical institutionalism, the starting point is crucial for the direction of institutional change [22]. Mixed-housing neighborhoods, which are artificially facilitated by external political forces, are different from rural neighborhoods based on villages, with traditional community ties such as blood and family ties [23]. It is also different from neighborhoods formed through pure marketization forces, in which the homogenization characteristics of neighborhood residents are obvious, making it easier to form new community ties [24]. Additionally, it also has different characteristics compared with the socially mixed neighborhoods, which are formed through social or market forces without any policy intervention. For example, this may be because the housing stock is of different ages, creating naturally occurring affordable housing, or the neighborhood is in transition because of gentrification. Community ties in these socially mixed neighborhoods may be intertwined and complex. Unlike these neighborhoods, mixed-housing neighborhoods use government housing policy tools to mix residents of different socioeconomic attributes living in the same neighborhood. Due to the differences among residents, there may exist differences in job–housing relationships, consumption levels, lifestyles, social networks, values, and norms between affordable and market housing groups, which allows the possibility of social stratification within the same neighborhood [25,26]. How to meet the differentiated needs of residents of different housing types and develop community ties for each group of residents in mixed-housing neighborhoods poses challenges for neighborhood management and land-use planning.

Based on a literature review, it is noted that the factors influencing community ties include not only individuals' socioeconomic attributes and trust level but also the neighborhood activities of residents. For example, Carpenter and Takahashi [12] found that gender, age, education, and years of residence have a significant impact on community ties.

Alesina and La Ferrara proposed that a higher level of trust among individuals is more conducive to the formation of community ties. Compared to homogeneous neighborhoods, it was more difficult to improve the level of trust between individuals in heterogeneous neighborhoods [27]. On the other hand, research has found that the more neighborhood activities residents engage in, the easier it is to strengthen individual community ties. For instance, Ross and Searle [28] found that a resident's leisure-time physical activity within the neighborhood was positively associated with his or her community connections. Li et al. [29] found that commuting time has a significant negative impact on residents' neighborhood activity time, which negatively affects neighborhood interaction and community social capital. Ta et al. [30] found that the daily time allocation of different groups led to group differentiation of activity time within neighborhoods, which may lead to different sense of place of the residents. As Wu and Logan [31] argued, the time residents spend in a neighborhood can be seen as a form of investment. Residents who only consider the neighborhood as a space for residing and meeting basic living needs are less likely to perform daily activities in neighborhood areas, let alone socialize with their neighbors and develop strong community ties [32,33]. Therefore, compared to adjusting the structured background of residents (such as income inequality), optimizing residents' spatiotemporal behavior, and enabling them to have more neighborhood activities is a more feasible and practical strategy to strengthen community ties.

In the context of mixed-housing neighborhoods, an increasing number of studies have found that there are significantly different or even segregated daily activities of different housing residents [14,34]. For instance, Chaskin et al. [35] used interview data from Chicago mixed-housing neighborhoods and found that different housing groups employed different parental management that served as a barrier among different groups. Graves [36] investigated a HOPE VI housing redevelopment program and found that housing units were often segregated by tenure and that residents of different housing used different facilities and services within the neighborhood. Therefore, for different housing residents, it is necessary to have a deep understanding of their daily behavioral characteristics and propose differentiated response measures to optimize the daily life activities of different housing groups and promote an increase in their neighborhood activities.

However, existing research has focused more on the characteristics of neighborhood activities themselves among residents of mixed-housing neighborhoods, such as the use of community public space [37], while research on the overall daily activities of different housing residents is still insufficient. Neighborhood activities are only parts of the overall daily activities of residents. The time, space, and types of activities allocated by residents within neighborhoods are closely related to their overall daily activity space, time utilization, and daily life projects [38,39]. Therefore, it is difficult to propose targeted and effective strategies for optimizing the daily activity structure of residents without clarifying the daily overall activity characteristics of residents. In addition, there is a lack of attention to population differences in existing research on the impact path of neighborhood activities promoting community ties. Groups with larger daily activity spaces may be more sensitive to the impact path of neighborhood activities and community ties and therefore will become groups of policy concern. By analyzing the group differences that affect the effects, we can better target the behavioral characteristics of different groups and propose differentiated planning strategies that adapt to group needs, which may improve the efficiency of urban planning and neighborhood management.

Based on the above background and literature review, this paper seeks to address the following two research questions: (1) What are the overall daily activity characteristics of different housing residents in mixed-housing neighborhoods? What are the connections between neighborhood activities and overall daily activities? Is there a segregation of spatiotemporal behavior of different housing groups? (2) How does differentiated daily life affect community ties among different housing groups? What is to be gained when residents feel connected to their neighborhood, even if they only interact with people such as themselves?

We proposed a research framework to investigate the above research questions. As shown in Figure 1, residents' overall daily activity space is assumed to impact residents' activities within the neighborhood. Residents' neighborhood activities are assumed to have direct effects on neighborhood interaction and community ties. Through the direct influence on neighborhood interaction, residents' neighborhood activities may also impact community ties indirectly. We also seek to determine whether there will be significant differences between market- and affordable-housing residents in terms of the influence of individual spatiotemporal behavior and neighborhood interaction on community ties. Furthermore, the socioeconomic variables are hypothesized to both directly and indirectly impact all the endogenous variables. This is because socioeconomic backgrounds affect the overall daily activity space and time allocation of individuals, which may further influence residents' neighborhood activities [40,41]. And socioeconomic variables may also explain neighborhood interaction and community ties [42–44]. Our research aims to further the understanding of microsegregation in mixed-housing neighborhoods and provide references for neighborhood management and urban-land-use planning. Moreover, it should be noted that community ties and residents' neighborhood activities may have a two-way relationship. Greater community ties may also have a positive effect on residents' neighborhood activities. However, in this study, we mainly focus on how residents' daily activities affect community ties, and how to promote more neighborhood activities of residents through planning strategies and adjustments of urban land use. Accordingly, in the framework of this research, we did not test the impact of community ties on residents' behavior.

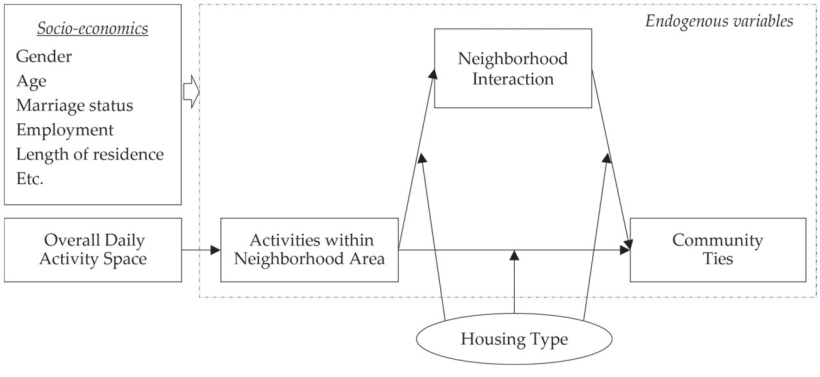


**Figure 1.** Research framework.

## 2. Materials and Methods

### *2.1. Study Area and Data Collection*

We take Fuzhou, China, as the study area of our research. Similar to many Western countries, China has also faced various negative social consequences caused by the construction of separate affordable housing neighborhoods. Referring to Western mixed-residence policies, China began adopting a mixed-housing policy in approximately 2010 [14,45]. In 2007 and 2009, the Chinese government issued the "Comments on Solutions to Housing Difficulties of Low-Income Families in Urban Areas" and the "2009–2011 Affordable Housing Guarantee Plan", respectively [46,47]. These documents recommended integrating affordable housing into the new development of market-housing neighborhoods, with a requirement of at least 20% affordable housing units. As a response, large cities, such as Beijing, Shanghai, Fuzhou, etc., were the first cities to implement this policy. Currently, the mixed-housing policy has been implemented in many provinces in China. Different cities have formulated their localized mixed-housing policy, stipulating the proportion of affordable housing in new development neighborhoods.

Fuzhou, located on the southeast coast of China, is the capital city of Fujian Province (Figure 2). It covers an area of 1761 $km^2$ and has a population of 6.64 million. There are two ring roads in Fuzhou. Within the Second Ring Road is the inner city, where most of the urban facilities in the city are located [48]. In the context of the development of mixed-housing neighborhoods in China, Fuzhou is one of the first cities to practice this policy. In the early stage, the affordable housing neighborhoods in Fuzhou were mainly built outside the Third Ring Road, where the urban facilities were insufficient and inconvenient [49]. In 2012, the Housing and Urban–Rural Development Department of Fujian Province issued the crucial "Guidelines for the Construction of 'Harmonious Living' in Affordable Housing" in response to the problems caused by the separate construction of affordable housing neighborhoods [50]. This document represented the first provincial government directive in China on mixed-housing policy, emphasizing the importance of creating harmonious and livable affordable housing neighborhoods. Building on these guidelines, the Fuzhou government issued the "Implementation Opinions on Statutorily Building Public Rental Housing on Residential Land through Public Bidding" in 2014, mandating a minimum allocation of 10% of residential building area for affordable housing in publicly tendered residential land [51]. As a result, Fuzhou has made remarkable progress in mixed-housing construction. By the end of 2021, more than 30 mixed-housing neighborhoods had been built in Fuzhou. Among the districts, Jin'an District, Cangshan District, and Taijiang District exhibited the highest concentration of mixed-housing neighborhood construction. Therefore, Fuzhou can serve as a typical representative for studying the development of mixed-housing neighborhoods in Chinese cities, providing a reference for other cities in China and other countries to further optimize mixed-housing policies.

Three mixed-housing neighborhoods in Fuzhou were selected as research cases: Hongjiang neighborhood (HJN), Pushang neighborhood (PSN), and Shanghai Xinyuan neighborhood (SXN) (see Figure 2). These neighborhoods are located in areas with a high concentration of mixed-housing neighborhoods in Fuzhou. All three neighborhoods were built in approximately 2017 as a result of policy interventions by the Chinese government, and the similar construction time helps to minimize the impact of length of residence on residents' interactions. In terms of neighborhood location, each of the three neighborhoods is unique. Located within the second ring road, SXN is closer to the city center and has high accessibility to urban facilities, forming a convenient living circle. The distribution of surrounding points-of-interest (POIs), such as public transportation, dining services, food markets, convenience stores, shopping malls for shopping facilities, and park plazas and recreation places for leisure facilities, is the highest among the three neighborhoods. HJN and PSN are located between the second and third ring roads in Fuzhou. Specifically, the density of urban facilities around PSN is much lower than that around HJN. Regarding transportation facilities, the number of bus stop POIs around PSN is the lowest among the three neighborhoods. In terms of shopping facilities, there are only scattered convenience stores near the PSN, with no other types of shopping facilities.

The spatial distributions of affordable housing and market housing in each of the three neighborhoods are shown in Figure 3. Specifically, in these three mixed-housing neighborhoods, market- and affordable-housing residents live in separate buildings and are spatially segregated from each other. In HJN, there are a total of 6 affordable housing buildings and 10 market housing buildings. Each building consists of 6 floors and accommodates 150 units. PSN comprises 9 affordable housing buildings and 11 market housing buildings. Each affordable housing building spans 6 floors and accommodates 144 units. In contrast, each market housing building spans 6 floors and accommodates 72 units. SXN has 4 affordable housing buildings and 6 market housing buildings. Each building spans 40 floors and accommodates 400 units.

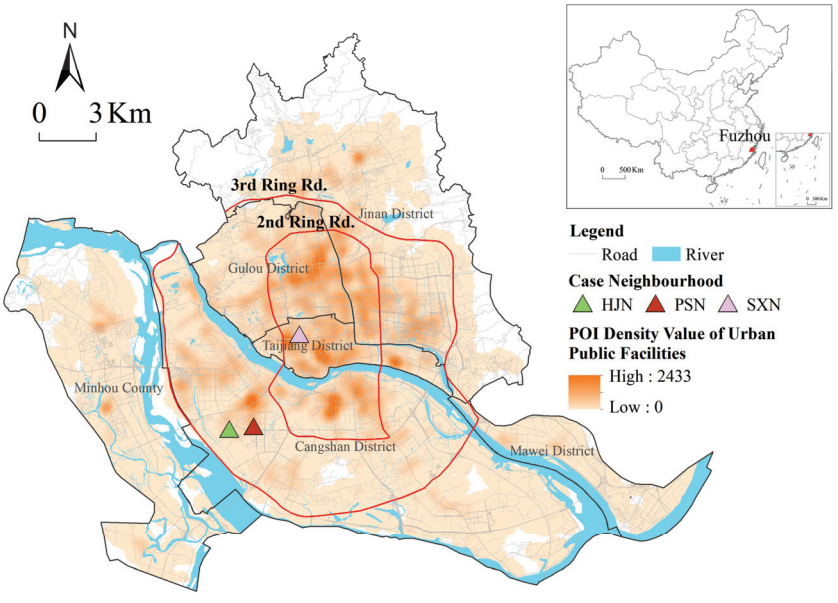


**Figure 2.** Case study area.

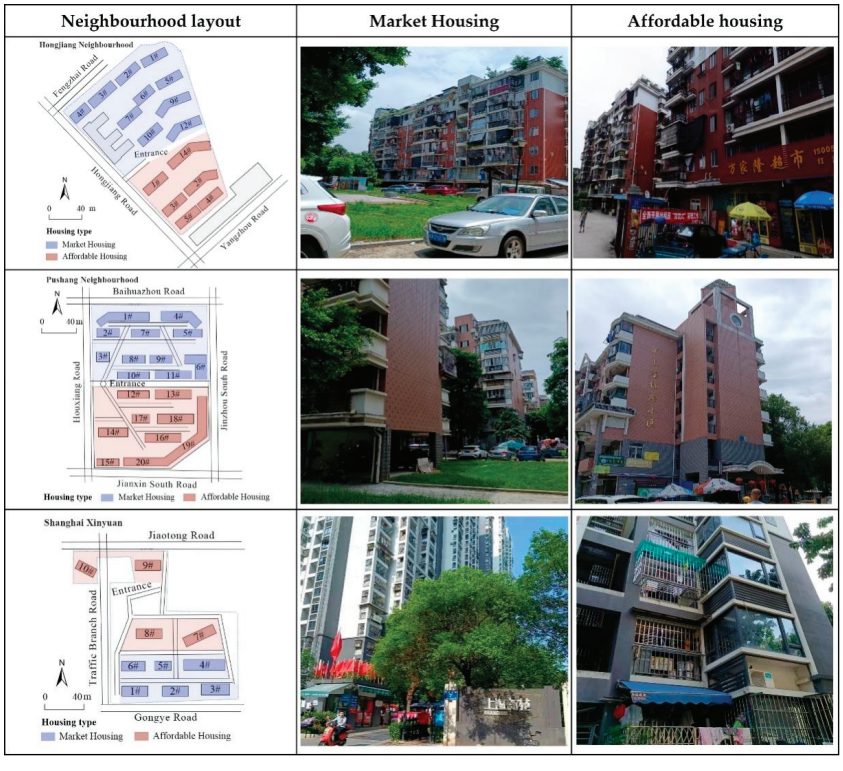


**Figure 3.** Spatial distribution and photos of different types of housing in case study neighborhoods.

Using a stratified random sampling method, we conducted a survey in these three case study neighborhoods from July to August 2021. To facilitate comparative research between different housing groups, the same number of affordable-housing respondents and market-housing respondents were recruited in each neighborhood. Considering the total population of each case neighborhood, 140 respondents, including 70 affordable-housing residents and 70 market-housing residents, were recruited from each case neighborhood. The contents of the survey included a 48 h activity diary and a questionnaire about residents' neighborhood interactions, community ties, and socioeconomic attributes. The activity diary was used to record the detailed activities and travel information of each sampled resident on a weekday and a weekend day. Each respondent was required to record all activities and travel information of the 2 days (48 h) in chronological order. The information about activities included the start time, end time, activity location, activity type, and space–time flexibility of each activity. After data cleaning and filtering, we finally obtained 380 valid samples. The activity diary dataset included 6744 valid activity records.

The sample profiles are shown in Table 1. In the total sample, the proportions of market housing (MH) and affordable housing (AH) residents are 57.4% and 42.6%, respectively. By using the *t* test method, it was found that there were significant differences in education level, employment status, monthly income, occupation type, children under 16 years old, car ownership, and average job–housing distance between the two groups. These differences are consistent across the three neighborhoods. Residents with market housing show the characteristics of a higher education level, a higher proportion of full-time employment, more employees of government institutions and enterprises, a higher monthly income, a higher proportion of children under 16 years old, a higher car ownership rate, and a longer average job–housing distance than affordable-housing residents.

**Table 1.** Sample profiles.

| | Total Sample (N = 380) | | | | HJN (n = 122) | | | PSN (n = 131) | | | SXN (n = 127) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total N = 380 | MH n = 218 | AH n = 162 | *p* Value | MH n = 66 | AH n = 56 | *p* Value | MH n = 77 | AH n = 54 | *p* Value | MH n = 75 | AH n = 52 | *p* Value |
| Gender (%) | | | | | | | | | | | | | |
| Female | 48.7 | 48.2 | 49.4 | 0.821 | 45.5 | 35.7 | 0.281 | 55.8 | 55.6 | 0.917 | 42.7 | 57.7 | 0.197 |
| Male | 51.3 | 51.8 | 50.6 | | 54.5 | 64.3 | | 44.2 | 44.4 | | 57.3 | 42.3 | |
| Age (%) | | | | | | | | | | | | | |
| <=30 | 40.3 | 35.3 | 46.9 | 0.102 | 33.3 | 35.7 | 0.440 | 36.4 | 44.4 | 0.143 | 36.0 | 61.5 | 0.205 |
| 31–40 | 29.7 | 33.5 | 24.7 | | 30.3 | 17.9 | | 33.8 | 33.3 | | 36.0 | 23.1 | |
| 41–50 | 20.5 | 20.6 | 20.4 | | 24.2 | 26.8 | | 15.6 | 18.5 | | 22.7 | 15.4 | |
| >50 | 9.5 | 10.6 | 8.0 | | 12.1 | 19.6 | | 14.3 | 3.7 | | 5.3 | 0.0 | |
| Education (%) | | | | | | | | | | | | | |
| Middle school or below | 26.1 | 24.8 | 27.8 | 0.041 ** | 24.2 | 32.1 | 0.032 ** | 27.3 | 31.5 | 0.029 ** | 19.2 | 22.7 | 0.018 ** |
| High school | 31.1 | 31.7 | 31.1 | | 37.9 | 35.2 | | 24.7 | 25.9 | | 30.8 | 33.3 | |
| College or undergraduate | 41.6 | 40.7 | 40.1 | | 36.9 | 32.1 | | 46.8 | 42.6 | | 46.1 | 42.7 | |
| Graduate or higher | 1.3 | 2.9 | 1.0 | | 1.0 | 0.5 | | 1.3 | 0.0 | | 3.8 | 1.3 | |
| Marriage (%) | | | | | | | | | | | | | |
| Married | 61.8 | 65.1 | 57.4 | 0.131 | 69.7 | 69.6 | 0.154 | 61.0 | 55.6 | 0.53 | 65.3 | 46.2 | 0.032 * |
| Other status | 38.2 | 34.9 | 42.6 | | 30.3 | 30.4 | | 39.0 | 44.4 | | 34.7 | 53.8 | |
| Employment (%) | | | | | | | | | | | | | |
| Full time | 77.9 | 78.0 | 67.8 | 0.056 ** | 80.3 | 61.4 | 0.029 ** | 83.3 | 64.0 | 0.067 * | 80.0 | 68.8 | 0.063 * |
| Part time | 16.6 | 16.0 | 27.3 | | 18.2 | 36.8 | | 11.2 | 26.9 | | 13.3 | 23.5 | |
| Unemployed | 5.5 | 6.0 | 4.9 | | 1.5 | 1.8 | | 5.6 | 9.1 | | 6.7 | 7.7 | |
| Occupation type (%) | | | | | | | | | | | | | |
| Employees of government institutions and enterprises | 47.2 | 65.3 | 22.7 | 0.017 ** | 65.3 | 22.5 | 0.012 ** | 64.5 | 24.1 | 0.015 ** | 66.2 | 21.5 | 0.017 ** |
| Service workers | 33.2 | 22.4 | 47.8 | | 20.4 | 47.6 | | 25.3 | 46.7 | | 21.2 | 49.2 | |
| Self-employed | 19.6 | 12.3 | 29.5 | | 14.3 | 29.9 | | 10.2 | 29.2 | | 12.6 | 29.3 | |
| Monthly income (%) | | | | | | | | | | | | | |
| <2000 RMB | 6.7 | 1.6 | 10.8 | 0.043 ** | 3.1 | 13.9 | 0.038 ** | 2.5 | 14.8 | 0.027 ** | 2.0 | 19.2 | 0.004 *** |
| 2000–4000 RMB | 52.1 | 51.4 | 53.1 | | 48.2 | 60.2 | | 32.9 | 67.3 | | 25.3 | 49.0 | |
| 4000–6000 RMB | 23.9 | 27.7 | 29.1 | | 32.7 | 20.7 | | 32.5 | 13.0 | | 46.7 | 24.6 | |
| 6000–10,000 RMB | 12.1 | 13.0 | 7.0 | | 13.0 | 5.2 | | 26.9 | 4.9 | | 20.0 | 7.2 | |
| 10,000–20,000RMB | 3.9 | 5.0 | 0.0 | | 3.0 | 0.0 | | 5.2 | 0.0 | | 6.7 | 0.0 | |
| >20,000 RMB | 1.3 | 1.3 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | | 1.3 | 0.0 | |
| Children under 16 years old (%) | 55.5 | 59.2 | 44.1 | 0.026 ** | 58.2 | 48.6 | 0.057 * | 68.1 | 47.8 | 0.063 * | 62.7 | 35.4 | 0.041 ** |
| Car ownership (%) | 43.8 | 55.5 | 28.0 | 0.016 ** | 49.4 | 30.4 | 0.052 * | 53.2 | 31.5 | 0.013 ** | 63.3 | 24.2 | 0.021 ** |
| Job–housing distance (km) | 5.6 | 7.5 | 3.1 | 0.034 ** | 7.3 | 2.6 | 0.046 ** | 7.9 | 3.2 | 0.034 ** | 8.3 | 2.7 | 0.027 ** |

Notes: * Significant at the 0.10 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

*2.2. Methods and Measures*

First, based on the activity location, activity type, and activity duration information from the activity diary data, we used 3D geospatial visualization (space–time path) and kernel density estimation methods to visualize the daily activity space of different housing groups in the same neighborhood. This helped us intuitively observe the spatial range, temporal intensity, and hot spots of residents' activities. Then, we quantitatively analyzed the overall characteristics of residents' daily activity spaces. T tests between the indicators of different housing groups' activity spaces were used to determine the significance of the differentiations. Subsequently, we used VISUAL-TimePAcTS software to visualize the sequence and time rhythm of residents' daily activities conducted within a 1 km radius of each neighborhood to intuitively visualize the role of neighborhood space in the lives of residents with different housing types. Accordingly, we quantitatively described the activity characteristics of residents within the neighborhood area. Afterward, based on the questionnaire information, we calculated the neighborhood interaction and community ties scores of different housing residents. The indicators of all the variables are illustrated below. Furthermore, we used a multigroup structural equation model to explore the relationships among residents' spatiotemporal behavior characteristics, neighborhood interaction, and community ties. This modeling method is also helpful for determining whether these relationships are heterogeneous across housing groups.

In terms of the indicators of residents' overall activity spaces, we referred to the indicators for studying activity-space-based social segregation that were proposed by Wang and Li [52]. We compared the overall characteristics of residents' daily activity spaces across housing groups in this study from the following three indicators: extensity, intensity, and diversity. The extensity of a resident's activity space is measured by the area of the 95% standard deviational ellipses based on the activity diary data [53]. The intensity of a resident's activity space is measured by the total time spent on out-of-home activities on the diary day and the total time spent on out-of-home nonwork activities on the diary day. The diversity indicator is measured by residents' out-of-home destinations.

We defined the neighborhood area as the 15 min life circle area of each neighborhood, considering that people's daily activities cannot be divided according to the administrative boundaries of their neighborhoods [54,55]. The scope of the 15 min neighborhood life circle is a 15 min (approximately 1 km) walk from the neighborhood gate along the road [56]. Then, we calculated the proportion of overlapping spatial ranges of the neighborhood area and each resident's activity space and obtained the ASN indicator, which refers to the ratio of neighborhood space to individual daily activity space. Similarly, based on the detailed activity diary records, we calculated the time duration that residents spend within the neighborhood area (except home) and further calculated the ratio of residents' activity time within the neighborhood area to their total out-of-home activity time as the ATN indicator. This indicator refers to the time investment that residents spend in the neighborhood area. Furthermore, we counted the number of types of activities that residents conducted within the neighborhood area (NTN) as the indicator of the diversity dimension of neighborhood activities. In addition, according to existing research, most residents' daily activities are systematic and well-projected [57,58]. Residents' daily activities usually have significant variations between weekdays and weekends, while the changes within weekdays and weekends are relatively small [59]. Therefore, we calculated the above indicators for weekdays and weekends to comprehensively understand the daily lives of residents and their related social impacts.

For the measurement of neighborhood interaction, referring to previous studies [60,61], we employed 5 items to capture this variable. The items include "say hello when meeting", "door-to-door communication", "having dinner together", "exercising together" and "helping each other (e.g., sending and receiving express delivery, taking care of children)". Response options ranged from 0 (never) to 5 (very often). We took the mean of all 5 items as the score for the frequency level of neighborhood interaction of a respondent. Higher scores indicated a higher level of neighborhood interaction.

Individuals' community ties are the dependent variable in this study. Based on the literature [8,10,11], we measured this variable using three indicators: common value, mutual trust, and willingness to assist each other. In the questionnaire of our survey, the respondents were required to rate the following statements on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating stronger community ties. The three statements were as follows: (1) My neighbors and I share common values; (2) My neighbors and I trust each other; (3) If we encounter difficulties, my neighbors and I will help each other. After obtaining the scores of the above indicators, we used the *t* test method to examine the differences between different housing groups.

## 3. Results

### *3.1. Segregation of Overall Daily Activity Space*

The space–time paths of residents with different housing are shown in Figure 4. The X-Y coordinate represents the latitude and longitude, respectively, and the Z-axis represents the time of one day. Different types of daily activities are represented by different colors in the figure, where activities related to work are depicted by red lines, shopping activities by green lines, and leisure activities by blue lines. In addition, the gray three-dimensional prism represents the scope of the neighborhood area. Kernel density estimation of different types of activities was also used to help identify the extensity and intensity characteristics of activity-space-based segregation of different housing groups (see Figure 5). The Second and Third Ring Roads are highlighted by thicker lines for reference. The quantitative analysis results of residents' overall daily activity spaces are shown in Table 2.

**Table 2.** Characteristics of the overall activity spaces of different housing residents.

| | | Overall | | AH | | MH | | *p* Value |
|---|---|---|---|---|---|---|---|---|
| | | Mean | Std.dev. | Mean | Std.dev | Mean | Std.dev. | |
| Weekday | Extensity ($km^2$) | 13.88 | 27.631 | 11.64 | 29.235 | 15.55 | 31.957 | 0.043 ** |
| | Out-of-home activity time (min) | 549.67 | 102.762 | 525.43 | 93.034 | 567.58 | 111.588 | 0.049 ** |
| | Out-of-home nonwork activity time (min) | 59.97 | 36.072 | 39.46 | 30.330 | 75.12 | 40.223 | 0.036 ** |
| | Out-of-home destinations | 1.87 | 1.765 | 1.21 | 1.980 | 2.05 | 1.627 | 0.038 ** |
| Weekend | Extensity ($km^2$) | 8.82 | 21.862 | 8.51 | 20.96 | 9.05 | 25.523 | 0.036 ** |
| | Out-of-home activity time (min) | 256.50 | 220.761 | 205.54 | 216.761 | 296.52 | 239.255 | 0.006 *** |
| | Out-of-home nonwork activity time (min) | 210.43 | 210.65 | 188.11 | 208.430 | 227.97 | 218.805 | 0.052 * |
| | Out-of-home destinations | 2.03 | 1.041 | 1.93 | 0.857 | 2.11 | 0.815 | 0.071 * |

Notes: * Significant at the 0.10 level. ** significant at the 0.05 level. *** significant at the 0.01 level.

Figures 4 and 5 and Table 2 show that there are significant differences in the daily overall activity space between residents with market housing and those with affordable housing. On both weekdays and weekends, residents with market housing exhibit significantly higher extensity, while affordable-housing residents' activities are primarily limited to the neighborhood area. In terms of the intensity and diversity of residents' activity spaces, market-housing residents spend significantly more time in out-of-home activities and nonwork out-of-home activities and visit more activity destinations.

Specifically, different types of activities have various differentiation characteristics (see Figure 4). Work activities are the primary purpose of out-of-home activities for residents on weekdays, and they play a dominant role in expanding residents' activity spaces. Affordable-housing residents exhibit a more fixed rhythmic pattern of work activities, with most starting at 8 a.m. and ending at 6 p.m. and having a lunch break from 12 p.m. to 2 p.m. Market-housing residents, conversely, have more flexible work schedules, less notable group characteristics, and a shorter lunch break and are more likely to work in the evenings than affordable-housing residents. For the spatial distribution of residents' working activities, residents of affordable housing exhibit stronger features of working near the neighborhood area, while the working space of market housing is more expanded to the inner city. In addition, from the differences of the three case neighborhoods, SXN has the most limited expansion of working activities, while the working activity expansion

of the residents of PSN and HJN is much larger. This may be due to the accessibility of job opportunities near the three neighborhoods, in which SXN has the most urban opportunities nearby, and HJN has the least.

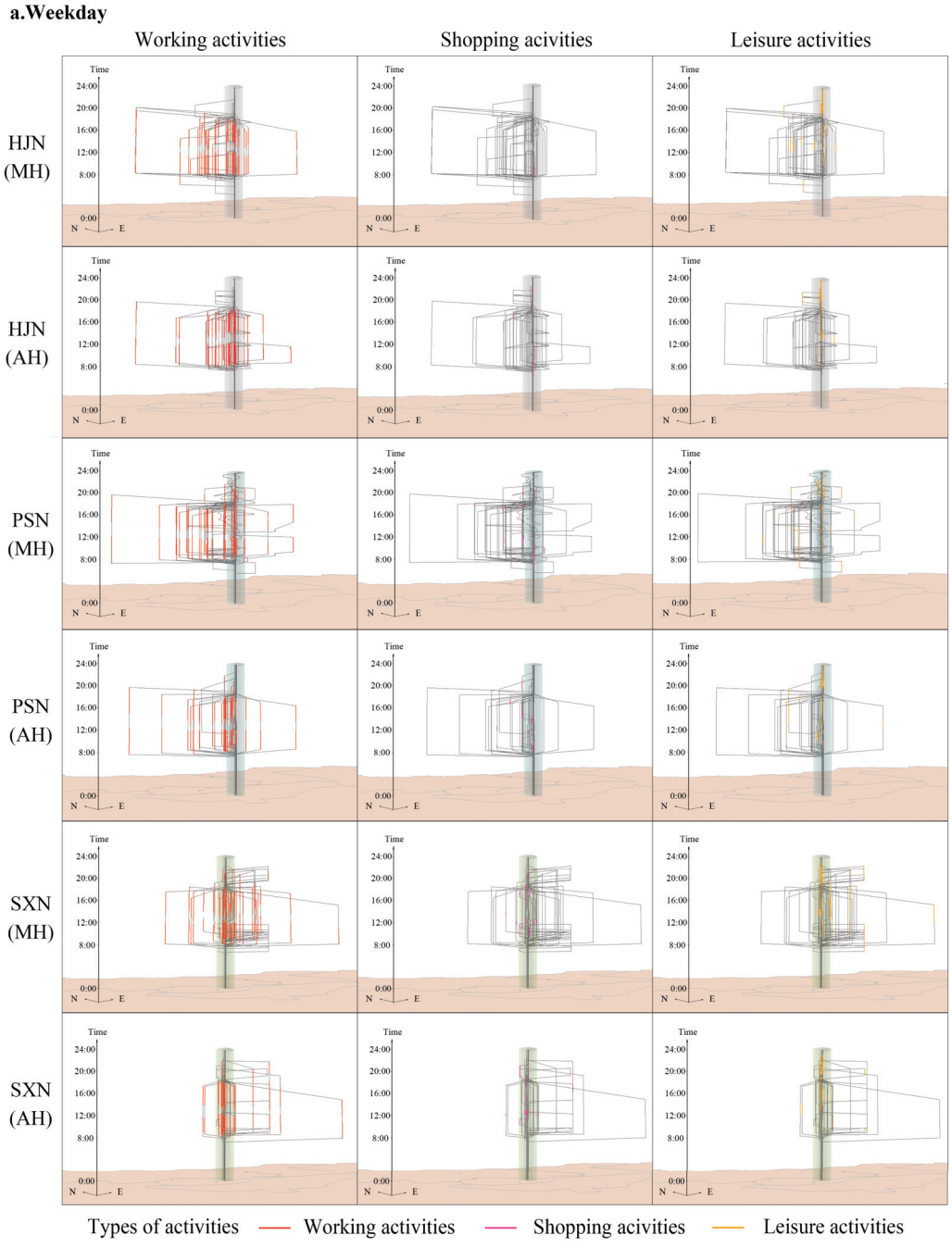


**Figure 4.** *Cont.*

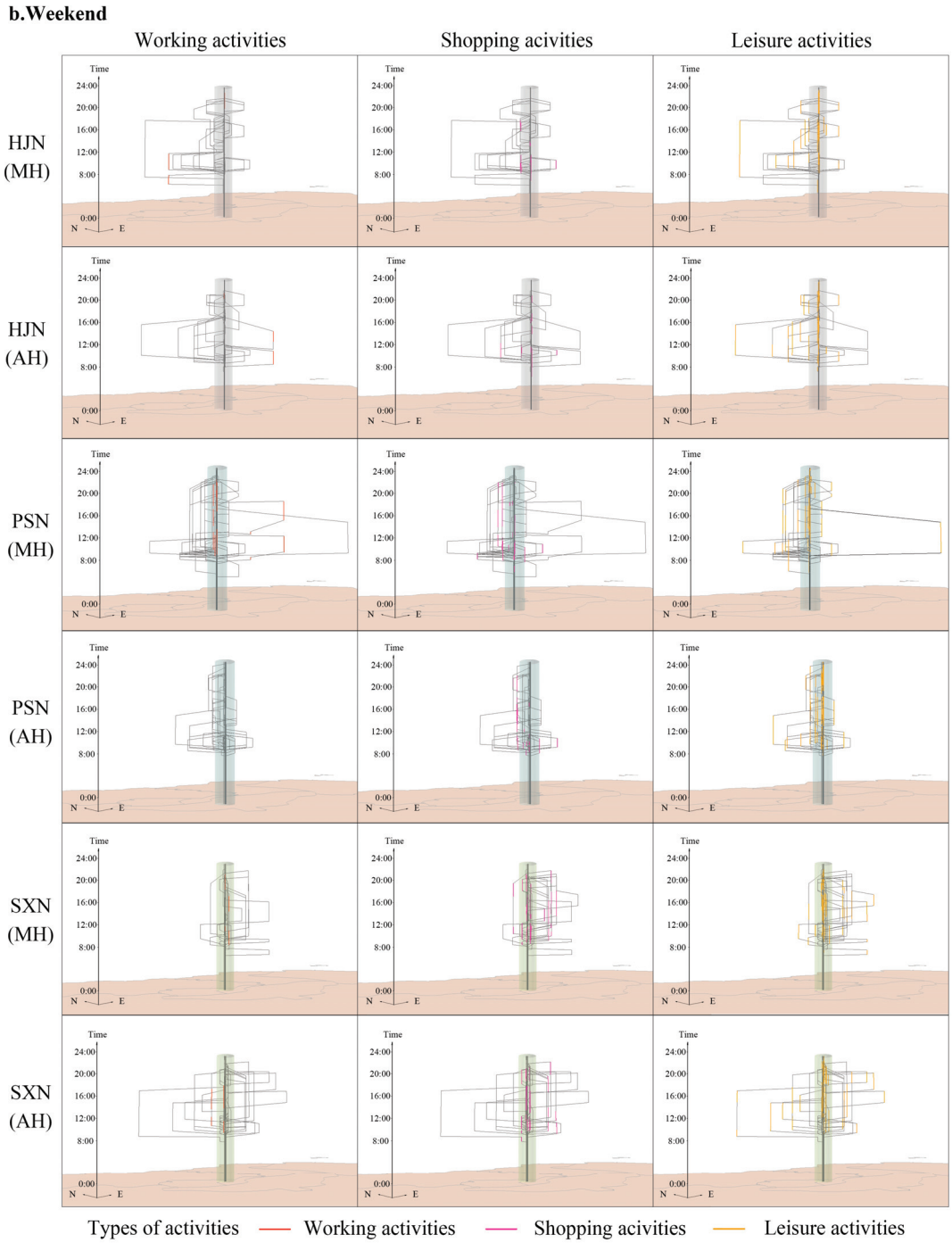


**Figure 4.** Space–time paths of residents with different housing types on weekdays and weekends. HJN (Hongjiang neighborhood), PSN (Pushang neighborhood), SXN (Shanghai Xinyuan neighborhood), MH (market-housing residents), AH (affordable-housing residents).

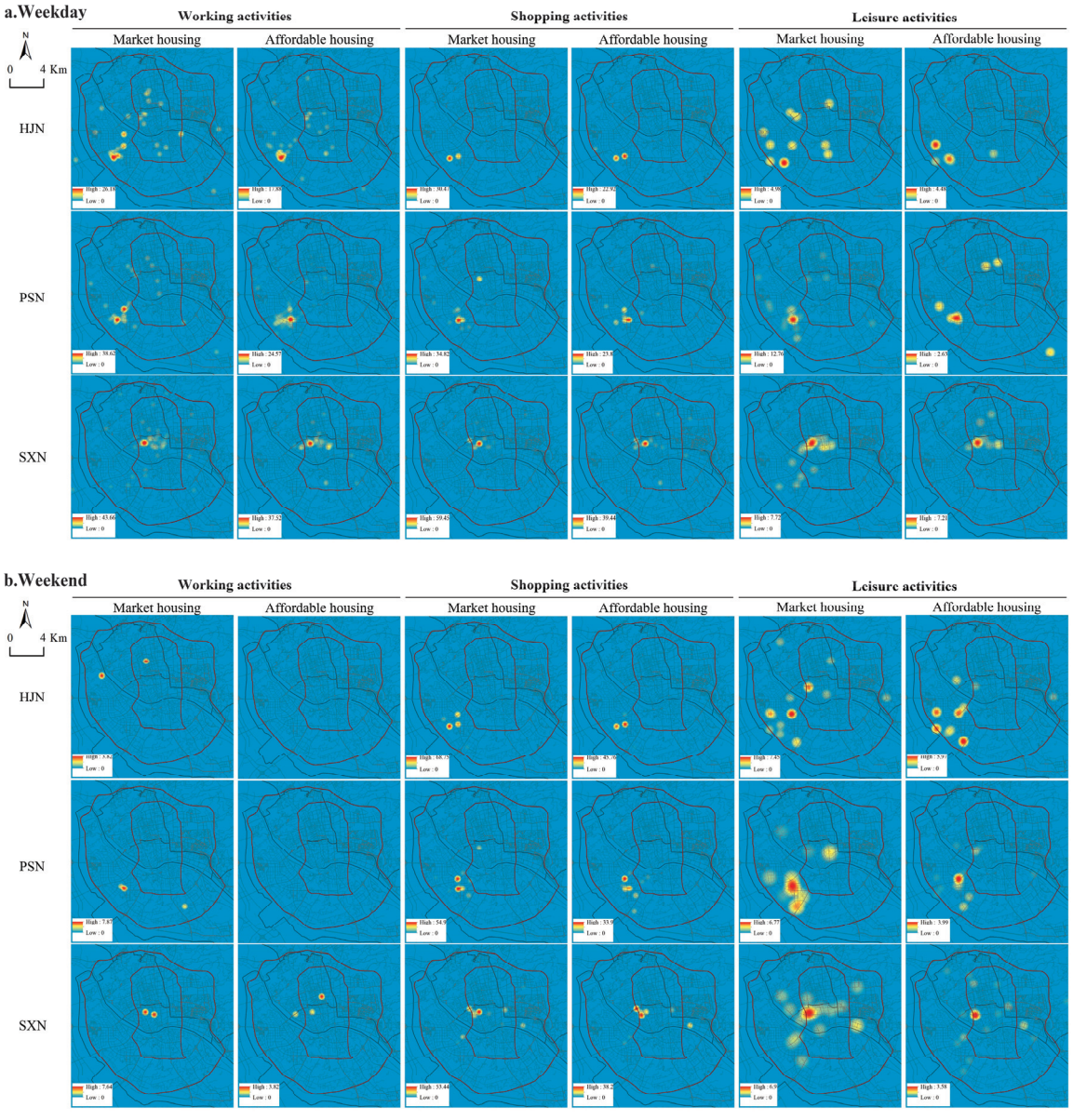


**Figure 5.** Kernel density estimation results of types of activities of the residents on weekdays and weekends. (Due to the absence of working activities of the respondents of affordable housing in HJN and PSN on the weekend, the activity points in the kernel density map are empty).

Compared with other types of out-of-home activities, shopping activities exhibit a more distinct feature of being distributed near the neighborhood area or at the workplaces on weekdays. This pattern is consistent across the three case neighborhoods. Shopping activities show fragmented and short-duration characteristics. They often occur with temporal continuity with work activities. There is also a small proportion of residents who conduct independent shopping activities on weekdays, and this proportion is higher among affordable-housing residents. These activities occur farther from the neighborhood

and last longer. Shopping activities on weekends are more frequent and longer in duration, and market-housing residents show a more significant spatial expansion in shopping space. Affordable-housing residents tend to shop in areas that align with their budget compared to market-housing residents, which leads to more pronounced shopping activity away from the inner city than market-housing residents in all three neighborhoods.

For leisure activities, on weekdays, the leisure activities of residents with affordable housing mainly occur near residential areas, while the leisure activity spaces of market-housing residents are more expanded, with higher frequency and longer duration. On weekends, leisure activities occur more frequently throughout the day and exhibit greater spatial expansion. Compared to affordable-housing residents, market-housing residents exhibit more spatial expansion, and their high-density activity areas expand from neighborhood areas to inner cities and suburbs.

In all three case study neighborhoods, the daily activities of affordable-housing residents were more concentrated near the neighborhood, while market-housing residents showed a greater tendency to expand, but this differential characteristic is the smallest in the SXN. This indicates that, although the density of urban facilities around the three case neighborhoods is different, residents of different housing types living in the same neighborhood still exhibit segregated patterns in daily overall activity space.

### *3.2. Segregation of Activities within Neighborhood Area*

Mixed-housing neighborhoods should be not only residential spaces but also important carriers for residents' daily activities, thereby promoting the effects of neighborhood interaction and community ties [14]. Based on the information on activity location, activity duration, and activity type from the activity diary data, we calculated the percentage of neighborhood area that overlaps with the daily activity space (ASN), proportion of time spent out-of-home within the neighborhood area (ATN), and number of types of activities conducted within the neighborhood area (NTN). The results are shown in Table 3. All three indicators for affordable-housing residents were significantly higher than those for market-housing residents on both weekdays and weekends. This indicates that residents with affordable housing have more space, time, and activity arrangements in neighborhood areas and rely more on neighborhood space.

**Table 3.** *t* Test results of activities within neighborhood areas of different housing residents.

| | | Overall | | AH | | MH | | *p* Value |
|---|---|---|---|---|---|---|---|---|
| | | Mean | Std.dev. | Mean | Std.dev | Mean | Std.dev. | |
| Weekday | ASN | 9.52 | 0.294 | 13.25 | 0.337 | 7.31 | 0.252 | 0.044 ** |
| | ATN | 4.21 | 0.191 | 5.11 | 0.219 | 3.52 | 0.166 | 0.039 ** |
| | NTN | 1.64 | 0.983 | 1.78 | 1.029 | 1.14 | 0.935 | 0.131 |
| Weekend | ASN | 31.57 | 0.245 | 39.02 | 0.278 | 25.72 | 0.202 | 0.007 *** |
| | ATN | 28.19 | 0.131 | 32.83 | 0.133 | 24.57 | 0.121 | 0.037 ** |
| | NTN | 1.64 | 0.983 | 1.78 | 1.029 | 1.54 | 0.935 | 0.135 |

Notes: ** Significant at the 0.05 level. *** Significant at the 0.01 level.

Furthermore, by visualizing activity diaries in VISUAL-TimePAcTS software, we analyzed the activity types, sequence, and rhythm of residents' activities in the neighborhood area (see Figure 6). The left side of each small chart represents the activity sequence of residents, and the line chart on the right represents the time rhythm. In the activity sequence diagram, the vertical axis represents the time of the day from 0:00 to 24:00, and each column on the horizontal axis represents a sample. The colored parts marked on the pillars represent residents' activities in the neighborhood area, and different colors represent different types of activities. The gray areas indicate that residents are currently in other locations besides the neighborhood area, such as outside the neighborhood area or within their own homes. Each activity is arranged in chronological order, forming a sequence of residents' activities. The horizontal axis of the time rhythm chart on the right

represents the proportion of samples, while the vertical axis represents the period from 0:00 to 24:00. The broken line represents the proportion of samples undergoing a certain type of activity at different times.

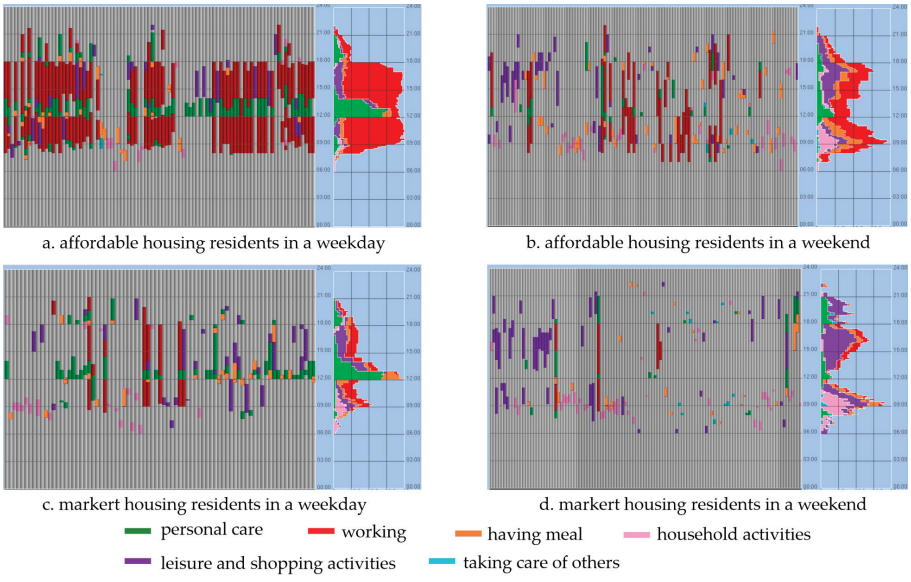


**Figure 6.** Sequence and rhythm of activities in neighborhood areas of different housing groups.

Figure 6 shows that, on weekdays, residents with affordable housing have more activities in neighborhood areas during the daytime. A large proportion of residents with affordable housing work in neighborhood areas, forming two peaks of work activity at approximately 10 a.m. and 4 p.m., respectively. Conversely, market-housing residents have fewer activities in neighborhood areas, with the main types of activities being household activities, personal care, and leisure and shopping activities. Compared to weekdays, residents' activities in neighborhood areas outside their homes are reduced on weekends. Notably, market-housing residents have fewer and scattered activities in neighborhood areas.

The analysis of activities within neighborhood areas further demonstrates the dependence of the daily activities of affordable-housing residents on the neighborhood area. On the other hand, it also indicates that, even on weekends, the activities of market-housing residents in the neighborhood area are still relatively low and exhibit a short-term and scattered distribution, indicating that the factors influencing their choices are not only limited by their workplace, but also follow some other factors, such as their socioeconomic attributes and personal preferences.

### *3.3. Relationships among Residents' Daily Activities, Neighborhood Interactions, and Community Ties*

Table 4 shows the scoring values and *t* test results of neighborhood interaction and community ties between residents with different housing types. From the perspective of neighborhood interaction, residents with affordable housing have a higher frequency. There is no significant difference in "say hello when meeting" between residents with different housing types. In terms of door-to-door communication, exercising together, and helping each other, the frequency of neighborhood interaction of residents with affordable housing is much higher than that of residents with market housing. However, in deeper neighborhood interactions, such as having dinner together, residents of different housing groups both showed low frequency scores. These results indicate that, for residents with market housing, the frequency of neighborhood interaction is much lower.

In terms of community ties, residents with affordable housing have higher scores than market-housing residents in mutual trust and willingness to assist each other. However, in terms of common value, both housing groups show lower scores than the other two indicators, and there is no significant difference between the two groups.

**Table 4.** *t* Test results of neighborhood interaction and community ties of residents in different housing types.

| | Overall | | AH | | MH | | *p* Value |
|---|---|---|---|---|---|---|---|
| | Mean | Std.dev. | Mean | Std.dev. | Mean | Std.dev. | |
| Neighborhood interaction | 2.36 | 0.881 | 2.78 | 0.902 | 1.95 | 0.864 | 0.041 ** |
| say hello when meeting | 4.15 | 0.721 | 4.25 | 0.671 | 4.11 | 0.876 | 0.105 |
| door-to-door communication | 3.07 | 0.572 | 3.56 | 0.656 | 2.17 | 0.421 | 0.072 * |
| exercise together | 3.31 | 0.431 | 3.78 | 0.412 | 3.05 | 0.562 | 0.043 ** |
| help each other | 3.29 | 0.475 | 3.76 | 0.323 | 3.06 | 0.795 | 0.035 ** |
| having dinner together | 2.25 | 0.423 | 2.67 | 0.519 | 1.89 | 0.376 | 0.104 |
| Community ties | 3.27 | 0.635 | 3.61 | 0.621 | 3.17 | 0.634 | 0.007 *** |
| mutual trust | 3.42 | 0.745 | 3.75 | 0.721 | 3.08 | 0.751 | 0.005 *** |
| willingness to assist each other | 3.83 | 0.808 | 4.05 | 0.776 | 3.59 | 0.819 | 0.026 ** |
| common value | 2.85 | 0.814 | 3.04 | 0.785 | 2.65 | 0.832 | 0.106 |

Notes: * Significant at the 0.10 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

Furthermore, based on the previous literature review and our research framework, to deeply analyze the social effects of the spatiotemporal behavior segregation of different housing residents in mixed-housing neighborhoods, we used a multigroup structural equation model to analyze the relationships among residents' daily activities, neighborhood interaction, and community ties. The results of the structural model indicated the acceptable model fit (see Table 5). Table 6 shows that the causal relationships hypothesized in the framework (Figure 1) were confirmed by the model results (the measurement invariance results are shown in Appendix A, Table A1). As shown in Table 6, the proportion of out-of-home time spent in the neighborhood area (ATN), percentage of daily activity space that overlaps with the neighborhood area (ASN), and number of types of activities conducted within the neighborhood (NTN) all had a significant positive impact on residents' neighborhood interactions (NIs). A similar effect was also found for the influence of NI on community ties (CT). Regarding the influence of residents' spatiotemporal behaviors on CT, the associations with ATN, ASN, and NTN were all positively significant at the 5% level. Therefore, more time spent in the neighborhood area, high percentages of daily activity space that overlaps with the neighborhood area, and various types of activities in the neighborhood increased CT; moreover, these effects were enhanced by increasing NIs.

Then, we conducted multigroup comparison models. After constructing the unconstrained model, the fully constrained models, and the partially constrained models, we finally obtained the final models. The constraints on the path coefficients (ASN-->NI, ATN-->NI, NTN-->NI) in the final model for weekdays were released. This indicates that the differences in these path coefficients across housing groups are not significant. The goodness-of-fit indicators all fit the reference value (see Table 5).

**Table 5.** Goodness-of-fit statistics of the models and reference values.

| | Reference Value | Structural Model | Weekday Model | Weekend Model |
|---|---|---|---|---|
| $\chi^2$ | | 1469.88 | 1578.32 | 1568.41 |
| Df | | 268 | 254 | 237 |
| CFI | >0.90 | 0.923 | 0.925 | 0.921 |
| RMSEA | <0.05 | 0.046 | 0.029 | 0.045 |
| SRMR | <0.05 | 0.039 | 0.037 | 0.025 |
| TLI | >0.90 | 0.919 | 0.919 | 0.907 |
| *p*-value | >0.05 | 0.075 | 0.082 | 0.061 |

Notes: CFI (comparative fit index), RMSEA (root mean square error of approximation), SRMR (standardized root mean square residual), TLI (Tucker–Lewis index).

**Table 6.** The direct effects between endogenous variables in the structural model.

| Hypothesis | Path | β | *p* Value | Supported |
|---|---|---|---|---|
| H1 | ASN-->NI | 0.725 | 0.037 | Yes |
| H2 | ATN-->NI | 0.538 | 0.029 | Yes |
| H3 | NTN-->NI | 0.293 | 0.035 | Yes |
| H4 | NI-->CT | 0.164 | 0.041 | Yes |
| H5 | ASN-->CT | 0.451 | 0.032 | Yes |
| H6 | ATN-->CT | 0.504 | 0.020 | Yes |
| H7 | NTN-->CT | 0.436 | 0.013 | Yes |

Notes: ASN (the percentage of neighborhood area that overlaps with the daily activity space), ATN (the proportion of time spent out-of-home within the neighborhood area), NTN (the number of types of activities conducted within the neighborhood area), NI (neighborhood interaction), CT (community ties).

The direct effects among endogenous variables in the models are shown in Figure 7. Figure 7 indicates that increasing the ASN, ATN, and NTN in the neighborhood area, whether on weekdays or weekends, has a significant positive impact on CT. At the same time, NI serves as a linkage between residents' spatiotemporal behaviors and CT. Furthermore, the model results show that there is significant heterogeneity in the immediate effects among residents' spatiotemporal behaviors, NIs, and CT between residents with different housing types. Compared to affordable-housing residents, increasing the ASN, ATN, and NTN of market-housing residents on weekends will significantly further enhance NI and CT. However, on weekdays, the relationships among ASN, ATN, NTN, and NI were not significantly different across housing groups. This indicates that market-housing residents are more sensitive to the path of increasing NI and CT by increasing ASN, ATN, and NTN, especially during weekends. Therefore, increasing behavioral guidance for market-housing residents and encouraging them to engage in more daily activities around the neighborhood area will help to generate the positive effects of community ties.

The direct effects of exogenous variables on endogenous variables in the models are shown in Table 7. As shown in the table, compared with market-housing residents, affordable-housing residents have a significantly larger ASN, ATN, and NTN on both weekdays and weekends. This illustrates that, although residents with affordable housing and market housing reside in the same neighborhood, there are significant differences in their daily activity arrangements and activities allocated in the neighborhood. Specifically, residents of affordable housing rely more on neighborhood areas for their daily activities. Meanwhile, consistent with the research hypothesis of this study, the NI and CT of affordable-housing residents are also significantly higher than those of market-housing residents. This indicates that groups with more activities in neighborhood areas have significantly higher NI and CT than other groups. In addition to housing type, gender, age, marriage status, monthly income, hukou, employment status, length of residence, and job–housing distance all have significant impacts on endogenous variables. Compared to men, women have more time allocation and overlapping activity space within the neighborhood area, as well as more types of activities in the neighborhood. Their NI and CT are also significantly higher than those of men. The impacts of age and marital status on endogenous variables are similar to those of gender. In terms of monthly income, as residents' income increases, their ASN, ATN, and NTN significantly decrease, whether on weekdays or weekends. However, the changes in NI and CT were not significant. Compared with local residents, the NI and CT scores of immigrants are significantly lower. Part-time or unemployed residents have more spatiotemporal activities in the neighborhoods. Length of residence also has a significant positive impact on NI. Job–housing distance has negative impacts on all the endogenous variables.

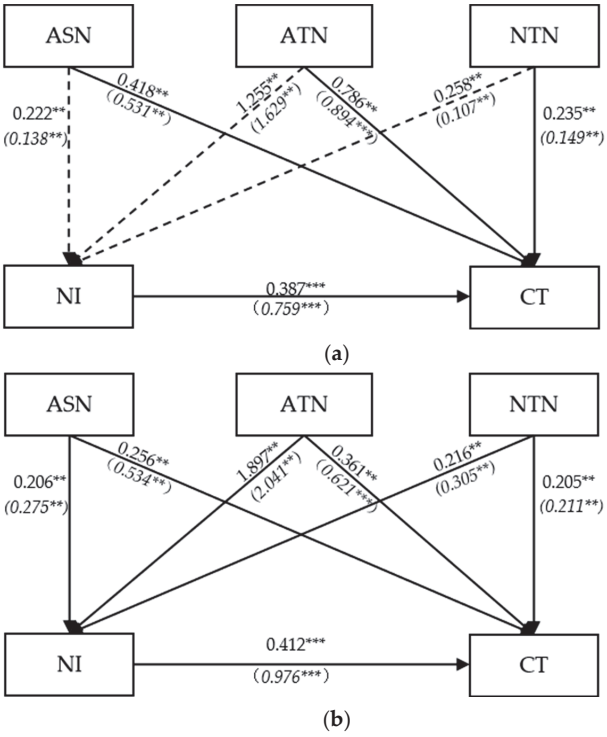


**Figure 7.** Results of grouping comparison models. (**a**) The direct effects between endogenous variables in the weekday SEM model; (**b**) The direct effects between endogenous variables in the weekend SEM model. Notes: ** Significant at the 0.01 level. *** Significant at the 0.001 level. β for the market housing group is in parentheses. ASN (the percentage of neighborhood area that overlaps with the daily activity space), ATN (the proportion of time spent out-of-home within the neighborhood area), NTN (the number of types of activities conducted within the neighborhood area), NI (neighborhood interaction), CT (community ties).

**Table 7.** The direct effects of exogenous variables on endogenous variables.

| | Weekday Model | | | | | Weekend Model | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **ASN** | **ATN** | **NTN** | **NI** | **CT** | **ASN** | **ATN** | **NTN** | **NI** | **CT** |
| Housing Type | | | | | | | | | | |
| Affordable housing | 0.041 ** | 0.072 ** | 0.362 * | 0.419 ** | 0.513 * | 0.052 ** | 0.083 ** | 0.402 * | 0.528 ** | 0.405 * |
| Market housing | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. |
| Gender | | | | | | | | | | |
| Female | 0.026 * | 0.085 * | 0.571 * | 0.562 * | 0.118 * | 0.105 | 0.041 * | 0.376 * | 0.275 * | 0.125 * |
| Male | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. |
| Age | 0.106 * | 0.163 ** | 0.952 ** | 0.681 * | 0.142 * | 0.115 * | 0.206 ** | 0.762 ** | 0.572 * | 0.117 * |
| Marriage status | | | | | | | | | | |
| Married | 0.025 * | 0.273 ** | 0.821 * | 0.781 * | 0.462 * | 0.019 | 0.076 | 0.857 * | 0.829 * | 0.327 * |
| Other status | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. |
| Monthly income | −0.026 * | −0.275 * | −0.796 ** | −0.692 | −0.576 | −0.032 * | −0.057 * | −0.752 ** | −0.12 | −0.316 |
| Hukou | | | | | | | | | | |
| Locals | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. |
| Migrants | −0.015 | −0.172 * | −0.619 | −0.596 * | −0.405 * | −0.008 | −0.003 | −0.562 | −0.482 * | −0.01 ** |
| Employment | | | | | | | | | | |
| Full time | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. |
| Part time or unemployed | 0.072 * | 0.077 * | 0.652 * | 0.519 * | 0.175 | 0.081 * | 0.087 * | 0.723 * | 0.552 * | 0.177 |
| Length of residence | 0.011 | 0.079 | 0.795 | 0.792 * | 0.309 * | 0.02 | 0.019 | 0.581 | 0.571 | 0.411 * |
| Job–housing distance | −0.056 * | −0.108 ** | −0.541 * | −0.276 * | −0.202 | −0.032 * | −0.092 * | −0.621 * | −0.317 * | −0.256 * |

Notes: * Significant at the 0.10 level. ** Significant at the 0.05 level. ASN (the percentage of neighborhood area that overlaps with the daily activity space), ATN (the proportion of time spent out-of-home within the neighborhood area), NTN (the number of types of activities conducted within the neighborhood area), NI (neighborhood interaction), CT (community ties).

## 4. Discussion

Our study analyzed the microsegregation of the spatiotemporal behavior of residents with different housing in mixed-housing neighborhoods, as well as the relationships among residents' behaviors, neighborhood interactions, and community ties. We contribute to the field of microsegregation research by identifying microsegregation issues within neighborhoods from the perspective of the spatiotemporal behavior of different housing groups. At the same time, we investigated the relationships among residents' daily activities, neighborhood interactions, and community ties. Based on the results of this study, decision-makers and urban planners can gain a deeper understanding of the microsegregation issues within mixed-housing neighborhoods, which is helpful for developing better measures and policy tools to promote community ties. Optimizing land allocation and reasonably adjusting land-use functions may be helpful for meeting the living needs of different housing groups, providing more opportunities to conduct neighborhood interactions and strengthening community ties. Our main findings and policy implications are illustrated below.

One major finding of our study is the salient spatiotemporal-behavior-based social segregation for residents with different types of housing in mixed-housing neighborhoods. Specifically, residents with affordable housing have a greater ASN and ATN, even though the size of their daily overall activity space is much smaller than that of market-housing residents and their total out-of-home activity time is much less than that of market-housing residents. Conversely, the indicator of NTN was not significantly different between the two groups. This characteristic has been manifested both on weekdays and weekends. This indicates that, although residents with affordable housing have more ATN and ASN, the types of activities for residents with affordable housing in the neighborhood area are not more diverse. They spent most of their time in neighborhood areas working and meeting their basic living needs. This can be explained by their fewer fulltime jobs, shorter job–housing distance, and lower car ownership. For market-housing residents, a longer commuting distance is a factor that affects their activity allocation in neighborhood areas. However, on weekends, they still have fewer activities within neighborhood areas, indicating that they are more inclined to engage in nonwork activities outside neighborhood areas. This may be related to their consumption level and lifestyles.

These results are consistent with previous findings, such as those by Ta et al. [62] and Arthurson [63], which indicated that, although mixed-housing neighborhood policies have mixed residential spaces for groups with different socioeconomic attributes, different housing groups are still segregated in terms of the allocation of daily activity space and time. This is very detrimental to achieving the policy goals of mixed-housing neighborhoods because it reduces the possibility of cross-group interactions. In this study, SXN enjoys superior locational conditions, a more convenient living environment, and greater accessibility to urban opportunities compared to other neighborhoods, leading residents to predominantly concentrate their daily activities around the neighborhood, particularly shopping and leisure pursuits. This fosters positive community ties among residents of different housing types, with reduced disparities in activity patterns between market- and affordable-housing residents within SXN. Therefore, adjusting the land-use structure and improving the quality of urban facilities around mixed-housing neighborhoods may encourage market-housing residents to shrink their daily activity space and time allocation toward the neighborhood area. On the other hand, although affordable-housing residents have more overlapping activity space and time allocation within neighborhood areas, most of these activities are work activities. Therefore, optimizing the public transportation system around the mixed-housing neighborhood may make it more convenient for affordable-housing residents to carry out diverse nonwork activities near the neighborhood.

Second, our study verified the link between residents' spatiotemporal behaviors and community ties and the linkage effect of neighborhood interaction in the relationships. The more residents' activity spaces overlap with the neighborhood area, the more out-of-home time they spend within the neighborhood, and the more types of activities are conducted within the neighborhood area, the stronger their community ties are. Residents who have

more opportunities to perform activities in the neighborhood area will be more likely to interact with their neighbors, which may enhance their community ties in the long term. Again, this finding supports that residents with market housing are not only exhausted by weekday activities and trips further away from the neighborhood area but also estranged from their neighbors and neighborhood environment, which might contribute to their lack of community ties. Therefore, one possible strategy is to establish neighborhood areas with a strong job–housing balance. If more job opportunities matching residents' skills are provided in or near the neighborhood, the space–time constraints from long-distance commuting could be somewhat reduced, leaving residents more time to interact with their neighbors and build strong community ties.

Third, we found heterogeneity effects of the relationships among residents' spatiotemporal behaviors, neighborhood interactions, and community ties caused by housing type. Through the multigroup structural equation modeling method, we found that market-housing residents are more sensitive to the relationships among individual temporal spatial behavior, neighborhood interaction, and community ties. That is, increasing behavioral guidance for market-housing residents and encouraging them to engage in more daily activities around the neighborhood area will help generate the positive effects of community ties. For affordable-housing residents, although their low socioeconomic status and limited means of transportation anchor their daily activity space around the neighborhood area, they have increased their dependence on the local neighborhood and thus increased the opportunities for neighborhood interaction. This once again indicates that the localization of daily activity spaces helps promote community ties.

Furthermore, our findings also reflect the recent argument on the discordance between the neighborhood effect and contextual uncertainty. As Kwan [64] suggested, "how a person perceives, understands, and reacts to specific environmental factors could be peculiar and person specific. Because the same environmental factors might lead to different behaviors or outcomes due to person-specific attributes, this is a major source of contextual uncertainty in the neighborhood effects literature". As cities in China learn from the mixed-housing policies implemented in developed countries to accommodate residents of diverse socioeconomic backgrounds in the same neighborhood, caution is needed to investigate whether living nearby can effectively promote the interaction of different social groups and improve community ties. Our findings show that residents living in the same neighborhood have segregated daily activity spaces and activities within neighborhood areas, and those residents who perform most daily activities outside the neighborhood area tend to have low community ties. Therefore, policymakers and urban planners should account for residents' daily mobility and attempt to reduce their space–time constraints. It is our belief that common space–time opportunities for different social groups are a prerequisite for their interactions and for enhancing community ties.

## 5. Conclusions

This study aimed to identify microsegregation in mixed-housing neighborhoods from the perspective of the spatiotemporal behaviors of different housing groups. It further explored the relationships among residents' daily activities, neighborhood interactions, and community ties. Through 3D geovisualization, descriptive analysis, and multigroup structural equation modeling (SEM) methods, this study revealed that the segregation of spatiotemporal behavior exists across housing groups in mixed-housing neighborhoods. Additionally, individual neighborhood activities were found to have positive effects on community ties. Neighborhood interaction plays a crucial role in linking individual spatiotemporal behavior and community ties. These findings could have significant implications for planning neighborhoods and urban land use.

Some limitations should be borne in mind when interpreting our findings. Firstly, it is essential to acknowledge that the selected case neighborhoods in our study solely represent mixed-housing neighborhoods formed under the influence of government interventions. Hence, our findings are specific to this particular type of mixed-housing neighborhood.

Since our study did not encompass other types of mixed neighborhoods or market-based residential neighborhoods, the ability to directly compare different types of neighborhoods and the broader applicability of our conclusions are limited. If more different types of neighborhood survey data can be included in future research, it may help to draw more widely applicable conclusions. Secondly, the feedback loop of community ties on residents' neighborhood behaviors has not been tested in this study. Future research should conduct more investigations to test the two-way relationships. Finally, we are unable to identify long-term changes in residents' community ties within the residential neighborhood, which are closely connected to the life course and relocation history of various social groups. To provide more robust and relevant evidence on the creation of strong community ties, qualitative studies and longitudinal cohort studies are required.

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## Appendix A

**Table A1.** Measurement invariance results.

| | SB-$\chi$2 | $\Delta\chi$2 | Df | $\Delta$df | CFI | RMSEA | SRMR | *p* Value |
|---|---|---|---|---|---|---|---|---|
| Configural invariance | 1495.45 | -- | 226 | -- | 0.913 | 0.051 | 0.066 | -- |
| Weak invariance | 1537.56 | 42.11 | 255 | 29 | 0.927 | 0.054 | 0.068 | 0.329 |
| Strong invariance | 1559.08 | 21.52 | 282 | 27 | 0.912 | 0.056 | 0.073 | 0.218 |
| Strict invariance | 1576.33 | 17.25 | 307 | 25 | 0.925 | 0.052 | 0.076 | 0.172 |

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# Housing Practices of Albanian Immigrants in Athens: An "in-between" Socio-Spatial Condition

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**Abstract:** Immigrants' access to housing is often the outcome of self-settlement practices within a context of limited social policies that often characterizes Southern European metropolises. Hence, immigrants are facing multiple constraints and remain vulnerable towards diverse socioeconomic fluctuations. This article focuses on the housing practices followed by Albanian immigrants, the largest immigrant group in Athens's municipality, to examine how spatial inequalities are intertwined with ethnicity in the Greek capital. The objective is twofold: to discuss ethnic segregation on the micro-scale of Athenian central neighborhoods and examine how immigrants' housing practices are being challenged within a rapidly changing socio-spatial context. The methodology follows a mixed approach, aiming at identifying differentiations and inequalities both on the macro- and micro-spatial scale. First, differentiations among Greeks, Albanians, and other third-country nationals in Athens (2011) are traced and compared, based on quantitative data. Second, for the purpose of highlighting micro-geographies in the city, this article presents an analysis of collected narratives of Albanian immigrants, through semi-structured interviews held in 2023. The main results indicate that the population under study finds itself in an "in-between" socio-spatial condition: an "in-between", compared to the housing experiences of Greek households and other third-country nationals, that produces (and reproduces) segregation trends visible on the micro-scale. Moreover, this article attempts to highlight how the lack of housing policies put in peril the successful self-settlement practices of Albanian immigrants, in the current context of financialization of the Athenian housing market.

**Keywords:** micro-segregation; housing practices; mixed method approach; mobility; immigration; Albanian immigration; Athens

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## 1. Introduction

The Albanian population in Greece is the largest immigrant group established in the country since the 1990s. This article relies on primary and secondary research data, seeking to present the ethnic dimension of housing practices in Athens, a Southern European (henceforth SE) capital undergoing major socio-spatial transformations. Following a pluridisciplinary geographic approach, we observe the spatial dynamics of the Albanian population, a research topic insufficiently discussed, so far, in the relevant literature. Cross-examining the socioeconomic, residential, and ethnic differentiations, the analysis focuses on the access of Albanians to the housing sector and on the contextual factors that have been interfering with their practices on the micro-scale. We conclude that Albanian immigrants in Athens stand in an "in-between" situation: an "in-between" compared to Greek households and other third-country nationals.

Ethnic and socioeconomic segregation within the broader European urban context has been increasing since the mid-1970s, following the rise in wealth inequalities on the global and national scale [1]. The SE context is characterized by low levels of spatial segregation, and, often, ethnic segregation is the outcome of residential inequalities experienced by the immigrant population [2]. As main indicators of residential inequalities, we identify

limited access to higher-quality housing, discrimination in the housing market, or limited social encounters with nationals within a context of spatial proximity.

In Athens, access to affordable and decent housing remains problematic for most of the immigrant population to this day, mainly due to increasing housing prices, the absence of relevant policies and social housing, shortages of affordable housing following new trends in the touristification of the city [3] and multifaceted discrimination in the housing market [4–7].

While immigrants' contribution to the social and economic life of the country is incontestable [8,9], social policies concerning their integration have (diachronically) been poor [10,11]. Numerous studies demonstrate how social housing policies in Greece are almost non-existent (for both national and immigrant population), while the social housing sector is also limited [4,12,13]. A few exceptions are the policies implemented since 2015 due to the so-called "refugee crisis". During that period, in response to the extreme accommodation needs of asylum seekers and beneficiaries of international protection in Greece, as in other SE countries, an expansive reception system was shaped including two types of accommodation infrastructures: the Open Temporary Reception Facilities (henceforth "Sites"), which in the case of Athens were established in suburban and peri-urban areas, and the Emergency Support to Integration and Accommodation (ESTIA), which included urban accommodation in apartments, hotels, and other buildings [14]. The Sites were turned into prolonged displacement accommodation infrastructures, while the ESTIA project was discontinued in 2023 and progressively replaced by the HELIOS project (Hellenic Integration Support for Beneficiaries of International Protection), a program which, nevertheless, exclusively addresses asylum seekers who received refugee status [15,16].

Throughout this turbulent period, asylum seekers and beneficiaries of international protection were included in EU-funded project-based initiatives. At the same time, immigrant communities already established in Athens, before 2015, were not included in the policies implemented during the "refugee crisis" and were left, once again, in a position of relative exclusion vis-à-vis the housing policy.

Following the introduction (Section 1), this paper presents the contextual and theoretical factors of the analysis (Section 2), highlighting the micro-segregation trends and outlining the general socioeconomic pathways of Albanian immigrants in Athens. Section 3 presents the materials and the methods employed in this study in order to examine the demographic profile and the housing patterns of the Albanian population in Athens using quantitative and qualitative data. Section 4 compares the education and housing profile of Albanians, Greeks, and other migrant populations. Lastly, Section 5 discusses the issue of immigrant settlement within the context of profound changes taking place in Athens today, and Section 6 presents the main findings.

## 2. Contextual and Theoretical Factors

### *2.1. Micro-Segregation Trends in Athens*

The theoretical approach of this paper draws insights from the conceptualization of segregation as an urban condition visible on the macro-, mezzo- and micro-socio-spatial scale. Concerning the case of Athens, a typical example of an SE city, the spatial and social inequalities "manifest themselves in spatially fragmented ways" [17]. Rather than observing large-scale and horizontal segregation patterns, the research conducted since the mid-1990s has shown that inequalities on the spatial scale are often manifested vertically and, therefore, on the micro-scale level [18–20]. Recent methodological inputs, such as the use of combined statistical data, in-depth interviews, and empirical research, allowed an analysis of multiple segregation trends that are visible on the mezzo- and micro-scale of the neighborhood, the street, and/or the apartment buildings (*polykatoikia*).

The Athenian housing stock produces a relatively homogeneous setting, especially in central urban areas. Most of the Athenians reside in apartment buildings, built on small plots—often smaller than 500 $m^2$—with an average of 15 apartments and 5–7 floors. Furthermore, most of these buildings were erected between 1960 and 1980 [3]. The preva-

lent mechanism of housing promotion throughout that period was the *antiparochi* system, which is a market-based mechanism of housing production associated with the massive densification and spread of the typical post-war apartment buildings (*polykatoikies*) following a triangulated form of building processes including a landowner; a small contractor, with whom they formed a joint venture to carry out a single operation, at the end of which they split the apartments according to their initial contract terms; and buyers [17,21]. Throughout this otherwise homogeneous (and relatively new) housing stock, differences do occur. They are expressed via access to homeownership, housing quality and amenities, or location. Furthermore, the floor of residence in the apartment building (*polykatoikia*) is also important, since it produces a social or ethnic stratification by floor of residence. Upper floors are more advantageous, offering higher living standards, while lower floors—ground floor and underground apartments—are much smaller, darker, and noisier [20,22,23].

This paper is about ethnic micro-segregation; it enriches the study on socio-spatial and ethnic inequalities in the Greek capital. Micro-segregation highlights that, despite urban proximity, "socio-spatial hierarchies, even in otherwise socially mixed neighborhoods, are (re)built at a micro spatial scale" [24]. Albanian immigration—with Albanians being the largest immigrant group which, according to the relevant literature, follows patterns of invisibility in the city—is taken as the main case study to address issues of social and ethnic mixes, entrapment and marginality, and micro- and mezzo-segregation in an urban context defined and redefined by hierarchies and inequalities.

### *2.2. Contextual Evidence on the Athenian Housing Market*

Access to rental housing is primarily determined by demand and supply, mainly imposed by rental prices, which are regulated by the expectations of owners and the incomes of those seeking a residence. Other forms of filtering, such as home insurance contracts or pay slips, are not imposed. First impressions and a warranty (one or two months in advance) seem to determine the whole procedure. Moreover, neither the owners nor the tenants are fully protected by the legal framework. On the one hand, the contracts are easily bypassed by the tenants and can be ended in advance. On the other hand, at the end of the initial three-year contract, the owner can set a new price without restrictions. In recent years, the rise in rental prices has led to changes in the Athenian housing market [25]. Fueled, among other factors, by touristification trends and an increase in short-term rentals, the rise in rental prices reflect mostly an increase in homeowners' expectations, rather than an increase in renters' incomes.

Access to homeownership remains a key housing strategy for Greek society. Traditionally, homeownership has been financed by personal savings, or families' ability to support younger members. Bank loans, linked to annual incomes, also used to play a pivotal role in access to ownership. The aforementioned sources were strongly affected by the debt crisis that turmoiled the Greek economy. Access to homeownership became more difficult, savings were reduced, the number of non-performing loans (henceforth NPL) increased, while property taxes were imposed horizontally on all income classes [5,26].

Social housing provision in Greece is limited, while there is a complete absence of the social rental sector [27,28]. The production of social housing often tried to resolve the extreme housing needs of more vulnerable groups (i.e., war refugees, internal immigrants due to natural hazards), but rarely proposed an organized housing solution. The state's absence was replaced by loans distributed mainly by the Greek Workers' Housing Organization (OEK), not active since 2012 [27], reproducing the homeownership residential strategy through social policies.

### *2.3. Albanians in Athens: Arrival, Socio-Spatial Settlement, and Vulnerabilities*

Albanian migration in Greece started in the early 1990s, during a period of economic and political challenges for both countries. Greece, on the one hand, secured its position in the North Atlantic Alliance (NATO) and the European Union (EU), while entering progressively in the EU market. Through the subsequent economic development, Greece became

an immigration country, in need of an unskilled and flexible labor force. Citizens from the Balkan countries and Eastern Europe arrived first, followed by an ethnically diversified migrant population, from Asia, the Middle East, and Africa. Albania, on the other hand, experienced in the 1990s a profound political change with the collapse of communism. The subsequent transformation of the economy, from socialist to market-oriented, resulted in an extended financial crisis with a subsequent increase in unemployment [29,30]. A part of the Albanian population fled the country, following the path of international immigration, mainly towards Greece and Italy. According to the Albanian Statistical Bureau (INSTAT), in the mid-2000s, Greece absorbed around 600,000 people out of 1,000,000 that had fled to Albania [30] (101).

The main factor that facilitated Albanian mobilities towards Greece is the border that the two countries share—a mountainous zone, difficult to control, of more than 280 km. The geographic proximity shaped migration patterns and fostered transnational economic, personal, and cultural ties between the two countries [31]. The border was the gateway for most of the migrants that moved towards Greece since the 1990s, regardless of which part of Albania they came from. Scholars have demonstrated that the Albanian population consists of a complex migratory group with important heterogeneities reflecting, among others, differences in the generational status, ethnic and spatial origins, length of stay, legal status, or employment conditions of its members [29,31–33]. For the needs of this analysis, we observed the pathway of Albanians coming from different cities, such as Shkoder in the north, Fier and Berat in central Albania, or Saradë in the south (Figure 1).


**Figure 1.** Greece and neighboring countries. Mapping by the authors.

On a global scale, the border between Albania and Greece was, and still is, a threshold between different economic systems or organizations. During the Cold War—after WWII and the end of the Greek Civil War (1945–1949), up until 1990—it was the limit between East and West. Today, it delimits the European Union. Largely, it was the vicinity and the extreme instability of the Albanian economy that fueled the immigration towards Greece and not the pre-existing relations between the two countries.

Albanian nationals started arriving in Athens in great numbers in the early 1990s due to the political turmoil in Eastern Europe. This migratory wave continued throughout the decade, with a second increase around 1997–1998 due to the pyramid investment schemes that took place in Albania, resulting in the collapse of the local economy [34] (Table 1 and Figure 2).

**Table 1.** Part (%) of the population of the most important foreign nationalities in the municipality of Athens (2011). [1] Source: EKKE 2015 [35], data processed by the authors.

| Country of Origin | Population | Part (%) of Total Population | Part (%) of Foreign Population |
|---|---|---|---|
| Greece | 499,947 | 74.1 | |
| Albania | 66,825 | 10.1 | 39.8 |
| Eastern Europe—EU (*Bulgaria*, *Romania*, *Poland*) | 24,347 | 3.7 | 14.5 |
| Indian peninsula (*Bangladesh*, *Pakistan*) | 11,578 | 1.7 | 6.9 |
| Eastern Europe—non-EU (*Georgia*, *Ukraine*) | 10,791 | 1.6 | 6.4 |
| Total | 664,046 | 91.8 | 67.7 |

[1] For the needs of this analysis, we regrouped our dataset geographically. As a result, we did not take into consideration the population from the Philippines (6th) and Afghanistan (10th), who are also part of the 10 most important foreign nationalities in Athens.

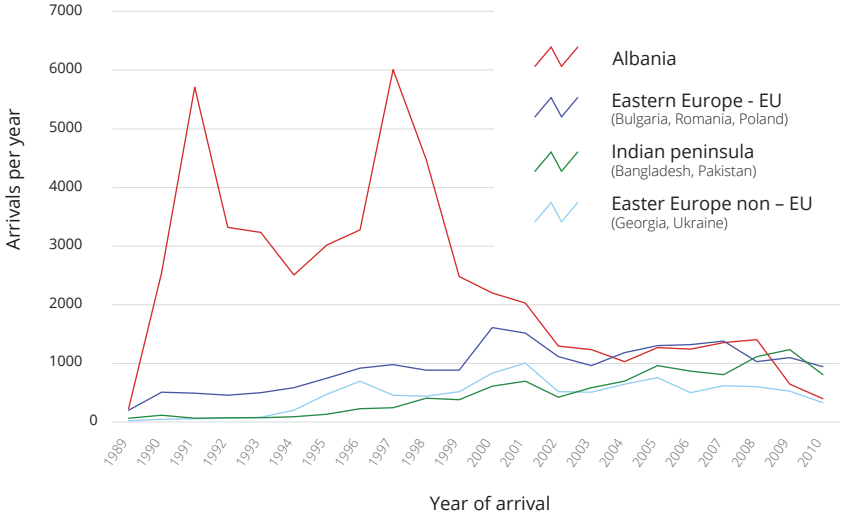


**Figure 2.** Year of arrival for the immigrant population residing in the municipality of Athens in 2011. Source: EKKE 2015 [35]; data processed by the authors.

After 2000, the rates of Albanian external migration decreased, while in the mid-2000s, some limited repatriation trends were recorded [32]. The migration towards Greece was still growing until the beginning of the 2000s. During that period, a sharp decline in the number of Albanians arriving in Athens was observed, returning to pre-1990 levels after

2008, when the signs of the financial crisis became evident (Figure 2). The arrival in greater numbers of immigrants and asylum seekers from other countries—especially from the Indian peninsula—since 2000, linked to the construction needs of modern infrastructures and of the 2004 Summer Olympics, resulted in substantial changes concerning the ethnic composition of the city. At the same time, other Eastern Europeans, especially from EU member states (e.g., Poland, acceded to the EU in 2004, and Bulgaria and Romania, acceded in 2007), showed a slow increase and stability in numbers throughout the 2000s.

Upon their arrival, Albanian populations settled in urban or rural areas and managed to self-integrate in the labor market, the housing sector, and other societal aspects [9,31,36]. The economic growth of the Greek economy during that period, mainly an effect of European funding, produced an increasing demand for low-skilled workers. Once in Greece, most of them were employed in pillar sectors of the local market, such as the service (tourism), agriculture, construction, and care sectors. This enabled the immigrants to enter the formal but—most of the time, due to the lack of a legal framework for the employment of immigrants in Greece—informal labor market [36].

Albanians progressively experienced social mobility and, as King and Vullnetari point out, their presence in Greece evolved into a permanent family settlement [9,37]. The legalization programs in the 1990s permitted family reunification, also giving access to legal status.[1] The dependency between work and the legal permit status did not prove to be an impediment of considerable importance, since the economic sectors that Albanians were employed in continued to flourish throughout that period, offering a considerable income.

The socioeconomic trajectories of Albanian immigrants in Greece were disrupted due to the economic crisis. Found in a spiral of increased precarity, their status changed dramatically [9,31]. Researchers demonstrate how they were disproportionately affected by very high rates of unemployment, since the basic employment sectors, in which they were typically occupied, were severely affected. As a result, their inflow was further reduced, while many Albanians fled the country, either to return to Albania or re-emigrate to other, more economically stable markets. According to the first published results of the 2021 census by the Hellenic Statistical Authority (ELSTAT), on a national level between 2011 and 2021, there was a decline of 22% (105,925 people) in the Albanian population and of 27.6% (53,375 people) in the Athenian metropolitan area [39].

Moreover, the crisis and the subsequent unemployment also had an impact on legal status—the so-called "de-legalization" of immigrants [31]. Legal debates on citizenship during the period of 2009–2015 became more complex within an increasingly nationalistic political landscape under conditions of intense economic instability [40].

Albanians, mostly second-generation, are currently coping with multiple economic and structural challenges, related to unemployment or underemployment, legal status exclusion, and poor opportunities. According to the 2011 census data, 20.8% of the Albanians residing in Athens in 2011 declared that they had never lived abroad, a percentage that shows the numerical importance of the second generation [35]. As already mentioned, Albanian immigrants were critically affected, often more than the Greek nationals, by the economic recession. The sovereign debt crisis intensified the challenges for the immigrant population, transforming in many cases the social mobility strategies that this population had applied over several years [41]. The existing socio-spatial inequalities were aggravated, increasing deprivation and precarity, especially in the ethnically mixed neighborhoods of the city [12,14].

On a local scale, Athens also changed profoundly during that period (1990–2010). For the first time, Greece became a "host" country for ethnically and socially diverse populations, with Athens being the epicenter of these changes, absorbing the majority of arriving populations, which meant new and more complex segregation patterns [7,42]. Due to the absence of public housing, the newcomers found accommodation in the private sector; in other words, they were obliged to "survive" in the free market. In Athens, the prevailing—apartment building (*polykatoikia*)—housing stock resulted in intense spatial proximity within the densely built neighborhoods. On the one hand, combined with

high percentages of homeownership, this favored low levels of segregation; on the other hand, spatial proximity often masks social distance, marginalization, and social exclusion, associated with poor-quality housing and precariousness [12,43].

## 3. Materials and Methods

Our analysis was based on both quantitative and qualitative research, conducted within the framework of the Horizon 2020-funded ITHACA (Interconnecting Histories and Archives for Migrant Agency) research program. The quantitative research used data obtained from the 2011 national census, the last available national census, accessible through the application Panorama of Greek Census Data [35]. The data were collected by the Hellenic Statistical Authority (ELSTAT). The scope of the analysis was to investigate the different social profiles and to identify differentiations in the quality of the housing stock occupied by migrants in Athens. The analysis focused on the population from developing economy countries[2] [44], especially from Albania. First, we compared the trends in the Albanian community with the Greek population's trends. Then, in order to facilitate the comparison with other migrant populations, we regrouped the most important ethnic groups into three distinct geo-economic groups. The first group included the countries from Eastern Europe who are not members of the EU—i.e., Georgia and Ukraine (henceforth EEnEU); the second, the countries of Eastern Europe that have joined the EU, i.e., Bulgaria, Poland, and Romania (henceforth EEEU); finally, the third features countries from the Indian peninsula, i.e., Bangladesh and Pakistan (henceforth IP).

In the relatively homogeneous Athenian housing stock, our analysis unraveled differentiations according to the nationality of the residents. To investigate the relation between poor housing conditions and ethnic segregation, we used several variables available in the census. The data analysis, and the mapping, was made at the lowest possible spatial level, i.e., the Urban Analysis Units (URANUs) [35][3].

First, we present the average profile of the ethnic groups residing in the Athenian municipality, putting emphasis on educational attainment, employment, and other demographic indicators. Second, we analyzed and mapped the data linked to homeownership, and then focused on housing amenities, such as the age of the housing stock, the heating system, and the sufficient insulation. Lastly, beyond the analysis of variables demonstrating horizontal ethnic inequalities, this paper also investigates the presence of vertical differentiations by investigating the unequal distribution of ethnic groups among floor levels in apartment buildings [14,20,23].

Our analysis also included the results of the qualitative research conducted during the ITHACA Horizon 2020 research program, containing a series of interviews and informal meetings with representatives of NGOs, representatives of migrant associations, academics, and experts in the field of migration and refugees' studies (Annex, Tables A1 and A2). Through the above-mentioned exchanges, a specific migrant association—representing Albanian households—further collaborated with us in order to deepen our understanding of this specific migrant group. Having built a relationship of trust, the research team engaged in extended discussions with its representatives and proceeded in conducting eight semi-structured interviews (Annex, Table A1)[4]. For the needs of those interviews, an extended interview guide was elaborated, composed of 44 open-ended questions and organized into five distinctive parts including questions about the household composition, the employment status of the household members, their educational level, their migratory status, and lastly, the detailed record of the household's housing pathway in Athens (i.e., first, second, and third accommodation). Special attention was given to aspects such as the rent, the apartment surface, its amenities, and the relations with the owner.

The resulting qualitative material was laden with narratives concerning the process of settlement in Athens. For the needs of this article, we utilized only those parts highlighting housing practices deployed by the migrants. Following a life story approach to migration [45], we recorded their pathways from their arrival to mid-2023, when these interviews took place.

## 4. Results

### *4.1. Albanian Socioeconomic Profile*

In 2011, in the municipality of Athens, foreigners represented 25.9% of the population and Albanians represented 39.8% of them (see Table 1). Before proceeding to the analysis of the housing practices, it is important to question the average profile of ethnic groups in the city. This part of our analysis refers to educational attainment (e.g., 12–14 year olds not in education), employment (e.g., percentage in specific professions), and specific demographic indicators (e.g., age or number of children per mother). In the next part of this analysis (Section 4.2), we examine issues concerning their housing practices, such as the age of the housing stock, the amenities, the access to homeownership, and the indices of vertical segregation.

Concerning education (Table 2), the drop-out rate for 12–15 year olds is extremely high for immigrants from the IP (32.1%), while the rest of the groups show small deviations between them—4.2% for the Albanians and 3.1% for the rest of East Europeans—with higher levels of participation in the compulsory education (this age cohort corresponds to lower secondary school, which is part of compulsory education). The percentage of those not in education, employment, or training (NEETs) also differentiates the EE countries from the IP countries, revealing important differences between them. The Albanians (21.1%) score lower than the other Europeans (22.8% and 27.8%), but still 8% higher than the Greeks. Unemployment places Albanians closer to other foreigners, scoring almost twice higher than the Greeks. It is interesting to mention that unemployment for Albanians and other Eastern Europeans decreases when first-time job seekers (i.e., those who never worked officially before) are considered. The latter finding reinforces the argument of important differentiations between the first and the second generation.

**Table 2.** Educational attainment and unemployment (2011). Source: EKKE, 2015 [35]; data processed by the authors.

| Country of Origin | 12–15 Year Olds Not in Education | NEET [1] (15–22) | Unemployed | Looking for a Job for the First Time |
|---|---|---|---|---|
| Greece | 1.3 | 13.0 | 5.9 | 2.0 |
| Albania | 4.2 | 21.1 | 12.1 | 2.9 |
| Eastern Europe—EU (*Bulgaria*, *Romania*, *Poland*) | 3.2 | 27.8 | 12.1 | 3.1 |
| Indian peninsula (*Bangladesh*, *Pakistan*) | 32.1 | 50.0 | 16.9 | 11.2 |
| Eastern Europe—non-EU (*Georgia*, *Ukraine*) | 3.2 | 22.8 | 11.1 | 3.1 |
| Total | 1.1 | 13.9 | 7.4 | 2.7 |

[1] NEET: Not in education, employment or training.

According to the data, the Albanian population in Athens is composed of a much larger percentage of children and a much smaller percentage of elderly compared to the Greek population (Table 3). Furthermore, there is an impressive gender equilibrium. The higher number of children per mother (1.5) indicates that fertility is higher in the Albanian population. Low scores for immigrants from IP counties are linked to their gender and age profile (adolescent males), while demographically, those from the other European countries, especially EEnEU, are primarily middle-aged women—mostly occupied in the care sector [35,46]. This factor, i.e., the over-representation of women, explains the low levels of the average number of children per mother.

**Table 3.** Age and families (2011). Source: EKKE 2015 [35], data processed by the authors.

| Country of Origin | 0–14 Years Old | More Than 65 Years Old | Males | Average Number of Children per Mother [1] |
|---|---|---|---|---|
| Greece | 9.9 | 23.7 | 46.2 | 1.1 |
| Albania | 21.3 | 4.0 | 50.6 | 1.5 |
| Eastern Europe—EU (*Bulgaria*, *Romania*, *Poland*) | 14.0 | 1.5 | 41.2 | 0.8 |
| Indian peninsula (*Bangladesh*, *Pakistan*) | 4.7 | 0.5 | 92.3 | 0.9 |
| Eastern Europe—non-EU (*Georgia*, *Ukraine*) | 7.8 | 2.0 | 28.4 | 0.8 |
| Total | 11.0 | 19.0 | 47.5 | 1.1 |

[1] Women > 15 years old.

The low score of the elder population should not be linked to lower life expectancy, but to the geographic vicinity and therefore the possibility of returning to the country of origin. Albanian immigrants in Greece supported their national economy through remittances; therefore, investments in the place of origin, linked to an eventual return, are not rare. For the populations originating from the IP, the low scores can be linked to their recent arrival at the time of the census (2011).

According to the census, Albanians tend to occupy lower, unskilled and semi-skilled, positions in the occupational spectrum. In Athens, they are over-represented in the construction sector, the services, and the care sector. Important differentiations, and traces of intergenerational mobility, do occur if we divide the active population into two distinct age groups (Table 4) and check the five most popular occupations for each group. The first group includes the younger population, between 16 and 29 years old, who were mostly born and raised, or just raised, in Greece. The second group includes those between the ages of 30 and 50. Born before 1981, they arrived in Greece in a productive age, and they represented more than half of the active Albanian population in 2011. The generational differences come to the forefront; the same sectors prevail in both groups, but with important inter-sectorial dissimilarities. For the younger people, 20% are employed in the service and sales sector (shop or waiters and bartenders). For the 30–50-year-old cohort, sales is the third most important category but absorbs only 6%. In this age group, the broader construction sector (i.e., builders, painters) dominates, while domestic, hotel, and office cleaners and helpers follow. For the younger population, these sectors remain important but to a lesser extent.

**Table 4.** Top 5 occupational categories by age group (2011). Source: EKKE (2015) [35]; data processed by the authors.

| Top 5 Occupations | | | |
|---|---|---|---|
| **16–29 Year Olds [1]** | | **30–50 Year Olds [2]** | |
| Shop salespersons. | 11.4 | Domestic, hotel, and office cleaners and helpers. | 21.3 |
| Waiters and bartenders. | 9.7 | Building frame and related trades workers. | 18.2 |
| Building frame and related trades workers. | 8.9 | Shop salespersons. | 6.0 |
| Domestic, hotel, and office cleaners and helpers. | 7.8 | Building finishers and related trades workers. | 4.9 |
| Building finishers and related trades workers. | 5.9 | Painters, building structure cleaners, and related trades workers. | 3.9 |
| Total | 43.7 | Total | 54.3 |

[1] 16–29 year olds represent 23.5% of the Albanian active population; [2] 30–50 year olds represent 57.9% of the Albanian active population.

### *4.2. Urban Settlement of Albanian Immigrants in the Municipality of Athens: An "in-between" Situation*

This part of our analysis seeks to reveal to what extent housing patterns and living conditions of Albanian immigrants differ from those of Greeks or other foreigners coming from developing countries.

The rental market remains the predominant housing solution for foreigners (Table 5). Across Europe, third-country national households are three times less likely to involve homeowners, especially in more recent destinations, such as Spain, Italy, and Greece, but also in long-standing destinations, such as Belgium [47]. Furthermore, researchers concerning the Global North have shown that renters are more precarious than homeowners in all the dimensions of housing precarity [48]. In Athens, access to ownership seems to be an important indicator of differentiation between Albanians and those coming from developing countries, since there are twice as many of the former.

**Table 5.** Distribution (%) of households by tenure and housing amenities in the Municipality of Athens, 2011. Source: EKKE (2015) [35]; data processed by the authors.

| | **Tenure Status by Household** | | **Housing Amenities by Household** | |
|---|---|---|---|---|
| **Country of Origin** | **Owners** | **Tenants** | **No Glazing** | **No Heating** |
| Greece | 67.6 | 25.3 | 48.9 | 2.1 |
| Albania | 25.9 | 72.3 | 69.4 | 8.0 |
| Eastern Europe—EU (*Bulgaria*, *Romania*, *Poland*) | 13.5 | 83.8 | 71.9 | 5.8 |
| Indian peninsula (*Bangladesh*, *Pakistan*) | 7.0 | 90.8 | 77.5 | 16.3 |
| Eastern Europe—non-EU (*Georgia*, *Ukraine*) | 22.3 | 73.3 | 73.5 | 5.7 |
| Total | 56.0 | 37.7 | 54.4 | 3.5 |

As seen in Figure 3, homeowners from developing countries are concentrated in the northern part of the municipality, especially around the main vertical axis of Patission Street and the Metaxourgeio neighborhood, both ethnically mixed [14,20,49] and deprived areas [12,50].

Albanians are dispersed, spreading throughout the municipality (Figure 4). In order to map their distribution in the municipality of Athens, we calculated a location quotient (LQ). The LQ is estimated by comparing their presence in a given URANU to their average presence in the municipality of Athens. An LQ score below 1 indicates the under-representation of Albanians, in blue colors, and an LQ score above 1 indicates the over-representation of Albanians, in red colors, compared to their average presence in Athens. An LQ of 1 indicates that their presence is proportional to their contribution in the rest of the municipality.

Important under-representations can be traced; the most important are in the eastern city center (where residential space is limited) and the southern slopes of the Lycabettus Hill, i.e., the Kolonaki district, a traditional bourgeoise stronghold of the city. At the same time, some clusters are identified in densely built areas where the high-rise housing stock prevails—such as Ampelokipoi, Gyzi, and the northern part of Pangrati—or, to a lesser extent, around areas of mixed uses (housing and manufacture) such as Neos Kosmos. The latter show that, through their housing pathways, Albanians manage to avoid stigmatized neighborhoods, such as Metaxourgeio, where ethnically diverse populations tend to concentrate.

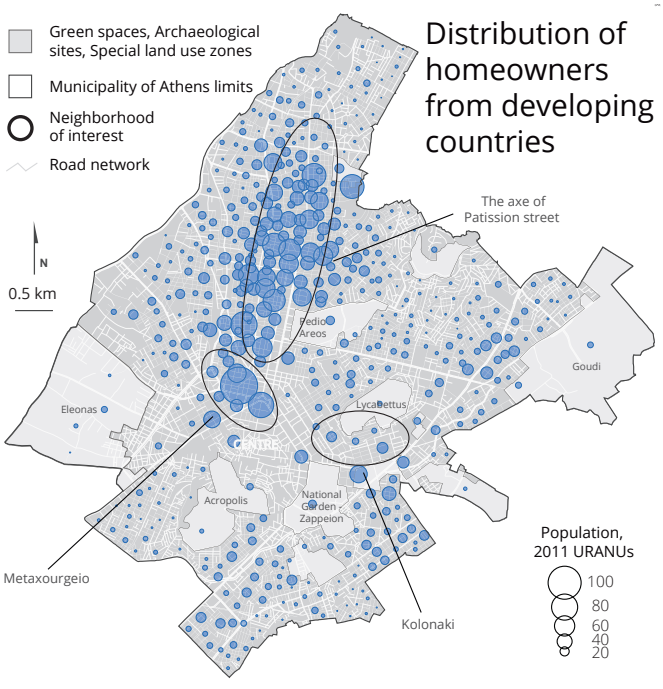


**Figure 3.** Distribution of homeowners from developing countries, Municipality of Athens, URANUs level 2011. Source: EKKE 2015 [35]; data processed and mapping by the authors.

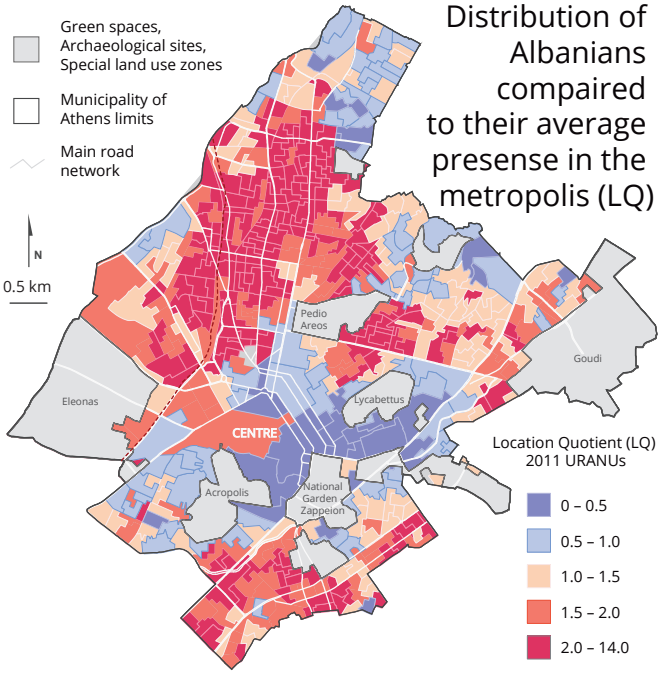


**Figure 4.** Distribution of Albanian population, Municipality of Athens, URANUs level 2011. Source: EKKE 2015 [35]; data processed and mapping by the authors.

A similar pattern is observed concerning the Albanian homeowners (Figure 5). The dispersion of homeowners is linked to the earlier arrival of Albanian populations compared to immigrants of other origins (see Figure 3). Being around longer, Albanians probably had the opportunity to make their choices not only according to availability, but also based on other aspects of a given area/district, such as social or family networks, ethnic composition, or schooling quality. Thus, our main observation is that Albanian immigrants are to be found "in-between" Greeks and foreigners from developing countries. On the one hand, concerning homeownership, Albanians seem to follow similar strategies to those of the native population—a practice that differentiates this migratory group from the rest of foreign populations. On the other hand, concerning the quality of housing, Albanians follow the trends in other foreigners.

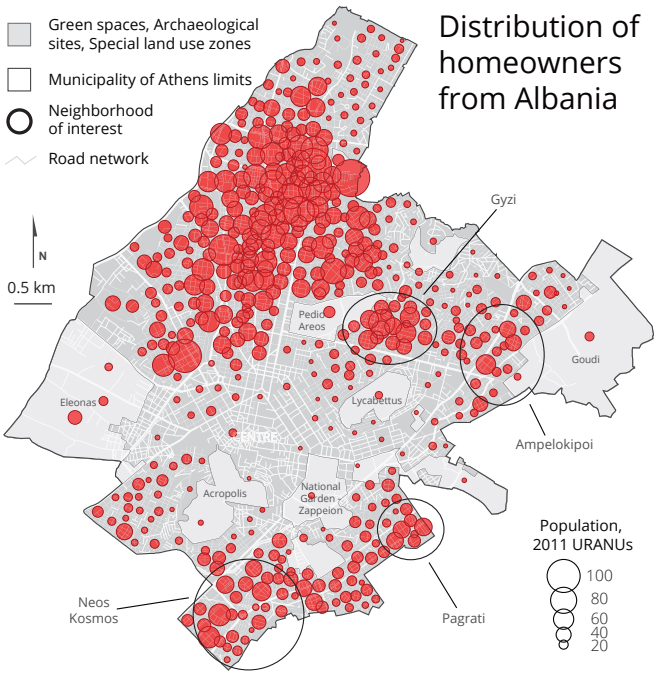


**Figure 5.** Distribution of homeowners from Albania, Municipality of Athens, URANUs level 2011. Source: EKKE 2015 [35]; data processed and mapping by the authors.

The high rates of homeownership among Greeks (67.6%) reveal the importance of owning a residence in Greek society. Albanians also appear to seek access to homeownership: one out of four Albanian households are homeowners, therefore embracing, to a certain extent, this strategy. The element of spatial dispersion corroborates this. Albanian populations are dispersed and, hence, spatially closer to Greeks.

The analysis shows that access to homeownership does not lead to better housing amenities, such as heating or insulation. Albanians seem to experience poorer housing conditions than Greeks. Therefore, the housing quality factor (see Table 6) seems to reduce their differentiation from other foreigners from developing countries. The age of the residence is also considered as a housing quality indicator for the purpose of our analysis. As already mentioned, most of the Athenian housing stock was produced between 1960 and 1980. The distribution of nationalities according to the age of the housing stock appears to be a factor leading to differentiation, even though immigrants reside in the prevailing residential constructions of the 1960s–1980s. Populations from developing countries show higher percentages in the older part of the stock (before 1960), while Greeks dominate the

newest part of city dwellings. Albanians seem to be highly concentrated (76.5%) in the 1960–1980 stock, not having access to "newer", post-1980 residencies, even though they score higher than the other groups, but also avoiding the oldest, and poorer, housing stock, scoring lower than the others. An important finding is that a clear differentiation between Albanian homeowners and tenants is observed. Albanians who had access to ownership seem to increase their numbers in post-1980 residences.

**Table 6.** Part (%) of the population by the residence's construction period, Municipality of Athens, 2011. Source: EKKE (2015) [35]; data processed by the authors.

| Country of Origin | Before 1960 | 1960–1980 | After 1980 |
|---|---|---|---|
| Greece | 10.8 | 60.4 | 28.7 |
| Albania | 13.0 | 76.5 | 10.5 |
| tenants | 13.9 | 79.9 | 6.3 |
| owners | 9.9 | 67.2 | 22.9 |
| Eastern Europe—EU (*Bulgaria*, *Romania*, *Poland*) | 14.4 | 76.8 | 8.9 |
| Indian peninsula (*Bangladesh*, *Pakistan*) | 23.4 | 74.4 | 2.2 |
| Eastern Europe non-EU (*Georgia*, *Ukraine*) | 18.0 | 74.6 | 7.4 |
| Total | 12.1 | 64.0 | 23.9 |

To cross-examine the spatial proximity and housing quality parameters between Albanians and other nationals, we took into consideration the mechanism of micro-segregation, especially of vertical segregation, for the needs of this analysis. We consider this parameter pivotal in understanding housing practices of Albanian populations. Residing in the same apartment building indicates spatial proximity, but residing on a different floor, in vertically segregated urban spaces, reveals social distance (Figures 6 and 7) [23].

**Figure 6.** Apartment buildings in vertically segregated neighborhoods in Athens. Photo by authors.

**Figure 7.** Apartment buildings in densely built vertically segregated neighborhoods in Athens. Photo by authors.

Foreigners from developing countries are over-represented on lower floors, scoring more than the average profile (14.5%) (Table 7). This stock of poorer quality, characterized by negative features such as a lack of sunlight, increased noise, poor ventilation, and smaller surface, is disadvantaged and less desirable. On the other hand, Greeks dominate the more advantaged higher floors (fourth floor and above). Albanians are over-represented on the middle floors (63.7%), therefore "avoiding", once again, the apartments of poorer quality found on lower floors, where they score lower than the other groups. The fact that Albanians score lower on higher floors is directly linked to their dispersal. Two arguments could explain this finding: First, it may be because other groups are concentrated in disadvantaged areas with a homogeneous ethnic profile and where foreign citizens from developing economy countries are over-represented across all floors. Second, it may be because—as we have already demonstrated—there is an important demographic differentiation in the Eastern European migrant groups, with women prevailing. Often, these women are occupied as in-house cleaners and helpers or personal care workers; therefore, being recorded by the statistical bureau at the place of residence, they are found in the more advantaged housing stock. Specifically, 74.3% of women from EEnEU countries and 64.2% of women from EEEU countries, residing on upper floors, were employed in those sectors. Lastly, one could assume that the score of the other foreign citizens on upper floors could be linked to the presence of foreign tenants in the so-called *doma* rooms (Figure 8). It is impossible though to prove it through the data we dispose of. *Doma*, the old common laundry room, is a common space found on most of the *polykatoikia* buildings' rooftops. These small rooms, with a complete absence of housing amenities, are not used anymore as such. Therefore, in some cases, they are rented to immigrants. Unavoidably, being on the rooftop, these spaces are recorded as "upper floors" in official statistics.

**Table 7.** Part (%) of the population residing in apartment blocks, by floor of residence, Municipality of Athens, 2011. Source: EKKE 2015 [35]; data processed by the authors.

| Country of Origin | Lower Floors (Basements and Ground Floors) | Middle Floors (1st to 3rd Floor) | Higher Floors (4th Floor or Higher) |
|---|---|---|---|
| Greece | 8.1 | 61.7 | 31.1 |
| Albania | 22.3 | 63.7 | 14.0 |
| tenants | 24.4 | 62.8 | 12.9 |
| owners | 9.7 | 70.0 | 20.2 |
| Eastern Europe—EU (*Bulgaria*, *Romania*, *Poland*) | 24.8 | 54.7 | 20.5 |
| Indian peninsula (*Bangladesh*, *Pakistan*) | 35.8 | 46.4 | 17.8 |
| Eastern Europe—non-EU (*Georgia*, *Ukraine*) | 23.7 | 54.3 | 21.9 |
| Total | 14.5 | 60.2 | 25.2 |

**Figure 8.** Upper floors and *doma* rooms in apartment buildings. Vertically advantaged areas (**left**) and vertically disadvantaged areas (**right**). Photos by authors.

Albanians are dispersed around the municipality (see Figure 4) and, therefore, also found in areas of ethnic vertical segregation [14,20]. In those instances, Greeks and foreign citizens from developed economy countries are over-represented on upper floors, while foreign citizens from developing economy countries are over-represented on lower floors. As such, while they are spatially closer on the micro-scale, it is much more difficult, financially and socially, to have access to the advantaged higher floors. The differentiation between Albanian homeowners and tenants, concerning the housing quality, already mentioned earlier, is further explored. Homeowners tend to live on higher floors; only 9.7% own a lower-floor apartment. This shows that Albanian homeowners, residing longer in Athens and having adopted a long-term settlement pattern, have experienced social and residential mobility on the micro-scale.

### *4.3. Housing Pathways: Between Geographic Dispersal, Social Mobility, and Multiple Marginalities*

The following section complements the above quantitative data, aiming to provide insights on the housing practices within the Athenian context, a context characterized by the so-called "segregation paradox" concerning SE cities, consisting of high levels of deprivation within a relatively low level of spatial separation [43]. To highlight micro-geographies in the city, this article presents insights of eight semi-structured interviews held in 2023 with Albanian immigrants that live and work in Athens, since the mid- and end of the 1990s.

The first finding of the qualitative analysis confirms that Albanian immigrants tend to settle, as tenants or owners, throughout the city, while their pathways indicate a social mobility. This "in-between" socio-spatial condition that they managed to achieve is evident in the narratives below:

Agni's household, from Sarandë in Albania, settled in Athens in 1992. When she first arrived in Athens, she lived as a domestic housekeeper in Kolonaki, downtown Athens. Four years later, and since she got married, she said the following: "*We needed to make money, then my son was born, and I needed help. We moved in with my husband's parents in a one-bedroom house in Koropi. The four of us worked a lot, we had few expenses. We indeed made money and moved a few years later [in 2001] to our own apartment in Glyka Nera, but always with my parents-in-law under the same roof*" (HS.INT.02). All three locations Agni mentions in her interview indicate a wider radius of choice of abode in the general metropolitan area of Athens, decided by the family with the purpose of long-term settlement, one synonymous with an upward social mobility trajectory. The relevant literature concerning Albanians' settlement in SE cities suggests that Albanian immigrants do not choose specific neighborhoods, thus composing "invisible" housing pathways. Geographically, they are settling in a dispersed way, following the so-called "Albanian assimilation paradox". An urban pattern that can be found in most SE metropolises is where immigrants' urban self-settlement is not related to specific national or local public policies, but primarily the outcome of family or personal strategies of a long-term settlement [37,51,52].

The next case shows a gradual improvement in housing conditions, mostly during the years before the economic crisis of 2010. Vasiliki arrived from Fieri to Athens in 1998, with her husband and young daughter. After four months of sharing a home with the family of her husband's brother, a two-bedroom apartment in Plateia Koliatsou, they rented their own apartment in the same area. She said the following: "*We could only afford a basement; we stayed there for three and a half years, and my second daughter was born there. We needed to move, my children often got sick, it was too humid*" (HS.INT.08). A few months later, the household moved to the second floor of the same building as tenants for four years. Then, in 2005, they managed to buy an apartment. "*We decided that we were not going to go back [to Albania]. With the money we managed to put aside and by taking out a loan, we bought a two-bedroom apartment in Agios Eleftherios. The area was much nicer [than Plateia Koliatsou], the schools were better. Everything we did was for our children*" (HS.INT.08). Vasiliki describes the gradual improvement in her household's housing conditions in terms of floors occupied (from the basement to the second floor), in terms of occupational status (from sharing an apartment with relatives, to becoming tenant and then homeowner), and in terms of the areas chosen: from Plateia Koliatsou, a very central and downgraded area, to Agios Eleftherios, again a central area which represents better living conditions and a better access to schooling, but still considered disadvantaged. Let us underline that the above "successful" housing pathway of Vasiliki's family, as recorded in other cases of this research, would become compromised a few years later, due to the economic recession of 2010.

Two main observations may be extracted from the above narratives. Firstly, the "invisible" practices of urban settlement—"invisible" vis-à-vis districts of immigrants' presence—for both households are typical of a migration project aiming at long-term settlement. What seems particularly crucial is that decisions are mostly taken "collectively" within a context of strong family and social networks that shape decisions concerning housing. Secondly,

both cases are characteristic of the "in-between" housing pathways of Albanian immigrants, as described by the above quantitative data and the relevant literature.

The second finding is related to the marginalities that also contributed to the shaping of precarious housing pathways of the Albanian immigration in Athens. The interview held with Afroditi, from Shkodër, Albania, who migrated to Athens with her husband and two children, without the help of their close family members, is indicative of the very harsh conditions that this household—as many others—had to cope with and are still facing in the housing market. In fact, Afroditi's family was obliged to leave their apartment and rent a new one during those challenging times. "*We had nothing, no furnishing, no food, nothing. My son brought a mattress where my daughter and her child slept, while he slept on the floor. The neighbors helped a lot, bringing milk and cookies to our door. We stayed there for eight years. Then we moved to a building in Kypseli. We were much better there, on the second floor. In 2009 we moved again in the same area. But in 2020 [during the pandemic], the owner asked me to leave; he wanted to rent the apartment as an Airbnb. My husband was sick, and I asked the landlord to give us some extra time. A few months later, we moved [within the same area] to an apartment that was in an extremely bad condition— everything was broken inside. We are still living there*" (HS.INT.07).

Eleni's narrative highlighted the issue of racism and marginality as well: "In 2005 we were living in Nea Ionia [with her parents], in a very small and inconvenient apartment. I could not invite a friend; I was truly ashamed. So, we found another apartment in the area. It was located on the sixth floor, had a nice balcony and was sunny [. . . ]. We paid the owner six-months' rent in advance, we cleaned the whole apartment and started packing. Then, he accused us of giving him counterfeit money and told us he had found a more reliable tenant. I knew all this happened because we were foreigners" (HS.INT.01).

The above narratives indicate that, within a context of very scarce housing policies, immigrants' housing settlement does not always follow a linear pathway of gradual improvement [42,53,54]. On the contrary, housing pathways are characterized by precarity, often changing and fluctuating, while remaining fragile in front of multiple crises. Indeed, the economic crisis of 2010 affected the housing condition for the majority of our interviewees. Monthly rents or banking loans were paid with extreme difficulty due to high unemployment rates, mostly for Albanian men working in the construction sector.

Apart from the well-known effects of the economic recession of 2010s, recent trends in the housing market have intensified migrants' marginalities in the housing sector [55]. As noted in Afroditi's narrative, the progressive financialization of the housing market and the expansion of short-term vs. long-term rentals produce new limitations [6,56]. Those marginalities, while they do not only affect migrant households, become much more obvious if one takes into account the racism experienced by immigrants in the everyday spaces of the city, as stated in Eleni's interview (HS.INT.01).

A third finding of the qualitative research is related to the access of Albanian immigrants to homeownership, a finding that also became evident from the quantitative analysis indicating that, in 2011, almost one out of four Albanian households in Athens has managed to buy a property. Of the eight participants in our study, six of them managed to buy an apartment. Anna's household, from Berat, managed to buy an apartment in Pankrati: "*We bought our apartment in 2006. It was my personal goal to have my own home. Since we got married, even in Albania, we did not have our own home; I wanted to buy property [...]. We took out a loan from OEK [Workers' Housing Organization] with a banking rate of 0.25%. In 15 years, we returned the money and, since I was paying [the loan instalments] regularly, I also got a refund. The loan was in my husband's name, since he was the one having 'declared' work.*" Vasiliki, from Fier, says: "*In 2005 we bought an apartment in Agios Eleftherios district. The cash we had saved wasn't enough. So, we took out a loan. We paid €70,000 in cash and the rest was given to us by the bank. Since we decided with my husband that we were not going back [to Albania], we decided to buy. We both worked very hard. In 2010–2012, the interest rate increased, and we really had difficulty paying the loan back. It took us until 2022 to repay all the money*". Two of our interviewees used a successful policy that was most often implemented in the beginning of

the 2000s by the Worker's Housing Organization (OEK, abolished in 2012), which offered fixed-interest mortgages provided stable banking rates for buying an apartment. Immigrants with documents proving that they declared tax and paid insurance contributions were also eligible. It is thus obvious that policies that aim to reinforce immigrants' access to housing are crucial for facilitating access to homeownership, which is recognized as a core integration indicator at the EU level, since the acquisition of property is seen as a sign of upward social mobility and long-term settlement [47].

At the same time, it is crucial to underline that access to homeownership is also beneficial for the host society, since immigrants' investment revitalizes the existing building stock in central, and usually degraded, urban districts [54,57].

## 5. Discussion

The Athenian housing market has undergone a transformation in the last two decades, compared to the postwar period where the intense urbanization processes gave access to affordable housing for large segments of the population. As presented in the contextual section, the mechanism of *antiparochi* produced a largely homogenous socio-spatial setting in Athens' central neighborhoods. This mechanism created the conditions for interethnic coexistence and the settlement of immigrants near non-immigrant households. Currently, the increasing commodification of housing, also evident in the socially and ethnically mixed areas of Athens, seems to be affecting the self-settlement practices of immigrants. This is a newly emergent issue concerning Athens's socio-spatial transformations, which requires further empirical research through a pluridisciplinary geographic approach.

Concerning macroeconomic figures, IMF [58] in its 2024 Country Report underlines the acute price increase, exceeding 35% since 2017, putting forth the "emerging vulnerabilities in the real estate and household sectors". In 2023, the Bank of Greece [59], in its published data on residential property prices, estimates a 13% increase in Athens. This increase was still ongoing during the first third of 2024 (9.4%).

The growing demand for real estate is partially linked to the increase in foreign investments. Specifically, the foreign capital invested in the Greek market, through the Golden Visa investment attraction policy, is estimated at EUR 5.5 billion, with more than 22,298 issued residence permits [60]. At the same time, the increase in residential rental prices is estimated at 30% [25], which, in a macroeconomic context of strong inflationary pressures (5.3% in 2023) [61], has amplified the inequality trends. It is thus obvious why the housing cost overburden rate in Greece is estimated at 32.4% [62] for 2021, the highest among the EU-27 members.

The relevant literature on SE cities, and Athens in particular, also underlines the impact of short-term rental (henceforth STR) expansion in a changing socio-spatial landscape. Pettas et al. observe that, between 2014 and 2022, approximately 33,900 housing units entered the Airbnb platform [3]. This "unavailability" of what was, until recently, an affordable and accessible apartment stock for rental purposes creates tensions over residential central areas, where the ethnic population is over-represented. Through the STR mechanism, downtown areas that were previously designated as "non-gentrifiable" are changing [46]. Finally, although the construction sector is flourishing, the increase in supply has not led to a decline in prices, probably because the newly constructed dwellings target higher-income investors.

Today, for the first time, affordable housing is at the center of the political agenda. While several policies or ad hoc support programs funded by the Greek state or the EU are being implemented, their impact on those in need seems to be limited. The above challenges formulate a complementary research question: how do recent real-estate developments undermine immigrants' access to housing? This question could be addressed through further secondary and field research. First, new insights could emerge through the comparative analysis of the 2021 census data concerning the 2011–2021 decade, a decade that was marked by the financialization of the Athenian real-estate market. Moreover, interviews with key actors, such as real-estate agencies, Airbnb hosts, and other professionals

related to the STR market, as well as complementary interviews with residents living in Athens's socially and ethnically mixed neighborhoods, would allow a better understanding of immigrants' housing practices in this context.

## 6. Conclusions

Albanian immigrants have been (self-)settling in Athens's metropolitan area since the 1990s, following personal or family practices of adaptation to the particular Athenian context: a SE metropolitan area, characterized by the so-called "segregation paradox", consisting of high levels of deprivation within a relatively low level of spatial separation [43]. Moreover, as has been largely discussed in the literature, their urban settlement did not benefit from housing policies. Even though they progressively experienced social mobility, the Albanian population remained vulnerable to the socioeconomic changes that ensued. Hence, the economic recession of 2010 must be considered another key contextual factor. It strongly affected the social and urban settlement of Albanian immigration in Athens, producing high unemployment rates and interrupting the "successful" settlement pathways that were previously underway [31].

This analysis led to the verification of the "in-between" hypothesis at different levels. First, we have demonstrated that Albanians follow different spatial patterns compared with both Greeks and other foreigners. Then, we explored the differences that occur in their sociodemographic profile, revealing important indications of intergenerational mobility. A third point concerns the residential strategies, underlining traces of residential mobility, expressed on the micro-scale, concerning mainly those with access to homeownership. Lastly, the quantitative analysis verifies the hypothesis of the invisible Albanian housing pathways, the improvement in housing conditions, the spatial dispersion, and the vulnerability towards the socioeconomic changes.

This article combined a mixed methodological approach to investigate segregation patterns and housing practices on the micro-scale of Athens's central neighborhoods. Using the data of the national census of 2011, this analysis first presented the average profile of ethnic groups in Athens, examining their demographic and educational characteristics, as well as the main employment sectors in which they are absorbed. The results demonstrate that Albanians stand in an "in-between" situation among Greeks and the other third-country nationals that were studied—namely, those from countries of Eastern Europe that have not acceded to the EU, those from countries of Eastern Europe that acceded to the EU, and those originating from countries of the Indian peninsula.

Concerning educational attainment, Albanians—as the rest of the Europeans—are differentiated to the populations from the Indian peninsula. Regarding the general demographic profile, Albanians are differentiated to the other ethnic groups, scoring higher at young ages and lower at older ages, while showing an impressive gender equilibrium. Finally, concerning their occupation, they tend to occupy lower, unskilled, and semi-skilled positions. A key finding in this context is the important intergenerational differentiations regarding (i) unemployment rates for first-time job seekers (lower levels of unemployment for the second generation of Albanians) and (ii) the most popular professional specialization (sales and services for the 16–29-year-old cohort, domestic and construction sector for the 30–50-year-old cohort).

Concerning immigrants' access to housing, Albanians are much closer to the native population—an aspect which differentiates this migratory group from the rest of the foreign populations—seeking access to homeownership. The spatial analysis reveals the dispersed geographical settlement of Albanians in Athens and demonstrates the avoidance of the stigmatized downtown neighborhoods, where an ethnically diverse population is mostly concentrated. A crucial finding relates to the living standards within the Athenian urban context, as Albanians seem to experience poorer housing conditions than Greeks.

Moreover, our analysis attempted to investigate the vertical segregation pattern by cross-examining spatial proximity with housing quality parameters. Foreigners from developing countries are over-represented on lower floors, scoring more than the average

profile (14.5%). This lower-quality stock, characterized by negative features such as a lack of sunlight, increased noise, poor ventilation, and smaller surface, is considered disadvantaged and less desirable. On the other hand, Greeks dominate the more advantaged higher floors (fourth floor and above). Albanians are over-represented on middle floors (63.7%), therefore avoiding, once again, the poorer-quality apartments found on lower floors. The analysis revealed traces of upward residential mobility among Albanian homeowners. Those who had access to ownership tend to invest, more than 90% of them, in middle or upper floors, and in newer apartments, 23% of homeowners reside in buildings constructed after the 1980s.

The qualitative material examined in this study is indicative of the fluctuations that have been shaping Albanians' socio-spatial settlement in Athens. It revealed vulnerabilities concerning the access to decent housing and showed how immigrants' urban settlement does not always follow a gradual improvement scheme.

According to our data, during the first months following their arrival, most of our interviewees resided temporally with relatives in rented apartments. The broader family networks seemed decisive during this initial phase. The economic development from the end of the 1990s until the mid-2000s generated considerable incomes and provided the opportunity for an upward residential mobility either to rented apartments with improved amenities compared to the previous one, or to homeownership within Athens's socially and ethnically mixed urban space. These "successful" and linear housing pathways are clearly depicted in the 2011 census data. Instead, the qualitative material collected in 2023, a decade after the outburst of the economic recession and at the end of the COVID-19 pandemic, brings into question the current validity of the 2011 findings. In fact, the interviews highlight that not only have those "successful" housing pathways still not recovered, but new, additional challenges have also emerged. These challenges are related to the ongoing increase in rent prices and the intense touristification of Athens's downtown areas, which directly affect the self-settlement practices of immigrants.

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## Appendix A

**Table A1.** List of interviews and informal meetings with experts (representatives of Greek NGOs, communities, forums, academics, and experts in the field of migration and refugees).

| Code ID | Role/Function | Place of Meeting | Date of Meeting |
|---|---|---|---|
| EX.INT.01 | Professor, Aleksander Moisiu University | Online (Durrës) | 19 April 2022 |
| EX.INT.02 | Professor, University of Western Attica | Online (Athens) | 10 March 2023 |
| EX.INT.03 | Postdoctoral Researcher, Aegean University | Athens | 2 June 2022 |
| EX.INT.04 | Member of an Albanian association in Athens | Online (Athens) | 3 March 2023 |
| EX.INT.05 | Member of the Greek Forum for Migrants | Online (Athens) | 13 July 2022 |

**Table A2.** List of Council Policy Events (CPEs).

| Title | Place of Meeting | Participants | Date of Meeting |
|---|---|---|---|
| **Local Policy Council Event.** Media representations and self-representation of migrants in COVID-19 Times. | Online (Athens) | ACCMR, Municipality of Athens, IOM, NGO Intersos, NGO Babel, NGO Nostos, NGO Praxis, Greek Council for Refugees, Greek Forum of Migrants, Migrant Intercultural, Mediator Integration Centers, National Kapodistrian University of Athens (NKUA) | 18 February 2022 |
| **National Policy Council Event.** Media representations and self-representations ofmigrants in COVID-19 Times. | Online (Athens) | ACCMR, Migrant Intercultural, Mediator Integration Centers, IOM, Greek Council for Refugees, Migrants' Integration Center (M.I.C) in the Municipality of Athens, Greek Organization of Public Health (EODY), NGO NOSTOS, NGO PRAXIS, Médecins sans Frontières (MSF) | 11 March 2022 |
| **Training session.** "How the Ngos can become active protagonists of the collection and preservation of migrants' narratives" | Athens, NKUA, Depart-ment of Economics | Centre for Asia Minor Studies, Institute of Historical, Research of the National Hellenic Research Foundation (IHR/NHRF), Greek Forum of refugees, NGO Babel, Greek Forum of migrants, Sams-USA, University of West Attica, National Centre for Social Research (EKKE) | 29–30 September 2023 |
| **Local Policy Council** Event. Acted, narrated, deconstructed: how research may influence European migration policies. | Online (Athens) | University of Cyprus, UNHCR, Migrants' Integration Center (M.I.C) in the Municipality of Athens, Federation of Albanian Associations in Greece | 3 March 2023 |
| **National Policy** Council Event. Acted, narrated, deconstructed: how research may influence European migration policies. | Online (Athens) | Federation of Albanian Associations in Greece, Ministry of Migration & Asylum, Greek Forum of refugees, University of West Attica | 10 March 2023 |

**Table A3.** List and composition of interviewed households.

| Code ID | Household Composition during the Day of the Interview—Present Members | Date of Birth of the Principal Household Informant) | Year of the Household Settlement in Greece | Place and Date of Interview |
|---|---|---|---|---|
| HS.INT.01 (Eleni) | 4 members: husband, wife, wife's father, and daughter | 1979 | 1997 | Athens, 8 March 2023 |
| HS.INT.02 (Agni) | 5 members: husband, wife, husband's mother, two sons | 1972 | 1992 | Athens, 3 April 2023 |
| HS.INT.03 (Mari) | 4 members: husband, wife, two sons | 1965 | 1995 | Athens, 5 April 2023 |
| HS.INT.04 (Irini) | 4 members: husband, wife, daughter, son | 1980 | 1998 | Athens, 5 April 2023 |
| HS.INT.05 (Liza) | 3 members: husband, wife, son | 1970 | 1995 | Athens, 5 April 2023 |
| HS.INT.06 (Zoe) | 4 members: husband, wife, daughter, son | 1978 | 1997 | Athens, 10 April 2023 |
| HS.INT.07 (Afroditi) | 3 members: husband, wife, son | 1949 | 1993 | Athens, 10 April 2023 |
| HS.INT.08 (Vasiliki) | 4 members: husband, wife, two daughters | 1971 | 1998 | Athens, 3 April 2023 |

## Notes

1 For the 1998 and 2001 legalization procedures, see [38].

2 The distinction between developed and developing countries was made according to the UN's Human Development Index [44] (127–130). http://www.undp.org/content/undp/en/home/librarypage/hdr/human_developmentreport2011.html (accessed on 22 June 2024).

3 These units are a modified version of the 2011 Census Tracts (CTs) produced by the Panorama of Greek Census Data 1991–2011 team to bypass confidentiality issues in sparsely populated Census Tracts. The metropolitan area comprises 3000 URANUs with an average population of 1250, and the municipality of Athens comprises 494 URANUs with an average population of 1330.

4 It is critical to underline that while the informants were female members of the aforementioned NGO, the questionnaire used—designed specifically for the needs of the ITHACA program—collects information about the households as a whole. As a result, this policy paper observes the issue of household integration, not focusing especially on women's housing integration experience.

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# Residential Micro-Segregation and Social Capital in Lima, Peru

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**Abstract:** This article addresses the bidirectional relationship between residential micro-segregation, in the form of built barriers to mobility, and social capital. I engage with two bodies of the literature. On the one hand, I critique a widespread top-down model of residential segregation. This model suggests that higher-status groups drive segregation through direct (e.g., secluded neighbourhoods) and indirect (e.g., by funnelling housing demand) measures. On the other hand, I provide evidence of the bounding effects of segregation on social capital. While some scholars suggest residential homogeneity favours social capital, others argue that benefits occur within privileged neighbourhoods. The effects of segregation on social capital are less clear at lower scales and in highly unequal Global South cities. My argument is twofold. First, I uncover the dynamics of segregation below the neighbourhood scale. I use the notion of horizontal micro-segregation to identify the social and spatial conditions associated with a higher concentration of street-level segregating infrastructure. My methodological approach draws on data for all residential blocks in Lima, Peru ($N$ = 99,685). I find that suburban-inspired urban design is positively associated with micro-segregating infrastructure, upon controlling for other factors such as socioeconomic status, density, and urbanization age of each block. Second, I provide evidence of the bounding effects of segregation on social capital. Using ten waves of the Lima Cómo Vamos survey (2010–2019), I show that micro-segregating infrastructure is associated with higher trust in neighbours and lower civic engagement. These findings indicate that exposure to segregation affects social capital within and across secluded neighbourhoods throughout the socioeconomic spectrum.

**Keywords:** urban micro-segregation; social capital; Lima; neighbourhoods; OpenStreetMap

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## 1. Introduction

In this paper, I present a novel approach to the study of contemporary patterns of urban segregation and its implications for social (dis)integration. Sociospatial divides are an important dimension of recent discussions on social fragmentation and political polarization around the world [1,2]. Nonetheless, most of the attention is paid to the differences across large geographic areas (e.g., urban–suburban, urban–rural, and across regions or neighbourhoods). Exploring sociospatial fragmentation at smaller scales poses several conceptual and methodological challenges [3]. Building on recent innovations in spatial analysis in combination with survey data, I identify the spatial underpinnings of residential segregation at the level of street segments and its consequences for social capital. I use the entire city of Lima, Peru, as my case study.

This study brings attention to the sociospatial dynamics that underlie residential (micro-)segregation as both a product and a cause of social fragmentation. First, I question widely shared assumptions about what explains the proliferation of segregated residential patterns. By contrast with dominant approaches, I emphasize urban design as an element that facilitates the erection of horizontal micro-segregation across social groups in highly unequal cities. Second, I explore the implications of micro-segregation on two dimensions of social capital: trust and civic engagement. I suggest that exposure to micro-segregating infrastructure limits the scope of social capital to those in closer proximity (e.g., one's neighbours).

Many existing theories characterize residential (micro-)segregation as a top-down process. According to the segregation model stemming from the Anglosphere, higher-status groups impose restrictions on lower-status groups' housing choices in two ways. Directly, as upper-status families limit access to "exclusive" neighbourhoods [4,5]. Indirectly, as upper-status families' preferences lead to the concentration of affordable housing in less desirable areas [6,7]. Both upper- and lower-status segregated neighbourhoods are physically, symbolically, and often legally separated from the rest of the city. The boundaries around segregated areas range from terrain conditions (e.g., rivers or hills), to infrastructure (e.g., highways or railways) and physical barriers (e.g., gates, walls, and fences).

The micro-segregation approach provides an alternative to enable the study of the sociospatial structuring of social groups scales below the neighbourhood (e.g., the residential tower) in higher-density contexts [3]. This model mostly retains the top-down assumption but challenges the notion that the neighbourhood is the central unit of sociospatial inequality in dense cities. While Lima's segregation pattern follows the latter model more closely—highly fragmented at lower scales—it is also geographically and socioeconomically disperse across levels of density [8,9]. I study Lima's street-blocking infrastructure as a form of micro-segregation to challenge the top-down assumption in the segregation and micro-segregation scholarship.

Meanwhile, there is inconclusive evidence on the effects of segregation on social capital. A thread of scholarship argues that demographic homogeneity—e.g., segregated neighbourhoods—favours social capital, including civic engagement and social trust [10,11]. In response, others show that segregation fosters bonding ties (i.e., within the neighbourhood), particularly among privileged groups, while curtailing bridging ties (i.e., beyond the neighbourhood) among underprivileged ones [12–14]. The relationship is less clear at lower scales. Studies on segregation in Latin America hypothesize that urban fragmentation (e.g., street-level residential enclosures) leads to social disintegration [8,15–17]. I present evidence of (micro-)segregating infrastructure's mixed effects on social capital independently of living inside physically segregated spaces at different scales.

This study addresses the relationship between residential micro-segregation and social capital, in the form of built barriers to urban mobility, in two steps. First, I draw on open data to identify the main socioeconomic and spatial factors associated with micro-segregating infrastructure. I define this type of infrastructure as the disperse barriers (gates, walls, and fences), often built on appropriated public space, that interrupt pedestrian mobility throughout the street network. Operationally, I count the barriers within walking distance from each residential block of the city ($N$ = 99,685). My findings suggest that suburban-inspired street design is positively associated with micro-segregating infrastructure. Additionally, higher socioeconomic status and older urbanization positively predicts more barriers, while socioeconomic diversity and population density have negligible effects.

Second, I use 10 waves of the Lima Cómo Vamos survey (2010–2019) on urban issues ($N$ = 12,000 per year) to assess the impact of higher environmental exposure to barriers on social capital. The relationship between barriers and social capital is not necessarily causal. The correlation between measures of these concepts may respond to underlying dynamics of social differentiation—e.g., racial or class divisions [18]. I explore the causal effect of barriers on social capital based on theoretical and empirical considerations. Theoretically, I suggest that micro-segregating barriers built on public spaces convey meanings of fear and exclusion that not only amplify existing forms of social fragmentation but bound the sense of belonging to narrow (and spatially close) communities. Empirically, most existing barriers in Lima were built between the late 1990s and early 2000s, while the survey data were collected in the 2010s [19]. Respondents had been living in a fragmented city for about a decade at the time of first survey. My multilevel models provide preliminary evidence of this causal relationship, considering the coarse spatial aggregation of the data. Individuals are nested within their districts of residence (43 districts in total), the smallest geographic unit available. My results provide evidence that otherwise comparable individuals living

in areas with more barriers are less likely to participate in civic actions (e.g., volunteering in neighbourhood organizations) but more likely to trust their neighbours.

My contributions to the existing research on residential segregation include challenging some long-held assumptions and expanding its methodological toolkit. I build on micro-segregation scholarship to highlight the role of the street level for segregation patterns in the U.S. and Latin America [8,16,20–23]. Specifically, I draw on the notion of horizontal micro-segregation to outline the fragmentation of the urban landscape resulting from resident-driven street enclosures within and across neighbourhoods, and throughout the socioeconomic spectrum. This form of micro-segregation drives attention to the spatial conditions (e.g., street design) that facilitate small-scale enclosures beyond traditional gated communities.

Methodologically, I leverage access to open software tools for spatial analysis (Python 3.10 and R 4.3.1), large spatial datasets (OpenStreetMap), and census and survey data (Lima Cómo Vamos) to study segregation and its implications at the city block and individual scales. Systematic work on street-level segregation may involve labour-intensive fieldwork or the manual coding of aerial photographs [15,20]. However, recent scholarship has shown the possibilities of fine-grained geolocated data to uncover overlooked segregation patterns [21–24]. I follow this line of work, providing a template (and reproducible code) for collecting and analysing spatial data using open software, and combining it with traditional sociodemographic and survey data.

More broadly, this paper contributes to understanding the relationship between residential segregation and social capital at the micro scale. My approach conceptualizes the street continuum as a relatively malleable public space. Despite the limitations of coarsely geolocated survey data, I provide preliminary evidence that exposure to (micro-)segregating infrastructure negatively affects civic engagement while promoting in-group trust regardless of which side of the fence people live on. In other words, spatial fragmentation may create or reinforce social boundaries across the socioeconomic spectrum.

### *1.1. The Spatiality of Residential (Micro-) Segregation*

The literature on residential segregation addresses the spatialization of social inequalities in cities. Several explanations of segregation share three assumptions: (1) segregation is primarily driven by upper-status groups; (2) social groups are well defined, generally by ethnicity, race, or class; and (3) the neighbourhood is the preferred unit of analysis. Scholarship on micro-segregation challenges this last assumption while providing insights into the spatial sorting of groups at lower scales. I draw on the micro-segregation approach to highlight the role of barriers as horizontally segregating infrastructure within and across neighbourhoods where preexisting group boundaries are diffuse.

According to the Anglosphere-focused scholarship, residential segregation entails two interrelated processes: sorting by preferences—i.e., families choosing housing in a free market—and sorting by restrictions—i.e., limitations upon lower-status families' choices. On the one hand, families are attracted to neighbourhoods with similar demographic compositions [25], and in proximity to regular destinations such as work, school, and previous social networks [26]. On the other hand, developers, authorities, and civil associations use an array of financial, legal, and physical mechanisms to limit housing options. While some mechanisms funnel housing demand, others directly restrict access to certain neighbourhoods. Planning policy and regulations, combined with market dynamics, affect demand by making certain areas more or less attractive to different groups. For instance, upper-status families' housing preferences affect the desirability of neighbourhoods, often leading to planning decisions that concentrate affordable rental homes in the less desirable places [7,27]. Meanwhile, direct measures include zoning ordinances, restrictive covenants, redlining, and physical boundaries. The latter encompass terrain conditions (e.g., rivers), infrastructure (e.g., highways), and barriers (e.g., gates, walls, and fences). Following this model, segregated residential patterns respond not just to families' purchasing power and locational preferences, but to the restrictions driven by upper-status groups' interests.

The types and degree of definition of the social groups driving and experiencing segregation vary by region of the world. In North America, whiter and wealthier groups often target restrictions against minorities, particularly Black and Indigenous families [7,28–30]. Emphasizing defined groups, however, often leads to omitting complex racial dynamics within and across "races" in the U.S. and beyond [31–34]. Scholarship from other regions of the world shows that segregation patterns predominantly follow class differences, although frequently intertwined with racial and ethnic ones [3,35]. The physical separation of groups, especially when they incorporate barriers to mobility, can fixate social boundaries in contexts where social differentiation is rather blurry and porous in everyday life [18].

The standard approach to the empirical study of segregation uses the neighbourhood as the unit of analysis (with the census tract or zip code as the unit of observation) and variations in the dissimilarity index as its metric. This attention to neighbourhoods responds both to substantive—the meanings people attach to where they live [6,36,37]—and practical reasons—the availability of georeferenced demographic data [23]. However, this approach is limited to accounting for spatial dynamics within and across neighbourhoods. First, the dissimilarity index ignores the spatial sorting of groups in relation to one another—the checkerboard problem [38]. Second, census tracts are administrative units that omit the effect of the arbitrary selection of boundaries on their internal demographic composition—the modifiable areal unit problem (MAUP) [39]. The result is that certain neighbourhoods may appear to be socially mixed when, in fact, they are segregated at the scale of the street or even the residential building.

Micro-segregation scholarship has developed conceptual and methodological tools to study the spatial organization of social groups at low scales, such as the residential tower and the street segment [3,22]. A thread of this line of work stems from analysing sociospatial hierarchies in dense and densifying cities, primarily in Europe and parts of East Asia and Latin America. In these contexts, micro-segregation is often vertical—namely, the altitude of residence is associated with social hierarchy as in Paris' Haussmann-style buildings [40]. Horizontal micro-segregation is more common in the less dense North American context. For instance, Grigoryeva and Ruef [21] show that southern cities in the late nineteenth-century U.S. displayed a "backyard" pattern of segregation, where Black families were relegated to alleys while White ones controlled the front streets. Others have shown that residential sorting is more consistent at the level of the street segment rather than the census tract [22]. These studies generally retain the assumption that patterns of micro-segregation are top-down processes involving defined social groups (by class, ethnicity, or race), although some suggest less hierarchical dynamics involving conservative religious groups [41].

Methodologically, micro-segregation research leverages fine-grained qualitative and quantitative approaches. Case studies reveal patterns of social differentiation in buildings that respond not only to vertical hierarchies but to interactions with suitable housing quality, type of tenancy, and local policy, among other factors, as Meyer and Pfirsch show for central Marseille [42]. Others leverage fine-grained quantitative data to show that attention to the spatial configuration within and across neighbourhoods uncovers subtle patterns of horizontal micro-segregation [21,22,24].

I use the case of Lima to question three widespread assumptions about the causes of residential (micro-)segregation. First, both the segregation and micro-segregation models assume well-defined upper-status groups actively separating themselves from lower-status ones, and passively relegating the latter to less attractive areas. If this holds, at the horizontal level (micro-)segregating infrastructure should surround upper-strata families wherever they are near lower-strata ones. Instead, I argue that barriers are widely distributed across the socioeconomic spectrum and are not a particularity of dense, diverse, or segregated places in Lima. I suggest that urban design and growth play a key role in facilitating the erection of segregating infrastructure. Second, I bring attention to the discontinuities in the pedestrian road network around each block of the city to account for barriers within and beyond administrative units of spatial aggregation. Third, my approach builds on

the micro-segregation tradition to escape the limitations of using neighbourhoods as units of analysis.

### *1.2. Segregation and Social Capital*

In the dominant approaches outlined above, both macro and micro forms of spatial segregation express pre-existing social boundaries. Here, I examine the relationship between the two phenomena in the opposite direction, i.e., whether segregation expands social fragmentation. I use social capital as an approximation of social integration. Drawing on prior scholarship, I suggest that proximity to micro-segregating infrastructure has a negative effect on outwardly oriented social capital, and a positive effect on its inwardly oriented form. In other words, when the built environment favours segmentation over continuity, social fractures deepen and ties with those in the immediate surroundings (e.g., neighbours) become stronger.

Social capital provides insights into the degree of integration of communities in large urban areas. Definitions of social capital vary widely [43]. A common element in these definitions is that the concept alludes to the resources available to individuals through their interpersonal networks [44–47]. The ties in these networks can be either bonding (e.g., friendships) or bridging (e.g., acquaintances). Both types are important as the former are indicative of supportive communities—inward social capital—while the latter create exchange opportunities across them—outward social capital [26,48]. Besides networks, scholars since Putnam [49] measure social capital using dimensions, including civic engagement (e.g., participation in collective action or voluntary associations) and interpersonal trust. I follow Putnam's social capital tradition as the dimensions he identifies are instrumental to studies assessing the impact of segregation on social capital [50,51].

Researchers debate to what extent segregated communities have a negative impact on social capital. Some argue that demographic heterogeneity is part of the problem [10,11]. This position suggests that certain forms of segregation that preserve homogeneity benefit stronger communities. By contrast, others show that the negative effects of diversity vary by social group and type of social capital [13,14]. Segregation can have a positive effect on bonding social capital among upper-status groups, like the homeowners of a planned neighbourhood who actively seek to preserve land value [12]. However, segregation also limits bridging social capital across the socioeconomic spectrum [50,52]. These findings echo urban scholars who, for decades, have argued that neighbourhoods disconnected from the city's fabric are prone to social isolation [5,53].

Research on Latin America and elsewhere in the Global South zooms into the interaction between segregation and social capital at smaller scales. Urbanization has pushed the rich and the poor closer together in Latin America, the world's most unequal region [54]. While Latin American cities have grown vertically in the last three decades, residential buildings are generally homogeneous—although, social differentiation does occur within them between, for instance, old and new middle classes [55]. The result is a dominant pattern of horizontal segregation characterized by the proliferation of "fortified enclaves" among upper- and middle-income (and whiter) groups that sharply contrast with deprived neighbouring communities [16,56]. These enclaves vary in size and format ranging from planned gated communities (e.g., in Mexico City) to small residential developments and subsequently enclosed street segments (e.g., in Lima and Bogota) [8,15].

The points of contention in this tradition are whether walls and fences impede social interaction, and whether these barriers foster social capital within them. Ethnographic studies on Santiago de Chile suggest, at small scales (e.g., residential enclaves), that segregation favours interaction across previously disconnected social groups but does not strengthen social capital within them [17,57]. From this perspective, gates, walls, and fences structure social contact. For instance, fortified enclaves are often built near disadvantaged areas—e.g., former peasant communities on the outskirts of growing cities. Proximity to wealthy enclaves provides lower-income people access to job opportunities in services such as housekeeping, gardening, and security. By contrast, Garrido [18] sees these barriers as

expressions of hardened class boundaries in the case of Manila. Interactions that occur across social groups reinforce class identities. Within street-level residential enclaves in Lima, Plöger [8] finds that erecting barriers is a collective action that often does not translate into tighter communities. The maintenance of barriers and other security devices is often a contentious issue among neighbours. Overall, these studies present limited and mixed evidence on segregation's impact on social disintegration across places while agreeing on its limited positive impact on local social capital.

I test these propositions by paying attention to the spatial configuration of pedestrian streets. The notion of micro-segregation highlights how the built environment restricts random encounters in its everyday use [52,58]. My focus on micro-segregating infrastructure drives attention to disperse patterns of barriers to mobility. Like the walls or fences surrounding gated communities, micro-segregating barriers symbolize exclusivity and private security measures often on appropriated public spaces [8]. However, micro-segregating barriers are more permeable than the traditional ones (e.g., some gates are closed solely during the night), thus the boundaries they establish between inside and outside spaces are less defined.

My approach takes the city's network of streets as an uneven although continuous public space [53,59]. Thus, while the street continuum is accessible to anyone in principle, parts of it are less welcoming to certain groups than to others (e.g., wealthy residential streets are often heavily policed, targeting racialized people as potential threats). Both the initial design and subsequent interventions affect the flow of the street network and condition its potential uses. On the one hand, frequent and visible intersections favour widespread public life, while sinuous and discontinuous layouts (e.g., cul-de-sacs) restrict it to residents [60]. On the other hand, subsequent interventions may increase (e.g., new public spaces) or limit (e.g., barriers to pedestrian mobility) the streets' level of public life.

My argument is twofold: (1) frequent exposure to barriers through living in proximity to them negatively impacts outward social capital regardless of which side of the barriers people live on; and (2) it increases people's sense of social proximity to their immediate neighbours, which translates into higher inward social capital. I emphasize the impact of spatial configuration and segmentation on social capital formation through random encounters in the street [52]. This approach takes Lima's pedestrian network as a single public space where social capital is curtailed through spatial segmentation. I elaborate on Lima's history and segregation patterns below before presenting the study's hypotheses.

### *1.3. Lima Cercada: The Fenced City*

Lima offers several advantages in terms of the study of micro-segregation, as one of the largest urban areas in Latin America, home to over ten million people. Lima's segregation pattern escapes dominant views of contemporary urban fragmentation in Latin America [16]. Here, I provide some background and my rationale for selecting Lima as a case study.

Lima is a highly unequal city with a long history of residential segregation. The centre of the current metropolis is the colonial City of Lima, today known as Cercado de Lima, or enclosed Lima. The name originates from the wall that protected the city until the nineteenth century. While the wall's official purpose was to protect Lima from pirate attacks, it created a symbolic boundary around the White Spanish settlers [61]. Residential areas reproduced similar symbolic boundaries, with patio houses ("quintas" in Spanish) internally subdivided between masters and servants [62]. Today, lower-status groups inhabit the patio houses of the old city, flattening the social differentiation between the more prestigious street-facing units and the less prestigious inner ones [63]. The wall came down in the late nineteenth century as the city grew, but the segregation patterns remained relatively stable decades later [59].

The twentieth century shaped Lima's contemporary spatial organization. The city expanded rapidly due to rural–urban migration in the 1940s and 1950s, and through the forced displacement of the rural population during the internal armed conflict of the 1980s

and 1990s [64]. Today, Lima Metropolitana—the city's official name—has 43 districts, each of them with elected municipal authorities. While this study focuses on the city of Lima, its metropolitan area includes the contiguous port city of Callao and its seven districts (see Figure 1).

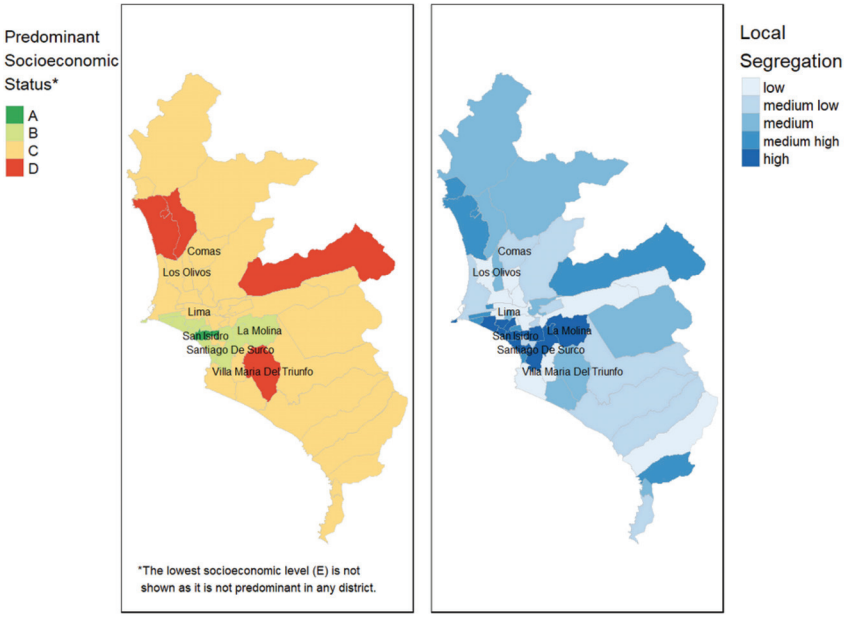


**Figure 1.** Left: Map of Lima by predominant (modal) socioeconomic (SES) level, where A is the highest and E the lowest. The lowest SES level, E, is not shown on the map as it is not the mode in any of the city's districts. The SES levels are calculated by the Peruvian National Institute of Statistics and Informatics based on household income. For reference, the percentages of dwellings per SES at the city level are A = 5.1, B = 19.7, C = 40.3, D = 25.9, E = 9.0. Right: Map of Lima by level local segregation. Darker colours indicate higher segregation within the district by comparison with the city.

The mid-century settlement patterns combine planned formal housing (including social housing) with informal settlements or *barriadas*. In broad strokes, the upper and middle classes settled in planned developments in the near south and southeast of the historic centre. Earlier developments followed traditional grid designs (e.g., Lince and San Isidro), while more recent ones follow suburban-inspired sinuous patterns (e.g., La Molina and San Borja), although with higher density than in North America [65]. Meanwhile, the lower classes occupied former agricultural and desertic areas in the north, northeast, and south. Settlements in these areas vary in levels of planning and design, with some (less planned) following traditional grids (e.g., San Martín de Porres), others more sinuous designs (e.g., Los Olivos), and one following pedestrian-oriented superblocks (Villa El Salvador) [63]. See Figure 2 for illustrations of these settlement's street layouts.

The twentieth century's settlement processes have shaped Lima's horizontal segregation patterns. At the city level, districts in southern-central Lima are generally wealthy (e.g., Miraflores and San Isidro), others in the north and southeast are generally disadvantaged (e.g., Comas and Villa El Salvador), while eastern Lima has a combination of both (e.g., Ate Vitarte and La Molina) (see Figure 1). Eastern Lima is where some of the most visible forms of segregation take place, like a 10 km long wall separating La Molina and Santiago de Surco (wealthy) from San Juan de Miraflores and Villa María del Triunfo (poor) [59,66].


**Figure 2.** Examples of urban grids in three districts of Lima (Lince, Los Olivos, and San Borja) at 1 square kilometre. Lince was urbanized in the early twentieth century, while Los Olivos and San Borja between the 1960s and 1980s. The plots are organized left to right by levels of circuity average. I explain this variable in Section 2; in sum, it indicates the sinuosity of the street layouts. Part of my argument below is that more sinuous layouts (e.g., San Borja) facilitate the construction of micro-segregating infrastructure.

At the neighbourhood level, Lima's horizontal segregation is marked by the abundance of subsequent residential enclosures mostly built between the 1990s and the early 2000s [19]. These enclosures generally encompass a few blocks within a residential neighbourhood and share three attributes. First, local associations promote and process applications to build the barriers that create the enclosures. While, in some districts, enclosures have construction permits, these are often approved after the barriers are in place. Second, enclosures are a widespread private security measure against perceived threats (e.g., burglaries and hooliganism). Other measures vary depending on the associations' resources and can include private guards (in lower-income areas, guards often live within or near the enclosure), security cameras, and codes of conduct restricting activities (e.g., parties) in the street. Third, the collective action involved in erecting the barriers often fades over time. This leads to fences and gates becoming permanently open or closed, and to residents within certain enclosures to build fences around a more limited number of blocks; often a short street segment (see illustrations in Figure 3) [8].

**Figure 3.** Examples of segregation barriers in Lima. Left: lift gate and security booth at the entrance of a gated community in the affluent district of La Molina. Right: closed swing fence with open pedestrian access in a lower-stratum residential neighbourhood in the San Martín de Porres district. Source: Google Street View.

The characteristics of these subsequent residential enclosures pose challenges for the study of Lima's horizontal micro-segregation. Physical barriers vary in size and porosity, often creating a nested structure of enclosures that pedestrians and vehicles must navigate. This form of fragmentation of the urban fabric differs from other large Latin American cities, like Mexico or Sao Paulo, where gated communities abound. Other cities like Bo-

gota and Rio de Janeiro feature similar enclosures but these are not as widespread [16]. This study aims to contribute to prior efforts to identify the conditions that have facilitated the proliferation of barriers in Lima, and the impact these barriers have on social (dis)integration.

### *1.4. Hypotheses and Empirical Predictions*

In the next sections, I empirically test two theoretical propositions:

**Hypothesis 1.** *Urban design (e.g., discontinuous street layout) facilitates residential micro-segregation. This relationship holds across socioeconomic groups and levels of density and is heightened in periods of rapid urban growth.*

Empirically, this proposition suggests that barriers to mobility such as gates, walls, and fences are widespread across the city regardless of the socioeconomic status of the area. Moreover, proximity to barriers should be associated with sinuous street layouts evocative of suburban design, and with areas urbanized before the rapid growth of the 1990s. In a context of high inequality and weak institutional responses to crime, rapid urban growth, particularly when associated with lower-status groups (e.g., Indigenous rural immigrants), heightens the insecurity discourses used to justify the erection of barriers.

**Hypothesis 2.** *Residential micro-segregation negatively affects bridging social capital, such as civic engagement, while it fosters bonding social capital among individuals in otherwise similar social positions.*

Empirically, this suggests that people living in places where micro-segregation is more pervasive should show lower levels of civic engagement, including participation in activities such as signing petitions or attending demonstrations. By contrast, higher exposure to barriers in the environment increases the sense of proximity to neighbours as reflected in higher trust towards them. Exposure presupposes that barriers predate the measures of social capital. These predictions should hold upon accounting for several other factors affecting social capital and commonly used as rationales for erecting barriers, including crime victimization and perceptions of safety.

## 2. Data

I use two types of data in this study: block-level socioeconomic and spatial information, and individual-level surveys. The main source of spatial data is OpenStreetMap (OSM), a volunteer-led open access map of the entire world (www.openstreetmap.org, accessed on 28 March 2023). I also use geotagged images hosted in Mapillary (www.mapillary.com, accessed on 31 March 2023) for missing data points, socioeconomic census data (2017) from the Peruvian National Institute for Statistics and Informatics (INEI) (http://arcgis.inei.gob.pe:6080/arcgis/rest/services/, accessed on 26 September 2022), and epoch of urbanization data from the European Commission's Global Human Settlement (GHS-SMOD) data repository (https://ghsl.jrc.ec.europa.eu/ghs_smod2019.php, accessed on 5 May 2023). At the individual level, I use Lima Cómo Vamos' (LCV) 2010–2019 survey data (https://www.limacomovamos.org/data/, accessed 19 January 2023). LCV is a nonprofit organization aimed at improving urban policy through evidence. They conduct an annual survey of about 1200 respondents. While the respondents' precise locations are protected, they are georeferenced at the district level.

### *2.1. Data Collection and Processing*

I collected the blocks database in three main steps. First, I added not previously mapped barriers to the OSM platform. This is a way to reduce OSM's coverage bias. OSM requires contributors to provide open-source visual support to the new features they add. For instance, to map a new school, contributors may use satellite images or geolocated

photographs—excluding Street View and similar proprietary platforms. OSM contributors often use Mapillary to host crowdsourced geolocated photographs. However, Mapillary's coverage is unevenly distributed: while most thoroughfares are densely photographed, many residential segments are not. Moreover, the quality of photographs is often poor, so barriers are difficult to spot.

With the support of two research assistants and a Lima-based OSM contributor, I mapped missing barriers in nine districts that represent 38 percent of the city's population: Comas, Carabayllo, Los Olivos (north), La Molina, San Juan de Lurigancho (east), Santiago de Surco, Villa El Salvador, Villa María del Triunfo (south), and San Miguel (west-central). I selected these districts as prior studies have included them as having some of the highest concentrations of residential enclaves [8]. The mapping used existing Mapillary images as support and Street View for verification. In one case, for San Juan de Lurigancho (the city's most populated district), I completed the mapping by uploading photographs to Mapillary directly. I used this sample of districts as a standard of accuracy to support my analyses of the entire city.

Second, I counted the barriers within a 1 km walking distance from each residential block in Lima ($N$ = 99,685). My main interest was the barriers that interrupt the flow of the street network. Therefore, the barriers I included are gates (e.g., swing gates), walls, and fences. These barriers are usually located at the intersections of two or more street segments and at least one of them is residential. I used a Python script to pull the data from OSM (using the 'osmnx' package [67]) and process it (using 'geopandas' [68]). The script ran for 20 days in the SciNet supercomputers. Below is a step-by-step summary of the script that produced the data (see Supplementary Materials for additional details). The script:

(1) Creates a map of the entire city as a pedestrian network where the edges are continuous street segments, while the nodes are intersections of three or more street segments;
(2) Separately, pulls all the barriers (gates, walls, and fences) previously mapped into OSM;
(3) Creates a pedestrian network at 1 km network distance around each block of the city by truncating the city-wide network from step 1;
(4) Counts the number of barriers from step 2 that interrupt the flow of the network around each block from step 3 by spatially overlapping the two objects.

In the final step, I added buffers (at 1, 3, 5, and 10 m) around the network to account for variations in street width and to include barriers removed from the street centreline. Wider buffers make it possible to correct for issues inherent to collaborative mapping. For example, a gate may have been mapped as blocking only one sidewalk, whereas, in fact, it blocks both sides and the road. Without a buffer, the network would not intersect with the barrier. At the same time, wider buffers may introduce errors by including barriers outside the street network itself (e.g., by including fences or gates around private property). To prevent bias, I use models with different buffer levels in the analyses below.

Finally, I merged the barrier data with socioeconomic data from INEI and the GHS-SMOD urbanization epoch data at the block level. Ojo Público, a digital news outlet, pre-processed the original INEI data for a feature on urban inequality [69]. For each block, the data include the population disaggregated by socioeconomic status (SES, or NSE in Spanish). The SES is based on income and is estimated combining the 2017 census with the national household survey [70]. There are five SES levels, where "A" is the highest and "E" the lowest. Additionally, I processed the GHS-SMOD data to identify blocks of the city that were categorized as "urban centre" or "dense urban cluster" only after 1990.

For the analysis of social capital, I used ten waves of the LCV survey (2010–2019). These years' data are harmonized and published online as a single file. The survey's annual sample size ($N$ = 1200) is representative of the city's population. Survey respondents are geolocated at the level of their districts of reference. Since districts are broad and uneven units of aggregation (see Figure 1), the individual-level analyses render preliminary evidence in support of my hypotheses. I processed the data using R. From the 12,000 observations, my models use $N$ = 11,429 (civic engagement) and $N$ = 4207 (trust in neighbours).

*2.2. Variables of Interest*

Three variables of interest correspond with my two hypotheses. For the first one, I use *barriers*, defined as the count of barriers (gates, walls, and fences) that interrupt the pedestrian network around each block of the city at a 1 km distance. Since I obtained the count using buffers around the network, I include five models corresponding each of those buffers (in metres from the network's centreline): 0 (no buffer), 1, 3, 5, and 10.

For the second hypothesis, I use *civic engagement* and *trust in neighbours*. I operationalize civic engagement as an indicator of whether the respondent had partaken in any of the following activities in the past 12 months: signing a petition, contacting media outlets regarding local issues, serving in a neighbourhood organization, engaging in participatory budget, volunteering, and demonstrating (sittings and marches). Around 19 percent of respondents across all years answered positively. The measure of trust in neighbours comes from a five-point scale question included in the LCV survey between 2010 and 2014. I recoded the original scale so that 0 is the lowest value and 4 is the highest. The average trust in neighbours is 1.76 (SD = 1.07).

**3. Methodology and Methods**

My methodology involves using open-source free software to explore fine-grained micro-segregation and social capital data through regression models. This approach offers three main advantages. First, fine-grained geolocated quantitative data facilitate comparisons between places with similar physical and sociodemographic characteristics [71]. While qualitative studies provide richer accounts of the processes that affect segregation and social capital, they pose challenges for conducting broader comparisons. Second, using open software and data facilitates the reproducibility of my methods in different contexts. For instance, OpenStreetMap has worldwide coverage, while the Cómo Vamos surveys are regularly conducted in several Latin American cities. Third, regression models using either complete or large and representative datasets provide reliable evidence of the statistical relationship between variables. My preliminary quantitative evidence may guide future ethnographic work that zooms into how people experience segregation in relation to social integration [72].

I tested Hypothesis 1 in two steps. First, I explored the distribution of barriers accounting for the predominant (modal) socioeconomic status of each block. Second, I fitted negative binomial regression models predicting the count of barriers within a 1 km pedestrian distance from each block in the city at different buffer levels. The use of negative binomial models responds to three conditions: (1) barriers are count variables, (2) their distributions are heavily skewed, and (3) they show overdispersion (thus discarding Poisson regression) [73]. I transformed the estimated coefficients into incidence rate ratios and provided prediction plots for easier interpretation. Equation (1) represents the models.

$$
\begin{aligned}
&log\left(barriers_{buff}\right) \\
&= \beta_0 + \beta_1 CircuityAverage + \beta_2 IntersectionCount + \beta_3 Density + \beta_4 LocalSegregation \\
&+\beta_5 I(UrbanizedAfter1990 = 1) + \beta_6 I(PredominantSES = B) \\
&+\beta_7 I(PredominantSES = C) + \beta_8 I(PredominantSES = C) + \beta_9 I(PredominantSES = D) \\
&+\beta_{10} I(PredominantSES = E) + \beta_{11} CircuityAverage \cdot IntersectionCount
\end{aligned}
\tag{1}
$$

Here, $barriers_{buff}$ represents the dependent variable at different buffer levels. On the right, I included the spatial and socioeconomic predictors of interest. Circuity average indicates the mean ratio of network distances to straight-line distances from each point in a network [74]. The circuity between any two points in a network (A and B) is 1 when the distance between them is a straight line. A higher value like 1.5 indicates that the distance from point A and B in the network is 50 percent longer than the straight line between them. The second term indicates the number of intersections in the pedestrian network around each block. An intersection is defined as the convergence of three or more street segments. Barriers to mobility are mostly erected on intersections in residential areas. The

count of intersections allows to isolate the effect of circuity on barriers regardless of the opportunities for barriers in a network. Thus, I also included an interaction term between both variables. The variable on density indicates the population per area at the block level. The fourth spatial variable of interest is the age of urbanization, operationalized as a dummy variable indicating blocks urbanized between 1990 and 2020.

The socioeconomic variables of interest are the predominant SES level of each block as a factor, with $SES = A$, the highest level, as the reference value, and the local segregation score. Local segregation is defined as the comparison in socioeconomic composition between each block and the district in which it is embedded. Higher values indicate that the block is more segregated (i.e., more unique), while lower values indicate its distribution is similar to the district's [75].

My estimation approach for Hypothesis 2 involves multilevel models with random intercepts. The first variable of interest, civic engagement, is a dichotomous indicator. Thus, I used multilevel logistic regression models (see Equation (2)).

$$log\left(\frac{P_{ij}}{1-P_{ij}}\right) = \alpha_0 + \boldsymbol{\beta_0 X_{ij}} + \boldsymbol{\beta_i X_j} \quad (2)$$

Here, $P_{ij}$ is the probability that the respondent $i$ in district $j$ participated in any civic engagement activity in the past year. Additionally, $\alpha_0$ is the intercept, $\boldsymbol{\beta_0 X_{ij}}$ is a vector of the individual-level covariates, and $\boldsymbol{\beta_i X_j}$ is the district-level barriers component. One of its elements, $\beta_i barriers_j$, is the main statistic to estimate as it represents the effect of barriers on civic engagement, accounting for other individual-level factors. I defined the barriers variable as the mean count of barriers within a 1 km pedestrian network distance of all the blocks in a district. The buffer around the network is 3 metres, although the results hold for other buffers as well.

The individual-level variables in $\boldsymbol{\beta_0 X_{ij}}$ include several factors usually associated with civic engagement, including socioeconomic status[1], age, gender, living for over ten years in the city (old timer), whether the respondent works outside the home, and their main form of transportation (driving or taxi versus others). I incorporated measures of perception of safety and prior crime victimization, as research shows that the latter increases political engagement [76]. As controls, I considered the year of the survey, district-level local segregation scores, and the proportion of blocks urbanized after 1990. I report one additional model including two cross-level interaction terms to account for the potential enhancing effects of victimization and being an old timer on barriers.

Finally, I modelled trust in neighbours using multilevel linear regression models. These models have a similar specification to the civic engagement ones. See Equation (3) below.

$$Trust\ in\ Neighbours_{ij} = \alpha_0 + \boldsymbol{\beta_0 X_{ij}} + \boldsymbol{\beta_i X_j} + \epsilon ij \quad (3)$$

Besides the different link functions, the models differ slightly in the individual-level predictors they use. I accounted for lower education and whether the respondent has dependents under 15 years of age. This is possible given the additional variables available for the 2010–2014 period discontinued in later waves. I report a model with two cross-level interaction terms to assess how neighbourhood safety and living longer in the city affect barriers as a predictor.

## 4. Findings

### *4.1. Barriers and the Role of Design*

The proximity to barriers is widespread in Lima across socioeconomic groups. Table 1 shows that there are generally more fences around higher-status groups, particularly A and B. However, there is high variation even within socioeconomic levels, and the average number of fences around medium-low groups (C and D) remains relatively high. For

instance, there are about 23 barriers at 3 m buffer of the pedestrian network for the C socioeconomic level, which is closer to the 32 around the A-level than to the 6 around the E-level blocks. Visual exploratory analysis suggests similar patterns (Figure 4): namely, that while fences are more prominent among higher-status groups, they surround blocks across the socioeconomic spectrum.

**Table 1.** Mean and standard deviation of the count of barriers at different buffers by predominant socioeconomic status of the block.

| Modal Socioeconomic Status | No Buffer | | Buffer 1 m | | Buffer 3 m | | Buffer 5m | | Buffer 10 m | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mean Barriers | SD | Mean Barriers | SD | Mean Barriers | SD | Mean Barriers | SD | Mean Barriers | SD |
| A | 7.53 | 9.40 | 23.29 | 31.82 | 31.92 | 66.19 | 48.01 | 137.95 | 103.92 | 287.27 |
| B | 8.58 | 10.00 | 24.93 | 28.95 | 32.19 | 53.92 | 43.88 | 96.33 | 91.73 | 199.53 |
| C | 7.06 | 9.88 | 19.79 | 26.07 | 23.20 | 37.98 | 29.15 | 52.31 | 60.56 | 108.24 |
| D | 3.40 | 7.28 | 9.13 | 18.23 | 10.35 | 20.84 | 12.94 | 26.71 | 27.08 | 55.80 |
| E | 1.68 | 4.95 | 4.61 | 12.48 | 5.50 | 15.59 | 7.25 | 23.21 | 14.71 | 47.12 |

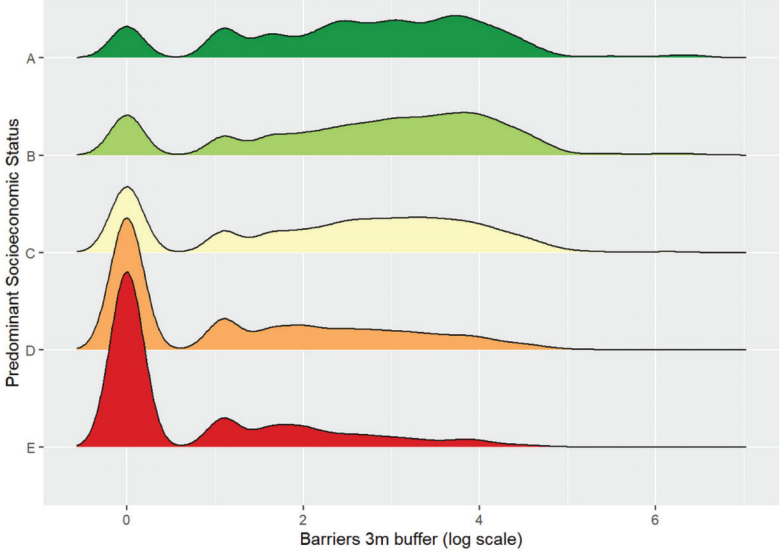


**Figure 4.** Ridgeline density plots of barriers (3 m buffer) by SES. Each density curve represents the estimated (smoothed) distribution of barriers around blocks grouped by predominant SES. The data are logged using $\log(x+1)$ to facilitate visual comparisons.

Furthermore, the distribution of barriers is relatively even across levels of segregation. I calculated five levels of segregation using kmeans clustering on local segregation scores. The clustering method, kmeans, produces relatively homogeneous groups for better comparisons. Figure 5 provides visual evidence that there are nearly the same number of barriers around very segregated and very integrated blocks. In fact, highly segregated places do not appear to have the most barriers around them. This finding indicates that barriers appear to be more common where people from different socioeconomic backgrounds are in closer proximity to one another.

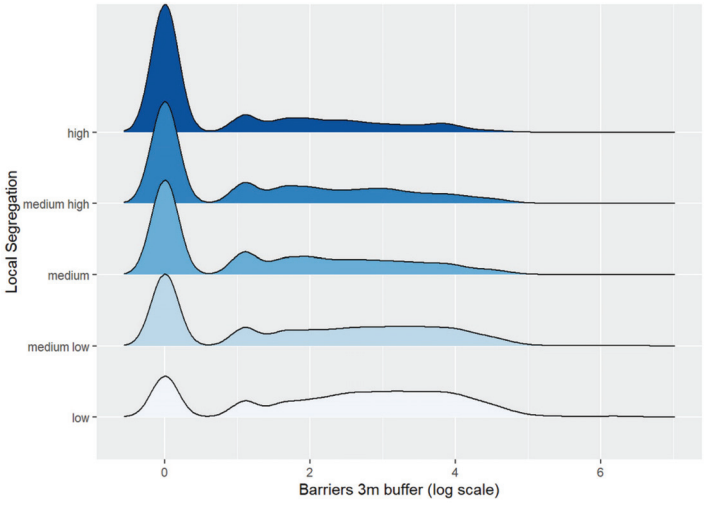


**Figure 5.** Ridgeline density plots of barriers (3 m buffer) by local segregation score. Given that local segregation is a continuous variable, the levels of segregation are calculated through kmeans clustering. Each density curve represents the estimated (smoothed) distribution of barriers around blocks grouped by level of segregation. The data are logged using $\log(x+1)$ to facilitate visual comparisons.

The negative binomial models indicate that, in addition to socioeconomic status, the variation in barriers responds to features of the urban design. In Figure 6, I show the models predicting barriers at different buffers around the 1 km pedestrian network from the block. The model coefficients are displayed as standardized incidence rate ratios.

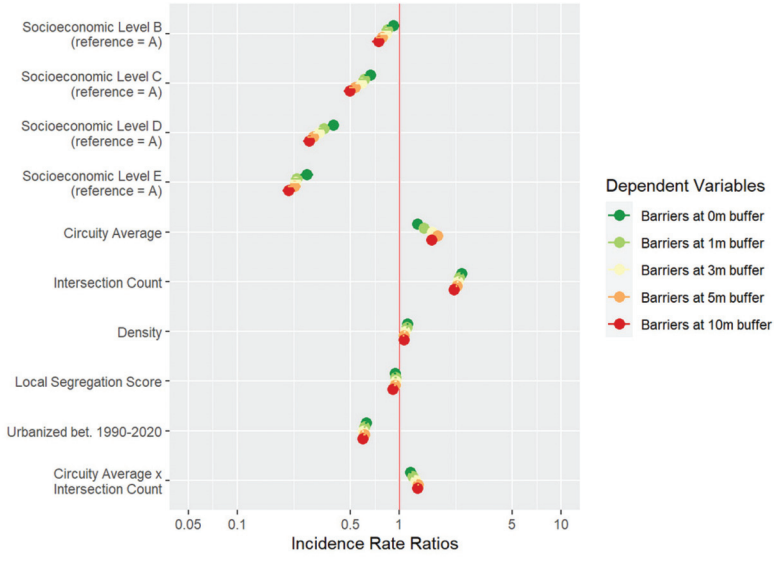


**Figure 6.** Plot of negative binomial models predicting the count of barriers at different buffer levels. The vertical red line indicates whether the estimated effects are negative (**left**) or positive (**right**). The estimated effects are not statistically significant if their confidence intervals intersect the vertical red line.

The model plots in Figure 6 offer three key insights in support of Hypothesis 1. The first is that some of the largest effects are related to the predominant socioeconomic status of each block, particularly among the lower groups by comparison with the highest one (A is the reference level). However, the effect of local segregation is negative and significant but small. This supports the proposition that barriers are pervasive and not unique to highly segregated places. In fact, less socioeconomically segregated blocks tend to have more barriers around them, as suggested in Figure 5. Density at the block level has a positive and significant effect although comparatively small, indicating that denser areas are more prone to barrier construction.

Second, the effects of urban design are positive, relatively large, and statistically significant. Thus, places with more intersections and a higher circuity average are more likely to have more barriers around them. Moreover, the effect of circuity is enhanced by the number of intersections in the network. Figure 7 is a prediction plot summarizing the effects of three of the variables of interest in the models. The three subplots correspond to different levels of circuity average, from low (left) to high (right). In each plot, we see the relationship between intersections and the count of barriers (at a 3 m buffer) for each of the five SES levels. This plot shows that higher levels of circuity and intersections correspond with growing counts of barriers for all SES levels, particularly the highest ones (A and B). Intersections and circuity are both conditioned by planning decisions, regulations, and terrain conditions. This finding suggests that residential areas that combine both factors may facilitate the subsequent enclosure of streets upon perceived threats regardless of the socioeconomic status or level of segregation of each block. The threats may come, for instance, from rapid urban growth in the surroundings. This might explain that barriers are more frequent around established blocks of the city, i.e., urbanized before 1990.

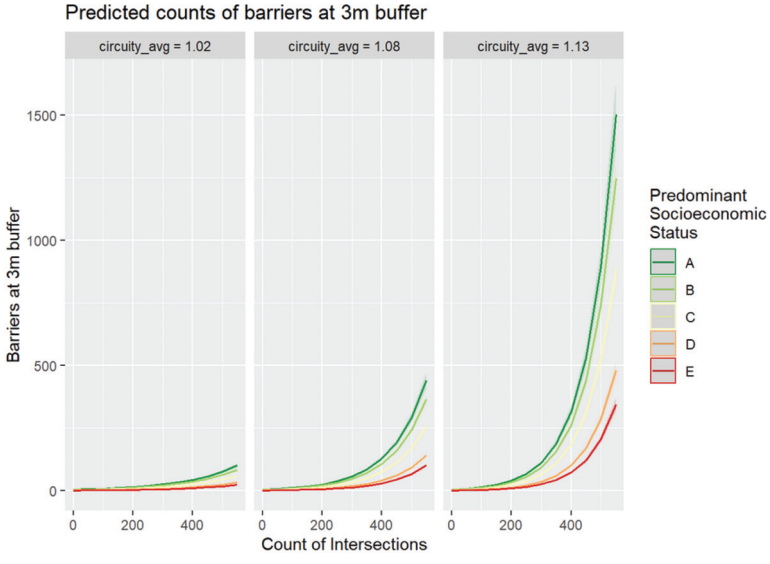


**Figure 7.** Predicted counts of barriers at a 3 m buffer by different levels of circuity average, counts of intersections, and SES levels.

A third aspect worth noting is that the five models provide similar results. This suggests that the patters I have identified are consistent regardless of the potential biases introduced through collecting the data using different buffers. Additionally, I conducted sensitivity analyses using subsamples of the data. For instance, I selected La Molina (high SES), San Miguel (medium SES), and San Juan de Lurigancho (low SES). These districts are both theoretically relevant and have the mostly complete data. The results remain fairly similar to those using the complete dataset.

Overall, I have found support for my first hypothesis. The evidence suggests that barriers such as gates, walls, and fences are present across levels of segregation, although with pronounced variations regarding the predominant socioeconomic status of each block. The models that account for these factors also suggest that urban design plays a significant role in creating opportunities for erecting subsequent segregating infrastructure. Thus, the circuity average and the intersections in the network around each block are important predictors of the number of barriers, while the age of urbanization indicates that established neighbourhoods are more likely to erect barriers than newer ones.

### *4.2. Proximity to Barriers and Social Capital*

My analyses provide preliminary evidence of the effects of micro-segregation on social integration. Residents living in districts with higher exposure to barriers are less likely to participate in civic engagement while reporting higher trust in their neighbours. I elaborate these findings in two steps. First, I explore the variables of interest with an emphasis on their variation across districts. Second, I present the multilevel models' results highlighting some of their most important insights.

Civic engagement is relatively stable across years and districts. Around 19 percent of respondents to the LCV survey had participated in any form of civic action in the previous 12 months between 2010 and 2019. Figure 8 shows that the variation across districts is low. Upon fitting an intercept-only multilevel model, the intra-class correlation (ICC) is of 0.01, which suggests that around 1 percent of the variance is explained by district-to-district differences. It is worth noting that districts are difficult to compare to one another. They vary a great deal in size and population—e.g., their sizes range from 3 (Lince) to 347 (Carabayllo) square kilometres, and their population from 7 thousand (Punta Negra) to over 1 million (San Juan de Lurigancho)[2]. However, districts are the smallest geographic unit at which socioeconomic and survey data are often aggregated in Peru. Thus, my findings are mostly exploratory.


**Figure 8.** Civic engagement by district grouped by predominant SES.

Even accounting for this limitation, the logistic regression models suggest that civic engagement is lower among respondents in districts with higher exposure to barriers (see

Figure 9). Thus, an increase of one standard deviation unit in the district average of barriers per block reduces the odds of a respondent engaging in civic activities by 9.5 percent (standard error of 3.4 percent). None of the other district-level variables in the model (local segregation and proportion of recently urbanized blocks) have significant effects. At the individual level, lower socioeconomic status, and negative perceptions of safety in the city at large generally decrease the likelihood of civic engagement. Conversely, factors associated with a higher likelihood of civic participation include age, victimization, living longer in the city, and perceiving one's neighbourhood as safe, which confirms prior research [51,76]. It is worth noting that the cross-level interaction between victimization and barriers did not render a significant effect, while the interaction between being an old timer and barriers is positive although small. Therefore, the negative effect of barriers on civic engagement is accentuated among those more recently living in the city. This may be indicative of respondents being less willing to partake in collective action due to living surrounded by barriers but having had no voice in the decision-making process to build them.

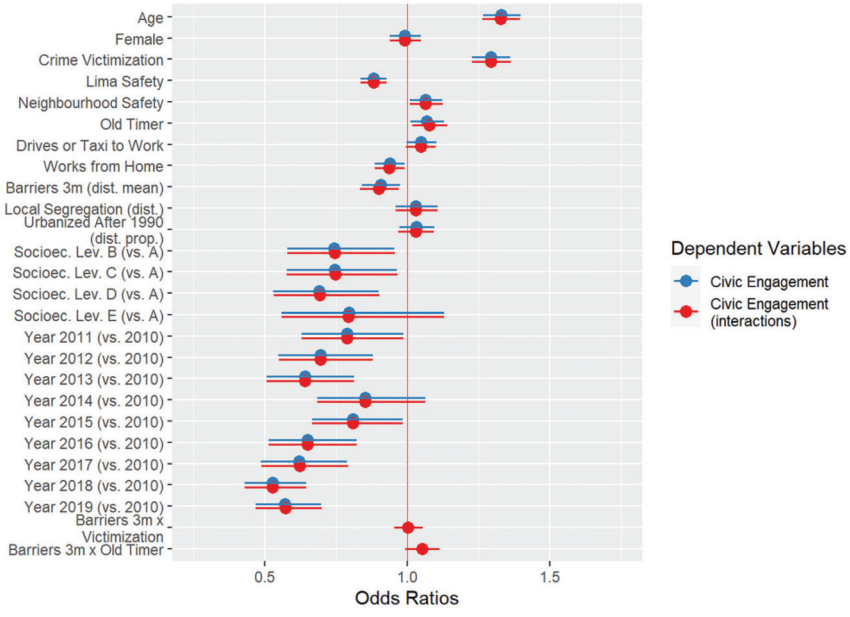


**Figure 9.** Multilevel logistic regression models predicting civic engagement. The vertical red line indicates whether the estimated effects are negative (**left**) or positive (**right**). The estimated effects are not statistically significant if their confidence intervals intersect the vertical red line.

Regarding my second measure of social capital, respondents in districts with more fences around their blocks generally show more trust towards their neighbours. The distribution of this variable follows an approximately normal distribution, with a mean of 1.76 and a standard deviation of 1.07 (scale from 0 to 4). More importantly, there is more variability in responses by district. Figure 10 suggests that districts with predominantly higher status residents tend to report more trust in their neighbours compared to lower status ones. The ICC is 0.04, higher than in the civic engagement case, confirming the observed district-to-district variability in Figure 10. The level of variability is remarkable considering the heterogeneity in district size and population.

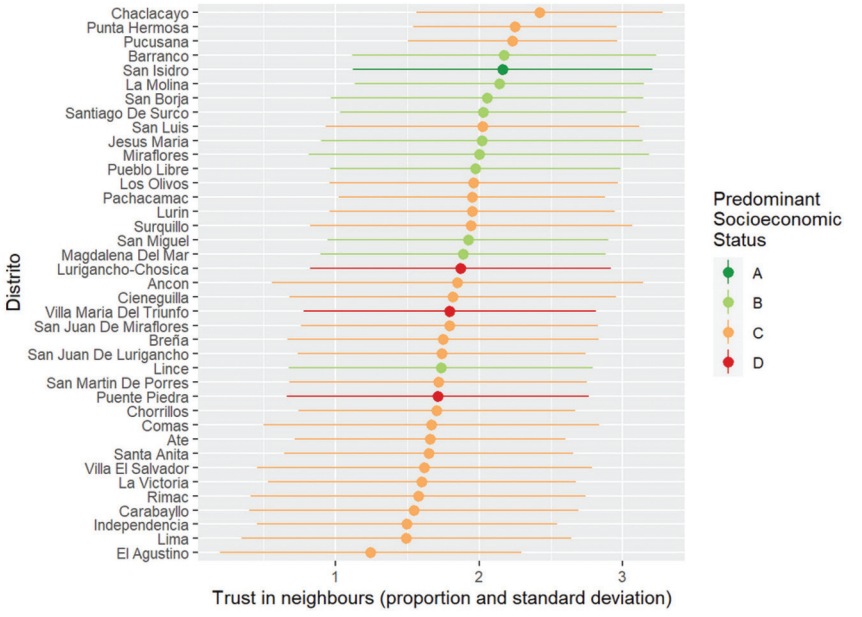


**Figure 10.** Trust in neighbours by district grouped by predominant SES.

The multilevel models in Figure 11 show that part of the district-level variation corresponds with the role of proximity to barriers. An increase in one standard deviation unit in the mean barriers per block in a district increases trust in neighbours by 0.04 standard deviation units (standard error of 0.27). While the effect is small, it remains statistically significant upon controlling for several other factors with a known influence on trust. For instance, trust decreases among lower socioeconomic groups (confirming the trend in Figure 10), low education, and among females, while it increases with age and positive perceptions of safety in one's neighbourhood and in the city at large. The interaction term between barriers and neighbourhood safety indicates that higher counts of barriers predict higher trust in neighbours among those who perceive their neighbourhoods as safe, while the relationship reverses for those with lower perceptions of safety. Additionally, trust in neighbours is higher in districts urbanized after 1990. This is consistent with prior research showing the importance of local social capital within newer residential areas, particularly among informal settlements where residents organize to access sanitation, electricity, and other public services [8,61].

Combined, my findings provide preliminary evidence for the hypothesis that micro-segregation has mixed effects on social capital. On the one hand, survey respondents in districts where the presence of barriers is more frequent report lower civic participation. On the other, higher exposure to barriers is associated with higher trust in neighbours. These results are meaningful considering that the models account for several other individual factors, including socioeconomic status, age, gender, crime victimization, and perceptions of safety. Thus, I bring attention to the interplay between built environment and social integration.

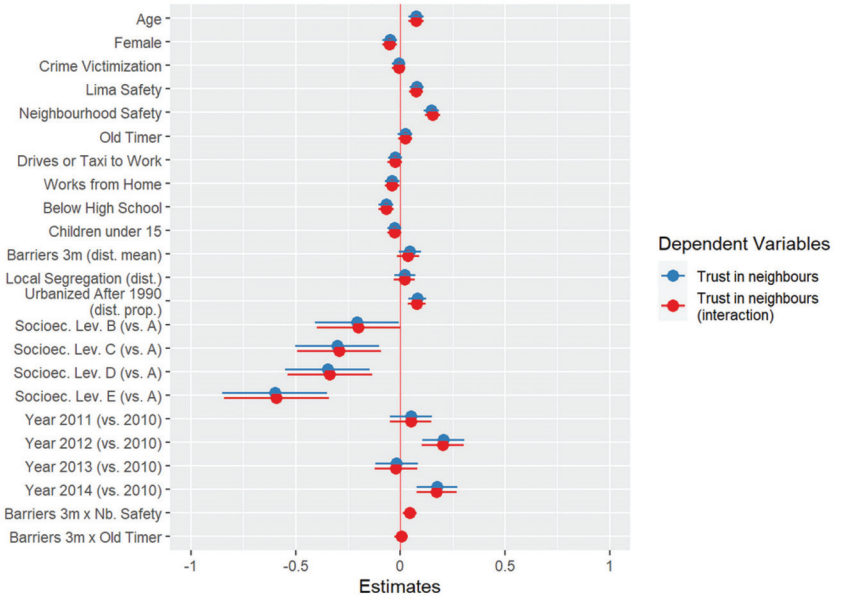


**Figure 11.** Multilevel linear regression models predicting trust in neighbours. The vertical red line indicates whether the estimated effects are negative (**left**) or positive (**right**). The estimated effects are not statistically significant if their confidence intervals intersect the vertical red line.

## 5. Discussion

This study's two main goals connect residential segregation and social integration in opposite directions. The first goal is to challenge some assumptions in the study of the causes of residential (micro-)segregation using recent theoretical and methodological innovations on a fragmented city like Lima. The second is to employ my novel approach to address an old discussion about the effects of segregation on social integration. My findings suggest that fine-grained measures of the built environment offer important insights into contemporary modes of horizontal residential segregation at the scale of the street, and into the extent to which exposure to certain features affects people's attitudes towards others. Below, I provide an overview of my study's main contributions, limitations, and implications for future research.

My first hypothesis suggests that horizontal micro-segregation, in the form of barriers to mobility, responds to elements of urban design and other spatial dynamics across socioeconomic groups and levels of segregation. This proposition has three implications for the residential segregation scholarship.

First, I question the dominant view that well-defined higher-status groups drive segregation through direct (e.g., building "fortified enclaves") and indirect (e.g., funneling affordable housing to deprived areas) measures. This approach obscures the role of middle- and some lower-status groups in the production of segregation. Instead, I provide evidence that barriers are widely distributed across SES levels, while being more present among the higher ones. Additionally, the presence of barriers is slightly more common around more diverse places rather than the more segregated ones. These findings align with prior scholarship on Latin America and elsewhere in the Global South arguing that residential segregation occurs independently of well-defined group boundaries—in fact, segregating infrastructure can physically inscribe them [18,35]. I add that the diffuse presence of micro-segregating infrastructure in Lima—where some fences are permanently closed and others permanently open in the same neighbourhood [8]—shows that boundaries are

negotiated across the social ladder. My findings suggest that both social dynamics and spatial attributes interact in the (re)production of micro-segregating infrastructure.

The second implication of the first hypothesis is to highlight the role of scale in segregation analysis. I follow prior scholarship showing the limitations of the neighbourhood (or the gated community) as a unit of analysis [3,20–22]. My models highlight the importance of street design and related spatial conditions (circuity and intersections) that allow residents to erect micro-segregating infrastructure. For instance, in Lima, some street segments have fences or gates within previously enclosed areas. Defining discrete units of analysis in scenarios like this posits conceptual and methodological challenges [8,15]. I address them by taking the pedestrian street continuum as a large public space. Thus, I conceptualize barriers as subsequent restrictions on opportunities for random encounters with strangers of different backgrounds [52,58]. Methodologically, I operationalize exposure to barriers using network distances from each block of the city to avoid the pitfalls of bounded census tracts or zip codes as units of observation.

Third, my findings suggest that, combined with other factors, design decisions may have undesired consequences for the spatial articulation of the city [58]. In the case of Lima, mid-twentieth century suburban-inspired residential development design has facilitated the construction of barriers in a context where other conditions coincide, such as limited enforcement of regulations, fear of crime, and inadequate provision of public services (e.g., policing) [8]. Certainly, my findings confirm that the fear-of-crime rhetoric masks discriminatory attitudes towards "the other", particularly those in lower socioeconomic statuses [56]. My contribution is to bring attention to the spatial conditions that facilitate the segmentation of streets as a response to inequality-infused external threats wherever they may appear.

Through the second hypothesis, I reframe the study of the effects of residential segregation on social capital. My approach explores the effects of exposure to segregating infrastructure on expressions of social capital such as civic engagement and trust in neighbours. Prior research suggests that segregation negatively impacts bridging social capital while fostering its bonding forms within segregated neighbourhoods, at least among privileged groups [12,50]. Others, instead, argue that segregating infrastructure may structure interactions among previously disconnected social strata and has limited impact on inward sentiments of community [17]. These studies draw on comparisons between relatively homogeneous populations living inside and outside enclosed areas. I find preliminary support to the first set of findings adding that the effects of segregating infrastructure are pervasive. Barriers can reduce the likelihood of participating in civic life while increasing our trust in those in closer proximity to us, regardless of which side of the barriers people live.

Lima exemplifies broader patterns of how small-scale segregation emerges and its impact on social integration. The city's rapid growth, sharp inequality, and diffuse governance structure create conditions for residents to take matters in their own hands upon experiencing external threats. Similar conditions exist in cities around the world where private local governance structures have appeared [12]. Their private security measures can result inconveniences—e.g., restricting access to certain parts of the city—but can also lead to fatal situations like the murder of Trayvon Martin in 2013. I expect my research on micro-segregating infrastructure to bring attention not only to the fear of "others" they express, but to their impact on everyone living around them.

Finally, this study opens avenues for future research addressing the relationship between micro-segregation and social capital across time and space. First, OSM has improved its coverage in recent years, but its data for most Global South cities is limited when it comes to identifying temporal changes. Future studies may leverage other data sources or timestamp a sample of barriers for longitudinal designs. Second, I use public and cross-sectional survey data over multiple years. While I nest respondents within their districts of residence, further research using more precise geolocation may analyse smaller and more consistent spatial units of analysis. Third, my study scratches the surface of how

different groups of people make sense of living in micro-segregated places. Subsequent work may use social media discussions and other forms of qualitative data to further explore the meanings of segregating infrastructure in different contexts.

## 6. Conclusions

Urban communities often build walls and fences against perceived threats. This study shows that street-blocking infrastructure has unexpected impacts on those living within them while perturbing the urban experience of everyone around them. Through the concept of horizontal micro-segregation, I bring attention to barriers as fractures to the largest public space in the city: the street continuum. My analysis sheds light onto the complex dynamics between social and spatial boundaries. In Lima, both upper- and lower-status groups across levels of density contribute fragmentation of the street to different degrees. Using a novel methodological approach, I identify the spatial conditions that allow the emergence of barriers, and explore the latter's impact on social integration. I focus on the street level to examine the symbolic power of micro-segregating infrastructure on how people relate to their social milieu.

The case of Lima reveals that exposure to barriers limits our willingness to act collectively, while fostering a bounded sense of community with those immediately around us. Contemporary discussions posit social fragmentation at the core of rising political polarization and extremist politics. While these debates account for spatial cleavages, their scope is usually broad (e.g., urban–suburban). Enclosed communities and street segments are a growing trend, especially in Global South cities from Manila to Delhi and Bogota [15,18,77]. Future comparative research could use my template to identify the conditions that enable segregating infrastructure around the world. Policymakers may benefit from tools to prevent further deepening of existing social and spatial fractures in cities.

**Supplementary Materials:** The following supporting information can be downloaded at: https://fcalderonfigueroa.github.io/land_microsegregation_lima/ and the doi: 10.5281/zenodo.10557420 accessed on 14 January 2024, (e.g., Code, Processed Data, Additional Models with Restricted Data, Prediction Plots, etc.).

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## Notes

1 Polling companies calculate socioeconomic status differently than INEI. Both use the letter system but have different underlying methodologies. For the LCV survey, SES includes income, occupation, dwelling conditions, and access to services.

2 I omit Santa María del Mar from the analysis. The district is small, with a population of under one thousand, and is mostly composed of beach houses only inhabited in the summer. Surveys generally leave Santa María out of their samples.

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# Safety Perceptions and Micro-Segregation: Exploring Gated- and Non-Gated-Community Dynamics in Quetta, Pakistan

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**Abstract:** Crime impacts residential neighborhoods not only through the loss of life and property but also by instilling a widespread fear among residents. To combat this fear, physical security measures like safety locks, gates, and high perimeter walls have proven effective in both developed and developing nations. This trend has led to the increased popularity of gated communities in Pakistan as a preferred housing choice. In addition to encouraging micro-segregation, these developments also attract a large number of residents. In order to better understand the differences in residents' fear of crime in relation to their health and socio-economic status, this paper compares residential housing schemes in Quetta, Pakistan (gated and non-gated). Surveys and on-site observations in four different residential areas of the city underpin the methodology. The results suggest that past experiences of crime victimization strongly affect feelings of safety in both gated and non-gated communities. The study highlights the complex relationship between the perception of safety, health and well-being, socio-economic status, and the type of community, highlighting how these factors collectively influence respondents' experiences and create micro-segregation.

**Keywords:** residential neighborhoods; fear of crime; gated communities; non-gated residential housing; Quetta; Pakistan

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## 1. Introduction

The increasing incidence of crime has emerged as a significant global concern [1]. It has led to a heightened sense of insecurity among residents [2]. Consequently, the fear of crime and its prevalence in residential areas has become an alarming phenomenon [3]. This fact has motivated numerous researchers to examine the studies regarding crime prevention and fear of crime in residential settings as well as the use of different technologies by law enforcement agencies for security purposes [4,5]. Consequently, our understanding of the elements that shape the fear of crime and the potential adverse outcomes has significantly expanded [6–10].

Fear of crime, defined as 'an emotional response marked by feelings of danger and anxiety', arises in response to the potential for physical harm [11]. Since the late 1960s, it has evolved into a significant concern for communities, necessitating both a social response and systematic action. The link between the physical structures in urban environment and crime has been thoroughly investigated in the realm of urban planning and design [12]. These circumstances can trigger particular types of criminal activity. For example, street robberies are more likely to occur when individuals are alone. In contrast, burglary becomes more viable in areas with secret entrances, while pickpocketing becomes more prevalent in crowded streets. Due to increased crime rates in cities, there has been a growing demand for gated communities, as they are considered a rational reaction to the escalating levels of crime [13].

Gated communities are characterized by their enclosed nature, typically designed with the construction of boundary walls and fences that limit public access to the development for non-residents [14]. They show the characteristics of micro-segregated areas [15]. Numerous aspects such as the desire for privacy, exclusivity, convenience, and a growing concern among residents to separate themselves from other segments of society are considered to be the main reasons [16,17]. However, crime and the fear of crime is the most prevalent worldwide explanation for the expansion of these communities [13].

In some nations, gated communities are regarded as a strategy for crime prevention and easing concerns regarding crime [18]. Moreover, Lynch [17] also stated that these communities provide residents with a heightened sense of security within their enclosed walls and gates. Lipman and Harris [19] reported that security was a crucial factor for the decision of 70% of residents to opt for a gated community as their new residence. Over the past two decades, economic instability and a lack of job opportunities have given rise to criminal activities, particularly in major cities across Pakistan. People living in non-gated communities become victims of crimes easily [20]. On the other hand, compact cities and rapid urbanization has led to a severe housing shortage. This scarcity has made housing unaffordable for a majority of the population, primarily due to a limited housing supply and high housing values [21]. It is important to mention that the public sector has proven inadequate in addressing this housing demand. Consequently, the private sector has taken on the role of developing housing projects in various suburban areas of Pakistan's cities [22]. The compact cities and criminal activities have changed the development patterns of cities and paved the way for new type of developments like gated communities and apartment blocks [23]. Balochistan, one of Pakistan's most underprivileged and less-developed provinces, is home to Quetta, which serves as both the provincial capital and the country's ninth largest city [24].

Situated in the north-western part of Balochistan, the Quetta district encompasses an area of 2653 square kilometers. This district plays a key role in connecting two countries from trade and communication. Quetta city encompasses the metropolitan area and cantonment. This urban area consists of a population exceeding 1 million and experiences high population density. Between 1998 and 2017, the average population growth rate in this region was 3.05% per annum [24]. In Quetta, the prominent ethnic groups include Pashtoon, Baloch, Hazara, and Punjabi. Quetta city faces the coexistence of typical urban and social life alongside the persistent threat of terrorism [25]. Various areas within Quetta have been adversely impacted by terrorist attacks and related activities. The safety perceptions of these neighborhoods differ between local authorities and the residents themselves [26]. Given the escalating crime rates and security concerns, a significant marketing factor has been evolved in relation to gated communities. For the purposes of this research, a gated community is characterized as "a secured private residential zone within an urban setting enclosed by boundary walls and featuring authorized access points through gates or checkpoints, supplemented by security measures like CCTV cameras and adequate street lighting" [27]. Further, a non-gated community is described by Mahar et al. [27] as "a public housing scheme lacking boundary walls or gates, allowing unrestricted traffic flow, with security responsibilities falling on individual property owners". It is considered that the perception of safety and risk of being victimized among residents are affected by the type of community they live in, their fear level related to crime, and their socio-economic status, thereby affecting their overall health and well-being.

On the other hand, while there is a common belief that segregated communities offer enhanced safety compared to non-segregated ones, the accuracy of this belief remains relatively unexplored [28]. In addition, despite the efficiency of physical security measures to minimize the fear of crime in segregated communities, the problems of the rise in security concerns and fear of crime in non-segregated communities are not discussed in the small cities of Pakistan. This issue emphasized the need for exploring the factors associated with safety perception in gated and non-gated communities.

Therefore, in order to understand how residents in both gated and non-gated communities perceive safety in Quetta city, this paper aims to assess the perception of safety of individuals residing in gated versus non-gated communities, in order to achieve the following objectives: firstly, it aims to explore variations in the perceptions of fear of crime among residents of gated and non-gated communities, considering both their actual encounters with crime and their perception of it. Secondly, the study aims to establish the correlation between the sense of well-being and overall health, and the choice between gated and non-gated communities. Lastly, the research aims to understand people's preferences for gated or non-gated communities based on socio-economic factors such as income levels and social class and to discuss how the differences in safety perception promotes the further development of micro-segregation.

This competitive study contributes to enhancing the understanding of the varied relationship between the built environment, socio-economic status, and safety perception in different community setups. Further, by considering health and socio-economic factors and their relationship with the perception of safety, this goes beyond the analysis already carried out in different papers. This multidimensional approach provides another perspective on looking into the other factors influencing residents' safety perception and well-being in segregated and non-segregated areas.

### *1.1. Literature Review*

#### Gated and Non-Gated Communities and Their Relationship with Fear of Crime

Gated communities and housing enclaves are commonly recognized as micro-segregated areas that foster a sense of privilege, facilitating a voluntary detachment and withdrawal from both spatial and social interactions by the wealthier residents [28]. A gated community (GC) is defined as a residential micro-segregated area where individual lots are enclosed by fencing, and access to the community as a whole is unregulated [29]. Access control is typically achieved through the use of fencing or gating elements, often complemented by additional security systems such as closed-circuit television (CCTV), security personnel, guard dogs, and other measures. In contrast, non-gated residences in this study refers to lack of fencing and any access control mechanisms, either at individual house level or at the neighborhood level [29]. Gated communities have become the favored choice for many homebuyers, both on a global scale and within local contexts [30]. One of the factors is socio-economic level, which is contributing to the formation of gated communities as micro-segregation, and it gives information about the different behaviors of people through the specific location of the micro-area [31]. Moreover, Morgan [32] identified the factors causing the emergence of gated communities as micro-segregated areas, include socio-economic and demographic segmentation, political integration and a desire for prestigious lifestyle and high security. However, this detachment creates a hindrance in collaboration and engagements among the residents of gated communities as well, and eventually causes the loss a of sense of community [17].

Prestige, lifestyle, and security-zone communities are the three main categories into which these gated communities are usually divided. The primary features of lifestyle communities are shared amenities, entertainment venues, public areas, and recreational opportunities [33]. Prestige communities are exclusive neighborhoods designed for individuals who prioritize social status and image-conscious living. These communities use their gated entrances as symbols of the residents' elevated social status [33].

In contrast, security-zone communities, categorized as 'city perches', 'suburban perches', and 'barricade perches', place top importance on ensuring the safety and security of their residents. These communities can be found in various settings, spanning from urban city centers to suburban areas and across economically diverse neighborhoods. In all cases, the presence of gates serves as a primary defense against perceived or real threats [19]. In developing nations, gated communities adopt diverse designs and labels primarily intended to prevent the entry of individuals considered "unrelated" or "unautho-

rized individuals" [33]. This leads to urban gating, which supports micro-segregation and causes social stratification among residents both inside and outside specific buildings [30].

The main reasons behind opting to live in these gated communities were driven by concerns such as the fear of crime, which has risen due to rapid changes in racial demographics and escalating incidents of vandalism and burglary across the US. These factors were often mentioned as pivotal reasons for opting for gated communities, as indicated by research [15,19]. Another study by Bandauko et al. [34] has shown that the rise in crime is one of the reasons behind the emergence and formation of gated communities as micro-segregated areas.

Another commonly cited reason is the pursuit of a sense of community; however, research conducted in both the US and the UK has not provided substantial evidence to support this claim [17,35]. On the other hand, research in [36] shows that the presence of boundary walls and fences restricts collaborative actions and engagements among the residents of gated and non-gated communities. Additionally, people living in the close proximity of gated communities have a sense of community confined to the people inside the urban gating.

Recent studies on gated communities (GCs) in developing countries have increasingly focused on demand-based arguments, similar to trends observed in developed nations [37]. These findings parallel many of the patterns seen in developed countries. For instance, Coy and Pöhler [38] suggest that fear and safety are prominent motivations for residents living in GCs in Brazil and Argentina. Conversely, Leisch [39] highlights fear and safety as the primary factors influencing the Chinese minority population's choice to reside in Jakarta. Adetokunbo [40] argues that families in Lagos Mainland, Nigeria, choose gated communities for security, exclusivity, and status benefits.

This perspective is supported by several scholars who view GCs as thoughtful efforts by the wealthy to distance themselves from harsh urban realities, including inadequate urban infrastructure and services, rising crime rates, and the fear of crime [41,42]. The fear of crime includes a broad spectrum of emotional and practical responses to criminal activities on both an individual and community level [43]. Farrall et al. [44] propose that fear of crime is often regarded as an indicator of one's susceptibility to becoming a victim of crime. The chances of becoming a crime victim tends to add to one's fear of crime [44]. However, the perception of fear of crime can be different for the individual, influenced by the circumstances under which one experiences it [45], the design and environment of the area [46], and social and psychological factors [47]. It is important to note that the measurement of fear of crime differs across various research studies [4]. Past studies have generally evaluated fear of crime as either an emotional reaction or anxiety connected to criminal activities [48]. However, context plays a crucial role, as some people might feel fearful of crime despite being statistically less prone to victimization [4].

Numerous factors, including the physical surroundings [49], the social environment [50], victimization [51], and issues related to specific types of crime in the neighborhood [7] have been found to influence people's fear of crime in international studies. The physical environment, as noted by [49], plays an important role in shaping fear of crime, especially for those with limited mobility or physical strength [52]. This vulnerability relates to environmental disorder, like abandoned cars and vandalized property [53]. Furthermore, the broken windows theory [54] suggests that evident indicators of crime and disorder in urban areas, like broken windows and public misconduct, can lead to increased crime. This perception of disorder can heighten residents' fear of crime [55]. Makinde [56] conducted a study on the fear of crime using three variables: territoriality, surveillance and milieu. Their findings indicated correlations between these variables and the creation of a sense of safety for the public.

A study by [57] found correlations between design features, crime rates, demographics, and residents' feelings of safety. On the other hand, Weidemann et al. [58] examined nine factors related to safety, including concerns about children, strangers, and noise; the presence of friends nearby and social interactions; surveillance and loitering; the

perception of crime, vandalism, and the likelihood of being a victim of crime; contentment with privacy and control; yard space, security systems, and community watch initiatives; and perceptions of crime reporting, police presence, overall neighborhood appearance, and wayfinding.

Furthermore, another key factor to consider is the social environment, which encompasses subjective elements related to social issues and economic dynamics within families, all tied to human relationships [50]. Additionally, problems associated with crime in neighborhoods are frequent contributors to the feeling of fear of crime. The next element influencing the fear of crime is victimization. Pandiani et al. [51] highlighted the fact that direct victimization relates to individuals who have personally experienced a crime. In contrast, indirect victimization involves fear of crime stemming from hearing about crime incidents, either through the experiences of crime victims among people around the individual or from media reports [51]. Those who have directly fallen victim to a crime are often characterized by heightened feelings of fear and anxiety [44]. This heightened sense of fear makes them more cautious about crime and their personal safety [59]. On the other hand, research by [60] indicated that victimization of crime caused the avoidance of those places instead of fear of crime, among the most fearful women.

Regarding crime-specific measures, Brunson et al. [61] conducted interviews with 94 public-housing residents to measure their fear of crime by looking at physical incivilities such as levels of vandalism, graffiti, and litter in proximity to their homes, as well as social incivilities like noise levels, the presence of strangers, and illegal activities. Age and physical appropriation also played roles in shaping these perceptions. Another study [17] indicated that communities were perceived as safer when they had more children and longer-term residents.

On the contrary, our understanding is that living in gated or non-gated communities effectively decreases an individual's possibility of criminal victimization, and fear of crime remains limited [13]. Shedding light on this subject, Jalili et al. [62] conducted a study in Ekbatan, the Middle East, which showed no substantial impact on residents' fear of crime or their sense of community. The enclosed and guarded nature of these living environments often discourages residents from actively engaging in safeguarding their neighborhood, leading to a diminished sense of responsibility for their place of residence [62]. Gating is generally considered a short-term solution to the issue of crime, since it may result in social segregation. Additionally, as per the study of [63], socio-economic level, age and gender have a significant effect in understanding the fear of crime and victimization experience.

Additionally, the study by [64] indicated that there is a negative correlation between fear of crime and mental and physical wellbeing. On the other hand, ref. [33] associated fear of crime with social classes in Lahore, Pakistan, emphasizes the fact that residents with higher incomes encounter fewer crimes compared to those from lower- or middle-income backgrounds, irrespective of their residence in gated or non-gated communities. The residents' perception of insecurity is closely linked to the prevalence of crimes within their community. Additionally, residents of gated communities tend to express greater satisfaction with the implemented measures for safety and security. Interestingly, there are 25 times as many reported crimes in non-gated areas as there are in gated communities [33].

Abdullah et al. [29] revealed that residents in individual gated residential areas are more fearful than people living in non-gated communities in Malaysia. The authors associated this phenomenon with lifestyle, community relations and the surrounding environment, all of which have an impact on how people perceive crime [29]. In another study, Kim [65] found that residents of Houston, Texas, felt safer overall in gated communities (GCs) as opposed to non-gated communities (NGCs). Mohit and Abdulla [3] conducted an investigation into safety levels in both gated communities (GCs) and non-gated communities (NGCs), considering residents' experiences with crime and their perceptions. Their results revealed that residents' perception of safety is influenced by both their personal experiences of crime and those of their neighbors. Surprisingly, their study found no major variations in how residents perceive safety in GCs and NGCs. This finding contradicts the

conclusions drawn by [59,66], who asserted that people in gated communities felt safer than those in non-gated ones. As a result, the study suggests that erecting gates may not be an effective means of providing a safer living environment [3].

In contrast, Addington and Rennison [67] demonstrated that households in gated communities (GCs) had a lower incidence of burglary victimization compared to non-gated communities (NGCs). Additionally, a number of other studies have suggested that there are not any appreciable differences in general crime rates between areas that are gated and those that are not [17,19,68,69]. According to the existing literature, the design of the built environment can play an important role in shaping criminal behavior. Likewise, crime prevention strategies such as target hardening, territorial features, and enhancing natural surveillance can effectively contribute to reducing criminal incidents [3].

Thus, the ongoing debate regarding the impact of gated communities (GCs) on crime rates continues, necessitating further research across diverse socio-economic and cultural contexts to explore these associations. In light of this, the present study seeks to investigate this phenomenon in Quetta, Pakistan. Unfortunately, there is a lack of scientific literature that addresses the presence of gated communities within the urban landscape of Quetta, despite their undeniable existence throughout the city. Various gated communities in Quetta city have different security measures, ranging from simple fenced complexes to fortress-like facilities equipped with high walls, CCTV surveillance, and security guards. These communities are located across different areas, from the city center to the suburbs. It is important to note that the fear of crime can vary among different housing schemes and is not exclusively dependent upon whether a community is gated or not. The fear of crime is shaped by a number of factors, including the general safety and security measures put in place inside a particular housing scheme, the current crime rates in the surrounding areas, and residents' perceptions. Therefore, conducting in-depth research, engaging with residents, and gathering information about crime trends, security protocols, and safety initiatives within each housing scheme is important.

The research hypothesis formulated for the study includes the following:

1. Residents in gated communities tend to perceive a higher sense of safety and a lower risk of crime victimization compared to those in non-gated communities.
2. Individuals who experience high levels of fear related to crime often report poorer health conditions. Crime victims often report a decline in their sense of wellbeing and overall health.
3. Individuals with higher socio-economic status generally experience a higher number of criminal incidents and tend to have higher levels of worry about being victims of crime.

## 2. Materials and Methods

An exploratory research approach was used in this study, to investigate the dynamics between gated and non-gated communities. Four residential areas in Quetta were examined: two gated and two non-gated. From each category, one high-income and one middle-income area were selected, illustrating the impact of social class on crime fear. Figure 1 shows the location of study sites including Jinnah Town (high-income, gated), Chaman Society (high-income, non-gated), Arbab Town (middle-income, non-gated), and Chiltan Housing (middle-income, gated). The survey aimed to understand differences in fear of crime between gated and non-gated residential areas in Quetta.

Systematic observations of these areas were conducted on two weekdays in January 2023, from 01 a.m. to 7 p.m. The tools used for this survey include detailed field notes to capture the qualitative information, like contextual information, and the overall environment of the communities. Further, maps and drawings were used to record the information and features within the areas. Mobile cameras were used to capture visual data during observation for later analysis.

The questionnaire was designed after carefully reviewing the existing literature related to gated and non-gated communities and the safety perceptions of residents. The survey

questionnaire (5-point Likert scale), comprising 27 closed-ended questions, was divided into three segments. Information on demographics, socio-economic and household characteristics and housing features was gathered in the first section. The second section explored residents' lifestyles, including walking habits and daily activities. The third section focused on participants' crime experiences and safety perceptions within their housing societies, differentiating between high-income/low-income and gated/non-gated areas. Questions aimed to assess perceptions on three key indicators: (1) overall area environment; (2) personal experiences of crime; and (3) safety concerns. The questionnaire commenced with a brief research introduction, ensuring participant anonymity and voluntary involvement.

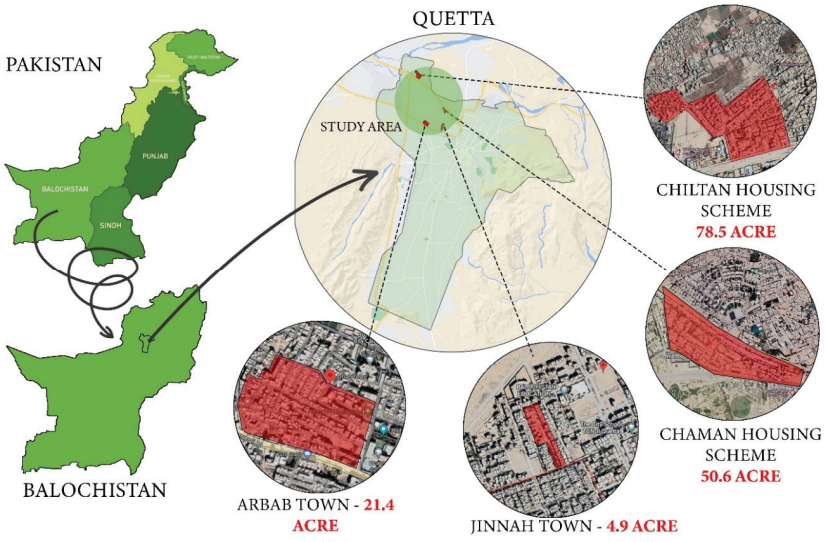



**Figure 1.** Case study area showing location of Quetta city in Pakistan and selected housing schemes in Quetta city.

The survey was carried out using a systematic random sample method. The second author supervised a survey team that knocked on the doors, asking residents to fill out the questionnaire. The survey was initiated with a random starting point, with a sample consisting of every third house number. Twenty-five homes from each housing scheme were selected to survey, making a total number of 100 residences. By using this method, biases resulting from differences in sample sizes can be avoided and a more balanced comparison of gated and non-gated communities can be made. Additionally, our results' statistical validity ensures that every housing scheme is fairly represented in the analysis, decreasing the possibility of sampling bias and increasing the accuracy of our findings. We also had to consider practical factors like time and resource limitations, which affected our choice to restrict the number of responders from each region. This approach helped us to use our resources more effectively and still collect enough data for analysis by maintaining a constant sample size.

Collected responses were compiled in Excel sheets and visually represented using charts like bar and pie charts. All responses underwent manual verification for completeness. Subsequently, data analysis was conducted using SPSS (v29). Initial analysis involved drawing frequency distributions of key variables. Furthermore, to describe and summarize the characteristics of the compiled data, descriptive statistics has been used, including the calculation of mean and standard deviation. In addition, correlation analysis comprised of the Pearson correlation coefficient was run to test the relationships between variables to identify any significant correlations between different factors related to fear of crime and residential characteristics.

### *2.1. Framing the Case Study Area*

With more than a million residents, Quetta is the provincial capital of Balochistan and one of Pakistan's most populous cities. It is located at latitudes 30°03′ N to 30°27′ N and longitudes 66°–44′ E to 67°–18′ E, nestled among four mountains. The region is mountainous, with heights ranging from 1254 to 3500 m above sea level. Hence, it historically consisted of grazing land and mountains, with diverse flora and fauna. This rapidly growing city functions as a key commercial hub, especially along the main trade route leading to Afghanistan. Its strategic importance has further intensified with the advent of the China–Pakistan Economic Corridor (CPEC), bestowing global significance on Quetta. The upcoming railway link connecting Quetta to the Gwadar port is poised to play a crucial role in facilitating future economic activities in the region. The climate in Quetta is cold and semi-arid, with large seasonal variations. Summer temperatures often range from 24 to 26 °C (75 to 79 °F), whereas winter temperatures are typically between 4 and 5 °C (39 to 41 °F).

Following the 1935 earthquake, Quetta city was originally designed to accommodate a population of 50,000–80,000. Up until 1947, Quetta remained a small town, often referred to as "small London" [70]. However, a surge in population ensued due to rural–urban migration, transforming Quetta into a bustling city. In addition, the 1980s witnessed the growth of slum areas fueled by the influx of Afghan refugees. Ongoing development of new housing schemes in various regions contributed to the expansion of settlements, solidifying Quetta's status as a densely populated city [71]. According to the 2017 census, Quetta's population surpassed one million, marked by a majority of Pashtun and Baloch residents, a Hazara minority, and smaller diverse communities, lending the city a multicultural character [24]. The city has a Pashtun majority followed by Balochis, Hazaras, Brahui, Punjabis and Muhajir people [72]. Over the past five decades, Quetta has undergone significant transformations from its original planned capacity of 50,000 residents. Presently, nearly half of the city's population resides in slums (Kachhi Abadi settlements). The ongoing development of new housing schemes poses a challenge by encroaching on valuable agricultural land [71]. However, new housing schemes are justified to cope with the challenge of crime because the city has a heightened population density, a consequence of Afghan refugee inflows and rural-to-urban migration, leading to an escalation in crime rates and terrorism [26].

The complexity of violence in Quetta is intense, characterized by complicated layers and historical dependencies. It has been significantly shaped by activities in state construction, as well as by tribal and ethnic conflicts, alongside the impacts of transnational warfare. Unprecedented violence targets the Hazara community, and Punjabi communities as well as security forces are merging with the deficiencies and inefficiencies existing in urban administration, thus forming a juxta city where state bodies are coping with internal power struggles within unstable security and governance mechanisms, while individual state actors navigate the maze of an inefficient political setting. In 2012 and 2013, the Hazara Shi'i community became the biggest target when gated communities of Hazara observed massive bombardment inside Hazara residential areas and multiple targeted gun and bomb attacks [26]. Therefore, the following paragraphs present the study of different housing areas.

### *2.2. Case Study 1*

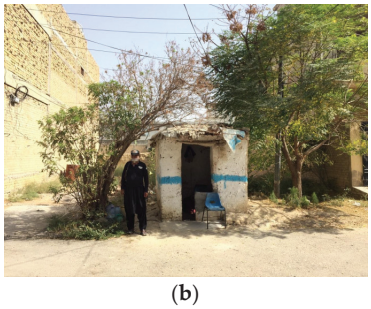
Jinnah Town, situated along Samungli Road, with an area of 4.9 acres, is one of the well-established and popular high-income, gated residential schemes in Quetta known for its well-planned layout, wide roads, and availability of basic amenities such as water, electricity, gas connections, and CB Public School and Degree College. Major landmarks comprise the Ziarat Samdu Agha Cemetery, $2\frac{1}{2}$ km northeast, the Akhtar Ali Stadium, $3\frac{1}{2}$ km east, and the Cantonment General Hospital, 4 km east. Jinnah Town has witnessed significant development over the years and has become a preferred choice for many residents in Quetta. This housing scheme has a diverse set of amenities, including supermarts, general stores,

ice cream shops, and a bank. It also has tea stalls/shops, restaurants, a library, and several snooker/gaming points, a public school, and a degree college. However, it is smaller in size, with 83 houses and a population of about 415 individuals with various beliefs and ethnic backgrounds (Table 1). Figure 2a depicts a perspective of a residential street, while Figure 2b illustrates a security guard positioned at the entrance of Jinnah Town.

**Table 1.** Details of amenities in the four chosen housing schemes, gathered from on-site inspections.

| Areas/Spaces and Amenity Details | | | Chaman Housing: Non-Gated Housing Scheme | Arbab Town: Non-Gated Housing Scheme | Chiltan Housing: Gated Housing Scheme | Jinnah Town: Gated Housing Scheme |
|---|---|---|---|---|---|---|
| **Public Spaces** | **Commercial activities** | Shops/Tea stalls and tea shops | 8 | 14 | 14 | 6 |
| | | Hotels/ Restaurants | 2 | 2 | 1 | 2 |
| | | Grocery stores/ general store | 1 | 11 | 16 | 11 |
| | | Supermarts | 1 | 2 | 2 | 3 |
| | | Snooker and Gaming points | 0 | 3 | 1 | 4 |
| | | Bank | 0 | 0 | 1 | 1 |
| | | Tailer shops | 0 | 3 | 2 | 0 |
| | | Medical stores | 0 | 2 | 2 | 0 |
| | | Community hall | 0 | 0 | 1 | 0 |
| | | Commercial buildings with shops on ground floor | 2 | 0 | 0 | 0 |
| | | Mosque | 1 | 2 | 2 | Grand Mosque (1) |
| | | Parks | Community Park (1) | None | 3 parks | None |
| | | Auditorium and cinema | None | None | None | None |
| **No. of houses** | | | 200 houses | 265 houses | 665 houses | 83 houses |
| **Total population** | | | 3350 people | 550 people | 5400 people | 415 people |

(**a**)



(**b**)

**Figure 2.** (**a**) View of a residential street in gated housing (Jinnah Town) (left). (**b**) Security guard at the entrance of Jinnah Town (right).

### *2.3. Case Study 2*

Chiltan Housing represents a relatively recent gated residential development situated on the main Airport Road in Quetta. Spanning an expansive 78.5 acres and perched at an altitude of 1615 m, it benefits from a strategic position in close proximity to Khrotabad and Shaikh Manda. Prominent landmarks in the vicinity include the Red Crescent Surgical Hospital, Sheikh Mānda Railway Station, Baleli Railway Station (4 km west), and Sor Bridge (4 km south). Chiltan Housing has become a favored choice among individuals and

families seeking budget-friendly housing options. Despite being a newer development, it currently has limited infrastructure and amenities compared to more established schemes. The scheme provides various amenities, including two supermarkets, three general stores, three tailoring shops and eight other shops (Table 1). Additionally, it features 14 shops, a community hall, a medical store, a clinic, and a snooker/gaming point. Of a considerable size, Chiltan Housing comprises over 665 houses and hosts a population ranging between 5200 and 5500 individuals, representing a diverse mix of various beliefs and ethnic backgrounds. Figure 3a presents a view of a commercial street, while Figure 3b shows a residential street facing the park in the Chiltan Housing Scheme.

(**a**) (**b**)

**Figure 3.** (**a**) View of a commercial street in a gated housing scheme. (**b**) View of residential houses facing the park.

*2.4. Case Study 3*

Arbab Town, a notable non-gated residential area in Quetta, has an elevation of 1638 m and is sited neighboring to the localities of Malik Abdullah Jan and Christian Town. Major landmarks include Sheikh Mānda Railway Station, 4 km north, and the Refugees' Hospital, 4 km north. It offers a variety of housing options for middle-income people, with the total land area of 21.4 acres. The scheme is known for its well-maintained infrastructure and provision of basic facilities. Arbab Town has good connectivity to major areas of the city. It has a slightly more extensive set of amenities, with two commercial buildings that include ground-floor shops, fourteen shops, a medical store, a clinic, two restaurants, two gyms, and a snooker/gaming point. The area comprises over 265 houses and has a diverse population of over 500 individuals with various beliefs and ethnic backgrounds (Table 1). Figure 4a depicts a view of a commercial street, while Figure 4b shows a residential street in Arbab Town.

(**a**) (**b**)

**Figure 4.** (**a**) View of a commercial street in Arbab Town. (**b**) Residential area in Arbab Town.

*2.5. Case Study 4*

Chaman Housing Scheme is non-gated residential scheme in Quetta, boasting an elevation of 1675 m. This locality is conveniently located in close proximity to Kili Malak Kabir and Gulshan Town. Major landmarks include the Askary Park, Ziarat Samdu Agha Cemetery, Akhtar Ali Stadium, Jinnah Market and Cantonment General Hospital, $2\frac{1}{2}$ km southeast. It caters to the housing needs of the high-income population and covers an area

of 50.66 acres. It offers various housing options, including residential plots and houses. However, it is important to consider the infrastructure, amenities, and access to basic facilities when evaluating this scheme. It features a modest array of amenities including shops, hotels, and a grocery store. The area accommodates over 200 houses and has a population exceeding 350 individuals (Table 1). Figure 5a depicts a view of a residential street, while Figure 5b illustrates a commercial street in the Chaman Housing Scheme.

(**a**) (**b**)

**Figure 5.** (**a**) View of a residential street. (**b**) View of a commercial street in the Chaman Housing Scheme.

## 3. Results

The study focuses on evaluating fear of crime in relation to health and socio-economic status across two gated and two non-gated communities in Quetta, Pakistan. It specifically aims to explore the disparities in gated versus non-gated housing schemes in Quetta. The findings and discussions are presented on an area-by-area basis, providing detailed insights into the unique characteristics of each community, Jinnah Town, Arbab Town, Chiltan Housing, and Chaman Housing. Each housing scheme has its unique features and facilities, with gated communities like Chiltan and Jinnah Town offering a broader range of amenities compared to the non-gated Chaman and Arbab Town. The population density and diversity also varies, with Chiltan housing being the most populous and diverse. Additionally, while all areas have mosques, only Chaman and Jinnah Town have parks, and none of the schemes features an auditorium or cinema (Table 1). Respondent sample size, and a descriptive analysis of indicators related to demography and economic activities, are presented in Table 2.

Gated communities are typically characterized by controlled access points and the presence of security personnel (see Figure 2b), aiming to provide enhanced security and privacy for residents. Common features include surveillance systems (in terms of security guards, security patrols, and restricted entry), which collectively contribute to a reduced fear of crime. The presence of physical barriers and safety measures fosters a perception of a safer environment, offering residents greater peace of mind. However, despite living in gated communities, respondents express concerns about their health, and 64% of them feel insecure at night. Chiltan Housing, a middle-class gated community selected as a case study, shows evidence of micro-segregation and hesitance among respondents to participate in outdoor activities due to safety concerns. This is reinforced by the fact that 64% of the respondents express a sense of insecurity at night, despite residing in a gated community. Adding to these safety worries, a significant 48% of the community's population is very worried about becoming victims of crime, and 36% have reported being victimized several times. These findings collectively portray a picture of a community struggling with health and safety issues, despite being a gated area that typically promises enhanced security.

In Jinnah Town, an upper-class gated community, a significant 88% of the respondents report not feeling healthy, and a similar high percentage, 84%, tend to avoid morning or evening walks. This avoidance of outdoor activities might be linked to safety concerns, underscored by the fact that 48% of the respondents have experienced being victims of crime multiple times. Despite these concerning health and crime statistics, a notable majority of 68% still feel safe during nighttime. This paradoxical situation highlights a unique aspect of living in Jinnah Town, where, despite health concerns and a high incidence

of crime, and growing micro-segregation, the measures in place in this gated community still instill a sense of security among its respondents, especially at night.

**Table 2.** Descriptive analysis of indicators assessed for demography and economic activities ($n$ = 100).

| Case Studies | | Chaman Housing | Arbab Town | Chiltan Housing | Jinnah Town | Total | | |
|---|---|---|---|---|---|---|---|---|
| | | Non-Gated | Non-Gated | Gated | Gated | | | |
| No. of Respondents | | 25 | 25 | 25 | 25 | | 100 | |
| | | | Respondents (%) | | | Total (%) | Mean | Std. Dev. |
| Age | 16–24 | 4% | 60% | 24% | 36% | 33% | 2.39 | 1.197 |
| | 25–34 | 12% | 16% | 28% | 20% | 19% | | |
| | 35–44 | 36% | 24% | 16% | 28% | 26% | | |
| | 45–54 | 44% | 0% | 8% | 8% | 20% | | |
| | 55–64 | 4% | 0% | 4% | 0% | 2% | | |
| Marital Status | Single | 4% | 16% | 20% | 0% | 10% | 1.97 | 0.502 |
| | Married | 88% | 76% | 80% | 100% | 86% | | |
| | Divorced | 4% | 4% | 0% | 0% | 2% | | |
| | Widowed | 4% | - | 0% | 0% | 1% | | |
| | Other | - | 4% | 0% | 0% | 1% | | |
| Economic Activities | Employed | 24% | 68% | 0% | 36% | 34% | 2.49 | 1.259 |
| | Unemployed | 0% | 16% | 8% | 20% | 11% | | |
| | Self-employed | 60% | 4% | 44% | 16% | 31% | | |
| | Student | 8% | 28% | 40% | 24% | 20% | | |
| | Retired | 0% | 4% | 8% | 4% | 4% | | |
| Income Status | ≤20,000 | 0% | 0% | 16% | 0% | 4% | 4.36 | 1.345 |
| | 20–30 k | 4% | 20% | 8% | 0% | 8% | | |
| | 30–40 k | 4% | 28% | 4% | 0% | 11% | | |
| | 40–50 k | 4% | 32% | 8% | 8% | 16% | | |
| | >50 k | 84% | 16% | 40% | 84% | 52% | | |
| | Refused | 4% | 4% | 24% | 8% | 10% | | |
| | Other | 12% | 8% | 16% | 8% | 11% | | |

Non-gated communities are more open and approachable than gated communities because they do not have physical barriers or regulated entrance points. Because of the perceived lack of protection, those who live in open neighborhoods frequently have a greater fear of crime than those who live in gated communities. However, the actual level of fear can vary, based on the overall safety and security conditions of the area. In the Arbab Town area (middle class, non-gated) the statistics indicate that in the middle-class, non-gated area (Arbab Town) a significant majority of respondents (76%) perceive their neighborhood as healthy, and engage in morning or evening walks (76%). Yet, concerns regarding nighttime safety are evident, with 32% feeling unsafe compared to 68% who feel safe in their neighborhood. The community shows a relatively balanced distribution of income across three categories (20%, 40%, and 40%). Furthermore, a significant link is observed between residents' sense of health in their neighborhood and their propensity to participate in walks, with 76% of those feeling healthy also engaging in walking activities. Additionally, there is a connection between feeling secure at night and a lower level of worry about crime victimization, as 68% of those feeling safe at night report being not-very or not-at-all concerned about crime (see Figure 6).

Chaman Housing, an upper-class non-gated community, presents a mixed scenario in terms of resident lifestyle and safety perceptions. On one hand, a majority of respondents (84%) report being in good health and actively participate in morning or evening walks, suggesting a positive and active lifestyle within the community. On the other hand, a significant portion of these respondents, 68%, express concerns about safety at night, indicating underlying safety issues despite the area's upper-class status. Additionally, the

community shows an uneven income distribution, with a notable 84% of its respondents falling into the higher income bracket of earning above 50,000 per month. This disparity in income levels could potentially contribute to the varying perceptions of safety and lifestyle within the area.


**Figure 6.** Perception of safety in four selected housing schemes.

Table 3 shows the relationships among various factors within gated and non-gated communities. In gated housing, the correlation between concern about crime and the actual experience of crime victimization shows a negative correlation (−0.371, *p*-value = 0.008). Additionally, the propensity to go for walks and the worry about crime in gated community housing also shows a negative correlation (−0.675, *p*-value = 0.000). However, a negative correlation that is not statistically significant was found between crime victimization experience and feeling safe at night (−0.223, *p*-value = 0.120). On the other hand, a strong positive correlation exists between being a victim of crime in the last 24 months and both feeling unsafe and reduced outdoor activity. This indicates that victimization significantly impacts safety perception and lifestyle (0.582, *p*-value = 0.000). Interestingly, there are no significant correlations between health conditions or feeling healthy in the neighborhood and other variables. Contradicting the third hypothesis, there is a negative correlation (−0.314, *p*-value = 0.026) that indicates people of a higher socio-economic class are less likely to worry about becoming victims of crime in their gated community.

In contrast, in non-gated housing schemes, the correlations are generally weaker, though there are still significant findings. There is a significant negative relationship (−0.399, *p*-value = 0.004) between being a victim of any crime in the last 24 months or witnessing a crime and feeling safe at nighttime in the neighborhood. Additionally, there is a significant negative relationship (−0.280, *p*-value = 0.049) between being a victim of any crime in the last 24 months (or witnessing a crime) and health condition. When testing the third hypothesis, the correlation between the worry about being a victim of crime and social income status (−0.342, *p*-value = 0.015) supports the idea. This statistically significant result indicates a moderate inverse relationship between socio-economic status and worry about being a victim of crime in the non-gated housing area.

**Table 3.** Correlation between safety perception and crime victimization, impact of fear of crime on health and well-being and socio-economic status in gated and non-gated communities ($n$ = 100).

| | | Safety Perception and Crime Victimization | | | Fear of Crime on Health and Well-Being | | | Socio-Eco. Status | Employment Status | Housing Schemes |
|---|---|---|---|---|---|---|---|---|---|---|
| | | **A1** | **A2** | **A3** | **A4** | **A5** | **A6** | **A7** | **A8** | ***n* = 100** |
| A1 | Pearson Correlation | | −0.371 ** | −0.223 | −0.675 ** | 0.060 | 0.092 | 0.171 | −0.314 * | Gated Housing schemes |
| | Significance (2-tailed) | | 0.008 | 0.120 | 0.000 | 0.681 | 0.525 | 0.234 | 0.026 | |
| A2 | Pearson Correlation | −0.371 ** | | 0.454 ** | 0.582 ** | 0.072 | −0.080 | −0.215 | 0.087 | |
| | Significance (2-tailed) | 0.008 | | 0.001 | 0.000 | 0.618 | 0.583 | 0.134 | 0.547 | |
| A1 | Pearson Correlation | | −0.143 | −0.071 | 0.239 | −0.093 | −0.202 | −0.188 | −0.342 * | Non-Gated Housing schemes |
| | Significance (2-tailed) | | 0.323 | 0.625 | 0.095 | 0.520 | 0.159 | 0.191 | 0.015 | |
| A2 | Pearson Correlation | −0.143 | | −0.034 | 0.280 * | 0.123 | 0.399 ** | −0.072 | 0.063 | |
| | Significance (2-tailed) | 0.323 | | 0.817 | 0.049 | 0.396 | 0.004 | 0.621 | 0.664 | |

* Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed). A1—How worried are you about being a victim of crime in your housing area? A2—Have you been a victim of any crime in the last 24 months? A3—Do you feel safe at nighttime in your neighborhood? A4—Do You go out for a morning/ evening walk in your neighborhood? A5—How is your health condition in general? A6—Do you feel healthy in your neighborhood? A7—Which income group do you belong to? A8—Which of the following best describe your employment status?

## 4. Discussion of the Results

Respondents of both gated and non-gated communities show varying levels of concern about crime, regardless of whether this reflects their actual experience of crime victimization. Interestingly, those who are more worried tend to feel less safe. This finding fully aligns with the first hypothesis, which suggests that residents living in more segregated communities are more likely to feel safe and less likely to become victims of crime than those of non-gated communities. These results directly contradict the findings of [29], who reported that residents of gated residential areas show higher levels of fear than those people living in non-gated communities.

Additionally, a slight trend was observed in the relationship between the inclination to go for walks and the worry about crime in gated community housing, which highlighted the fact that increased worry about crime correlates with a reduced likelihood of going out for walks. This finding contrasts with the findings presented by Gul et al. [73], who argued that perception of crime does not prevent people from walking in their neighborhoods. Moreover, the evidence linking crime victimization experience and feeling safe at night is not substantial. Surprisingly, we have not found any other studies to confirm this result, as most of the studies primarily focus on perceived safety rather than crime victimization [60].

Overall, our respondent's responses support the idea of that people have been victims of crime in the last 24 months and as a result they feel unsafe and unengaged in reduced outdoor activity. These findings are consistent with a previous study conducted by [44], which identified the fact that individuals who have directly fallen victim to a crime are often characterized by heightened feelings of fear and anxiety. Additionally, Gul et al. [74] found that increased perception of crime is associated with decreased physical activity.

Interestingly, the correlations between health conditions or feeling healthy in the neighborhood and other variables are not significant. This suggests that personal health perceptions are less influenced by safety concerns or victimization experiences within this context. Therefore, while safety concerns and victimization may affect aspects like outdoor activities and feelings of safety, they do not have a direct influence on how residents

perceive their health status or sense of well-being within their community. These results are somewhat in line with the research conducted in New Zealand by [64], which found that negative mental- and physical-health effects are more strongly correlated with the fear of crime than actual crime rates. This aligns with the idea that perceptions of safety and fear of crime can significantly impact individuals' health outcomes, regardless of actual crime rates in the neighborhood. In light of these insights, it is suggested that improving safety measures can positively impact residents' willingness to engage in outdoor activities and overall community well-being, and can strengthen community ties.

People with higher socio-economic status are less likely to worry about becoming victims of crime in their gated community. Contradicting the third hypothesis, this means that as socio-economic status increases, worry about being a victim of crime decreases. This implies that individuals with higher incomes are less concerned about crime victimization, which goes against the hypothesis. Therefore, the text provided does not support the hypothesis but rather presents evidence to the contrary. This research aligns with earlier contributions by [33], which indicated that residents with higher incomes experience fewer crimes compared to those from lower- or middle-income backgrounds, regardless of whether they live in gated or non-gated communities.

In non-gated housing schemes, the relation between being a victim of any crime or witnessing a crime and feeling safe at nighttime in the neighborhood could be attributed to increased safety measures or a psychological adaptation within gated communities. This finding supports the first hypothesis and emphasizes the impact of personal or observed victimization on safety perceptions. Furthermore, the relationship between being a victim of any crime or witnessing a crime and health condition highlights how different types of housing can affect perceptions of safety and well-being. Experiencing or witnessing a crime in the last 24 months is associated with poor health condition, implying that crime exposure can directly affect physical or psychological well-being [64]. Additionally, the correlation between the worry about being a victim of crime and social income status supports the third hypothesis. This contradicts previous findings of [63], which are that the residents of high-income communities have a higher level of worry about property crimes and personal victimization. In our study, higher socio-economic status is associated with less worry about crime, possibly due to better access to healthcare, healthier lifestyles, or living in safer, better-off neighborhoods.

The study's results demonstrate the connection between safety perception, socio-economic status, and micro-segregation in urban environments. It reveals that worry about crime and the actual experience of crime victimization affect people negatively. Residents of gated communities who express higher concern about safety are less likely to feel safe, supporting the hypothesis that people living in more-segregated neighborhoods typically feel safer [15] and are less likely to become victims of crime. However, this contradicts previous research suggesting that homeowners in gated residential areas are more fearful than those in non-gated communities. The study also suggests that increased concern about crime is associated with reduced outdoor activity. This highlights the influence of safety perceptions on lifestyle choices. Moreover, individuals with higher socio-economic status are less likely to worry about becoming victims of crime in their gated community, indicating a further divide based on socio-economic class. This self-segregation can further increase existing divides within communities, leading to the formation of micro-segregated enclaves based on perceived safety. As a result, neighborhoods or districts may create social stratification [30], as individuals search for locations where they feel safer and more comfortable.

## 5. Conclusions

Gated communities, by their nature, offer a sense of exclusivity and controlled access, which can impact the sense of community cohesion. Non-gated communities, being more open, might foster greater interaction and a sense of belonging among respondents, though this comes with its own set of safety concerns.

The results generally corroborate the theory that people who live in gated communities feel more secure and are less likely to become victims of crime than people who live in non-gated communities. The tendency to go for walks when worrying about crime, as well as the negative correlations between fear about crime and actual victimization, demonstrate how citizens' perceptions of safety affect their actions and way of life. Additionally, the significant impact of crime victimization experiences on feelings of safety and outdoor activity highlights the intense psychological and behavioral consequences of crime within gated communities.

On the contrary, in non-gated housing schemes, the correlations are generally weaker, though still significant. The negative correlation between experiencing or witnessing crime and feeling safe at nighttime as well as crime exposure and poorer health conditions aligns with the hypothesis, indicating that personal or observed victimization significantly impacts safety perceptions. Similarly, the correlation between crime exposure and poorer health conditions supports the notion that crime can have detrimental effects on individuals' physical and psychological well-being. In non-gated communities, micro-segregation may manifest differently, with respondents from diverse socio-economic backgrounds often living in closer proximity and potentially experiencing more intermingling of social groups.

Lastly, socio-economic status plays a crucial role in shaping perceptions of crime and overall safety. It also contributes to micro-segregation by providing information about the different behaviors of people based on their specific micro-area locations. Moreover, this factor has a significant impact on the concerns and experiences of respondents in their respective communities. Surprisingly, evidence suggests that individuals with higher socio-economic status in gated communities exhibit lower levels of worry about crime victimization, contrary to expectation. This highlights the complexity of socio-economic factors in shaping perceptions of safety within different housing contexts.

The data presented here face several potential limitations and biases that should be considered. Firstly, the relatively small sample size of 100 respondents might not accurately reflect the broader population of all social classes in a gated and non-gated neighborhood. It is important to note that the research design is exploratory in nature, with the goal of understanding community dynamics rather than drawing firm conclusions. Given that our study is exploratory in nature, our intention was to present a descriptive analysis of the data to identify potential patterns and relationships. This approach allows for a holistic understanding of the data, rather than focusing solely on statistically significant findings. Secondly, we would like to make it clear that we opted for a uniform sampling approach to support fairness and consistency across all study areas. This method involved selecting an equal number of respondents from each area. By doing so, we aimed to mitigate potential biases arise from uneven sample sizes and facilitate a more equitable comparison between gated and non-gated communities. Furthermore, maintaining an equal representation of respondents from each study area supports the statistical validity of our findings. It ensures that every area contributes equally to the analysis, thereby reducing the risk of sampling bias and increasing the reliability of our results. Additionally, practical considerations, such as time and resource constraints, played a role in our decision to adhere to a consistent sample size across study areas. This approach allowed us to manage resources efficiently while still obtaining enough data for analysis. Moreover, the reliance on self-reported measures for health and safety perceptions could introduce individual biases or inaccuracies, due to subjective interpretation. Similarly, the self-reported nature of the data also raises concerns about response bias or inaccuracies due to memory recall issues. Additionally, the absence of numerical values in the data restricts the scope of statistical analysis that can be performed. Another prominent limitation is the lack of information regarding the total population in each housing area, which impedes the ability to gauge the representativeness of the sample. Furthermore, there are no concrete data on the actual number of crimes in these areas, which adds another layer of uncertainty to the findings. These factors collectively suggest that while the data provide valuable insights, they should be interpreted with caution, considering these potential constraints.

Future studies could concentrate on identifying the key elements that influence perceptions of nighttime safety, delving into why certain individuals feel more vulnerable to crime, and investigating how income levels affect health and safety perceptions within neighborhoods. These data could prove valuable for guiding decision-making processes or shaping policies, particularly by emphasizing the need to tackle safety issues and encourage health-enhancing activities like walking, in these communities. The findings highlight the importance of addressing safety concerns and promoting health-enhancing activities in both gated and non-gated communities. For gated communities, this might involve evaluating the effectiveness of existing security measures and reassessing the impact of micro-segregation on safety and community dynamics, while for non-gated areas, enhancing safety could involve community-based initiatives or improved public safety infrastructure. Additionally, the findings could inform the allocation of resources towards crime prevention measures in the area, ensuring a more targeted and effective approach to enhancing community safety and well-being.

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**Data Availability Statement:** Data will be furnished upon request from the corresponding author.

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# Measuring Deprivation and Micro-Segregation in Greek Integrated Sustainable Urban Development Strategies: Time to Apply a Common Method?

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**Abstract:** During the Programming Period 2014–2020, dozens of Greek cities drafted Integrated Territorial Investment programmes, based on Integrated Sustainable Urban Development Strategies (ITI SUDs). The Strategies justified the selection of intervention and activity areas using socio-economic analysis. The parameters of that analysis, as specified by the National Coordination Authority, reflected the socio-economic and functional parameters highlighted in the relevant EU regulations. This paper uses a recently published methodology in order to estimate and map deprivation in Greek cities with over 100,000 inhabitants, and compares the results with the activity areas identified in the ITI SUDs of those cities. The paper also makes an estimation of the potential for micro-segregation in deprived areas, in an effort to uncover the links between deprivation, built form and social composition at the micro-scale. The analysis shows that deprivation is comparatively more pronounced in Athens and Thessaloniki, and that the use of a common methodology to measuring deprivation, but with customized measurement scales, could support a more targeted allocation of urban policy resources. On the other hand, micro-segregation seems to be a factor worth exploring only in Athens and Thessaloniki, and not in Patra, Larissa, Volos and Heraklion, where the building stock in areas of deprivation is mostly low-rise.

**Keywords:** multiple deprivation; micro-segregation; Greece; Athens; integrated territorial investment

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## 1. Introduction

This paper will discuss a hitherto unexplored aspect of place-based urban policy in Greece, namely the way that the intervention areas (areas covered by the Strategy) and the activity areas (areas targeted by projects) of the ITI SUD (i.e., areas where resources would be targeted) were identified in the six largest Greek cities (Athens, Thessaloniki, Heraklion, Larissa, Patra, Volos). The Sustainable Urban Development Strategies of those cities were implemented via the Integrated Territorial Investment (ITI) mechanism (Article 7, Regulation (EU) 1301/2013 [1]; Article 12, Regulation EU 1304/2013 [2]; and Article 36, Regulation (EU) 1303/2013) [3]. These regulations followed a long debate on the reform of EU Cohesion Policy and the pursuit of territorial cohesion, an EU policy goal since 2007 and the Lisbon Treaty. The Barca report [4] made a strong argument in favour of place-based approaches, best captured in the European Commission's early assessment of integrated territorial and urban strategies [5] (p. 3):

"...integrated place-based approaches are concerned with the efficiency of policy, i.e., how policy interventions can achieve full capacity or endogenous growth potential of territories. The basic principle of a place-based approach is that exogenous interventions through conditional grants of integrated bundles of public services and goods can be achieved in many different ways (no one-size-fits-all). Selecting the appropriate way to instigate reforms is contingent on the local context, and hence local knowledge is necessary to determine the most appropriate solutions for a particular place". Regulations (EU)

1301/2013 and 1303/2013 follow that spirit and offer tremendous flexibility to member-states and urban authorities when it comes to the implementation of Sustainable Urban Development. Having said that, the European Commission [5] also notes that poor data availability makes monitoring and evaluation of SUD strategies particularly challenging. We would add that the challenge extends to the drafting of the strategies too.

The Sustainable Urban Development Strategies, drafted during the Programming Period 2014–2020, mark a turning point in Greek urban policy. At the time, the place-based integrated approach was well-established historically in some EU countries and had been piloted at EU level during the mid-1990s and early 2000s with the URBAN and URBAN II initiatives, which funded projects in several Greek cities. Although Integrated Urban Intervention Plans (IUIP, in Greek: ΣΟΑΠ) were introduced in Greece by law in 1999, 8 years before the Leipzig Charter of 2007 and 10 years prior to the Barca report [4], there are no provisions for funding and implementation [6] and they have cumbersome approval procedures, which require several ministerial assents. The IUIP specifications (Ministerial Decision 18150, 24 April 2012, Government Gazette 1341B) list the various socio-economic parameters that need to be taken into account during the delineation of the intervention area but they do not stipulate the use of multiple deprivation as an analytical concept and leave the method of analysis up to the team which would draft the IUIP. Therefore, when the ITI mechanism was introduced, it was the first time in Greek urban policy that a strategic integrated approach to urban interventions, and the associated investment programme, had a streamlined approval process and was coupled with a clearly defined and ringfenced funding source (5% of ERDF funds, but often more), in the context of an implementation mechanism (the ITI). However, the methodology to be followed in order to identify intervention areas remained at the discretion of member-states and urban authorities. This was a reasonable approach, given that at the time many member states had an urban policy and had already developed a wealth of methodologies and indicators for the identification of deprivation areas, and to guide policy on cities, health, social welfare, etc. For example, according to Zelenina et al. [7]:

"In the UK. . ., all indices are developed at the regional level. Similarly, in Spain and Italy most of the indices are developed at the regional level. Denmark, France, the Czech Republic, Hungary, Slovenia. . .and Sweden developed only national deprivation indices".

However, in the case of Greece, at the time and to this day there is no official methodology and indicator set to be used for the identification of urban policy intervention areas, largely because there is no explicit national urban policy other than what is 'downloaded' from the EU level. The methodological gap was plugged by the Greek administration dealing with the management of EU funds, in the process of implementing the relevant EU regulations.

According to the implementation circular issued by the National Coordination Authority (NCA) of the Ministry of the Economy [8], which is in charge of the design and implementation of territorial development mechanisms funded by EU funds, the ITI SUD for the Programming Period 2014–2020 should have covered urban areas with 'special characteristics and challenges'. These would include "urban areas. . .facing intense economic, social, environmental, climate change, demographic, and functional organization challenges", mirroring the challenges mentioned in Article 7, Regulation (EU) 1301/2013. In the same document [8], the ITI SUD intervention areas were further specified as (a) 'deindustrialised areas' facing poverty, social exclusion and unemployment, (b) areas where land uses are changing and there is informal development or (c) urban centres with functional areas over 70,000 inhabitants, where the focus would be on 'degraded' living and working conditions. In the case of the Region of Attica, the Managing Authority for the Regional Operational Programme invited Urban Authorities to submit strategies targeting areas with 'special development dynamic' or 'highly degraded' areas.

In practice, all the ITI SUDs we looked into for this paper took all three aspects (degradation/social issues, development dynamics, urban functions) into account in the justification of the selection of intervention areas and activity areas. Broadly speaking, the

parameters used in order to identify 'degradation enclaves' in the nine ITI SUDs focused on density, income, demography and environmental problems but there was some leeway when it came to the requirements for spatial disaggregation of the data and to the methods that the Urban Authorities could use for that identification process. This allowed Urban Authorities to exercise discretion insofar as their preferred methods of socio-spatial analysis are concerned, which in turn resulted in diverse approaches towards the definition of 'degraded' areas, and their identification (see Section 2).

The paper will measure multiple deprivation and micro-segregation in the six largest Greek cities, using the methodologies published by Karadimitriou et al. [9] and Maloutas et al. [10], and will compare the findings with the results of the spatial analysis caried out in support of said strategies. The aim of that comparison is twofold. First, to discover to what extent the choice of method and the parameters of analysis affected the targeting of the ITIs, and therefore the effectiveness of place-based public investment. Second, to explore whether deprivation and micro-segregation are policy-relevant, and therefore whether they should also be included in the analysis of the socio-spatial characteristics of areas targeted by ITI SUDs.

Multiple deprivation, understood as the relative lack of resources across several domains, is a relatively understudied aspect of the social morphology of Greek cities. In fact, the only studies dealing with aspects of that topic are about Athens, and are few and far between. The work of Kandylis et al. [11] looked into the spatial typology of immigrant locations and the spatial hierarchy of Athens, while Panori et al. [12] investigated the spatial segregation of immigrants. Arapoglou and Maloutas [13] looked into the clustering of deprived immigrant populations in Athens. Chatzikonstantinou and Vatavali [14] have looked into the spatiality of energy deprivation in Athens, and Dimitrakou explored urban vacancy and access to housing [15]. However, the first study which analysed multiple deprivation in Athens came very recently, in 2021, by Karadimitriou et al. [9]. They demonstrated that the spatial patterns of multiple deprivation in Athens reveal nuanced centre–periphery divisions linked to the city's urban development trajectory and the way housing is accessed by households.

Compared to the study of multiple deprivation, social segregation and micro-segregation in Greece is covered in greater depth in the bibliography, although the relevant research only deals with Athens in this case too. Greek scholars, starting with Leontidou's seminal book on the Mediterranean city [16], have developed the concept of vertical segregation in order to explain the way that social stratification is spatially expressed in the densely built urban fabric of Athens. Since the 2000s [17], Maloutas has explored this spatial expression of social stratification at micro-level in greater depth. Lately, research in various parts of the world showed that micro-segregation and verticality are not a unique characteristic of Athens but could be effectively used as analytical concepts to describe the spatiality of social segregation in densely built-up urban areas across the globe (for recent examples see: [18–20]).

It has been argued (see Maloutas and Karadimitriou [21]) that micro-segregation (i.e., vertical segregation in the case of Athens), could help to explain the relatively less polarized social geography of Athens [9], at the macro scale. More broadly speaking, there is an argument taking shape in urban sociology that micro-segregation might be a phenomenon which attenuates the segregated socio-spatial expressions of highly polarized societies [21]. To the extent that micro-segregation plays such a role, a better understanding of the interaction between the dynamics of multiple deprivation and the dynamics of micro-segregation could help target resources more effectively in urban space, in cases where micro-segregation is 'masking' the spatial expression of deprivation.

For example, two areas with comparable average scores of multiple deprivation may either reflect a socially homogenous population or a rather polarized area where more deprived strata and more well-off strata live in very close proximity to one another. The polarized area is bound to have populations experiencing more extreme levels of

deprivation. Therefore, place-based interventions targeting multiple deprivation would have to be qualitatively and quantitatively different between the two areas.

This paper seeks to show how micro-scale analysis could enable a better focus on deprivation issues with the aim to achieve a more targeted distribution of funding. Deprivation is an important component of the analysis backing SUD strategies, and therefore a more refined understanding of its spatial distribution according to micro-scale factors is bound to affect the effectiveness of public spending on policies to tackle it.

Following the introduction (Section 1) and the methodology (Section 2), the paper will estimate and map the patterns of multiple deprivation and social segregation at the micro-scale in all six cities. The paper will compare the deprivation and micro-segregation patterns between the six cities with the map of activity areas selected in the Strategies in order to identify differences between the two. Section 4 discusses the findings and offers key policy recommendations.

## 2. Materials and Methods

The paper looks into all the approved ITI SUDs drafted for cities with a population over 100,000 inhabitants, for the Programming Period 2014–2020. This includes the ITI SUDs for the Municipality of Athens, Piraeus, Athens Western Sector, Athens Southern Sector, Thessaloniki, Larissa, Volos, Heraklion and Patra. The Greek urban network is dominated by metropolitan Athens (a.k.a. Athens, the capital), and Thessaloniki. These two cities had 44% of the country's population, or more than 4,760,000 inhabitants, in 2011. Larissa, Volos, Heraklion and Patra did not exceed 200,000 inhabitants (Table 1). Athens, Thessaloniki, Heraklion, Patra and Volos are cities with access to the sea and have significant port facilities, unlike Larissa (Figure 1). Altogether, half (50.1%) of the country's population in 2011 lived in these six cities. Concerning the socio-economic profile of the six cities, the three variables presented in Table 1 concern the three main axes of employment, education and housing. All six cities are above the national level, especially Athens, with more or less pronounced differences. In detail, Athens and Thessaloniki show a strong over-representation of unemployed and highly educated individuals (20–64 years old). Volos, Larissa and Heraklion seem to be closer to the average national profile with Larissa scoring higher in the highly educated population and Heraklion showing an over-representation of tenants. The latter is also present in Athens. Patra seems to be in between those two groups, scoring relatively high in all three variables.

**Table 1.** Distribution of the population in the six main Greek cities (2011).

| City | Population | Cumulative Percentage | Unemployed | Higher Education (20–64 Years Old) | Population in Rented Dwellings |
|---|---|---|---|---|---|
| Athens | 3,722,450 | 34.4 | 13.9 | 31.1 | 24.4 |
| Thessaloniki | 1,040,325 | 44.0 | 9.8 | 21.2 | 21.7 |
| Patra | 196,051 | 45.8 | 8.9 | 18.5 | 23.4 |
| Heraklion | 168,235 | 47.8 | 8.9 | 18.4 | 27.8 |
| Larissa | 156,141 | 48.8 | 7.9 | 21.0 | 21.5 |
| Volos | 136,353 | 50.1 | 8.1 | 18.9 | 19.5 |
| Total Greece | 10,816,286 | 100.0 | 7.9 | 17.6 | 19.3 |

In metropolitan Athens there were four ITI SUDs approved: the Municipality of Athens', the Municipality of Piraeus', the Southern Sector's, and the Western Sector's. Athens, Piraeus and the Western Sector also had an IUIP, on which a great deal of the ITI SUD analysis was based. The call issued by the Managing Authority for the ROP of Attiki (the Region in which Athens is located) invited Urban Authorities to submit ITI SUDs focused on either "degraded areas" or "areas of special development dynamic". The ITI SUDs for the Municipality of Athens, Piraeus and for the Southern Sector were focused on areas with "special development dynamic", whereas the Strategy for the Western Sector was focused on "degraded areas".

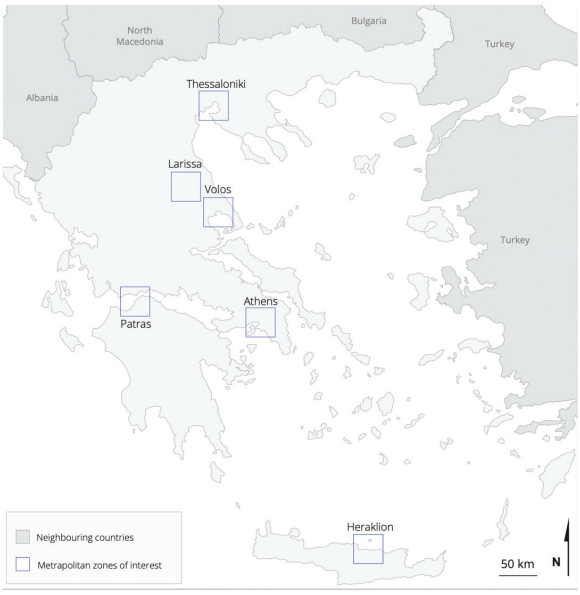


**Figure 1.** The location of the six cities.

In the Western Sector ITI SUD, which explicitly focused on "degraded areas", a multi-criteria approach was used in order to identify activity areas (called "focus enclaves" in the strategy). The criteria were social cohesion, poverty, weak economic basis, deindustrialization, land use pressures, bad quality of buildings, poor quality urban fabric, environmental problems, proximity to large or special uses and strategic position and potential. The intervention area of the ITI is identical to the IUIP's, and the activity areas are mostly the same, with some minor differences in some cases. In Athens, the intervention area of the ITI SUD is identical to the IUIP "area of responsibility" but has two additional linear extensions towards the Municipality of Tavros and the Municipality of Nea Smyrni (the rationale for these extensions is functional). In Piraeus, the ITI SUD analysis and area delineation is also based on the IUIP. The intervention area is the administrative area of the Municipality of Piraeus, which is split into two 'Major Intervention Zones', further broken down into 'Special Enclaves'. We were not able to find the map depicting the ITI SUD special enclaves but the IUIP outlines seven 'Special Restoration Zones' with 36 enclaves which require special actions. In the Southern Sector, the intervention area was identified by reference to functional criteria, and it covers the areas neighbouring major urban regeneration projects in Faliron and Ellinikon.

The ITI SUD of Thessaloniki also used multi-criteria decision-making in order to identify the activity areas (so-called "focus enclaves"). This analysis took into account population density, green space deficit, declared income, percentage of special social groups and marginalized communities as well as traffic and noise pollution, age of housing stock, population ageing and unemployment. In Patra, Heraklion, Volos and Larissa, the activity area was the same as the intervention area, and an analysis of demographic, socio-economic, urban fabric, environmental and climate change parameters was used to justify the area selection. Notably, Heraklion has an IUIP and, indeed, the ITI SUD intervention area is a segment of the IUIP's intervention area.

It is worth pointing out that in the case of the Municipality of Athens, much of the area covered by the SUD Strategy (the intervention area) appears to be highly deprived in our analysis, whereas in Piraeus, the Southern Sector and in the Western Sector too, the deprived areas covered by the Strategies are much smaller (see Figure 2). To delineate the ITI activity areas, we used the boundary lines depicted in the Sustainable Urban

Development Strategies that were submitted for approval to Managing Authorities. We laid those boundaries over the ELSTAT (Hellenic Statistical Authority) Urban Analysis Units (henceforth URANUs) basemap used for census purposes in 2011. This means that in some cases the ITI SUD boundaries cross over URANUs of the 2011 census. The base map was provided by the Panorama of Greek Census Data 1991–2011 [22] and covers the metropolitan areas of the cities in question using spatial units (URANUs) of an average population of 1250. The URANUs are a modified version, due to protection of personal data, of the 2011 Census Tracts. Their surface indicates the density of the population. Size differentiations are therefore observed between the cities, but also within cities. Smaller units are to be found in denser and high-rise areas while bigger units are to be found in peri-urban and scarcely built parts of the city. With that in mind, it needs to be pointed out that whenever the URANUs are used for mapping social phenomena in Greek cities, the results in some cases might be influenced by the Modifiable Area Unit Problem.

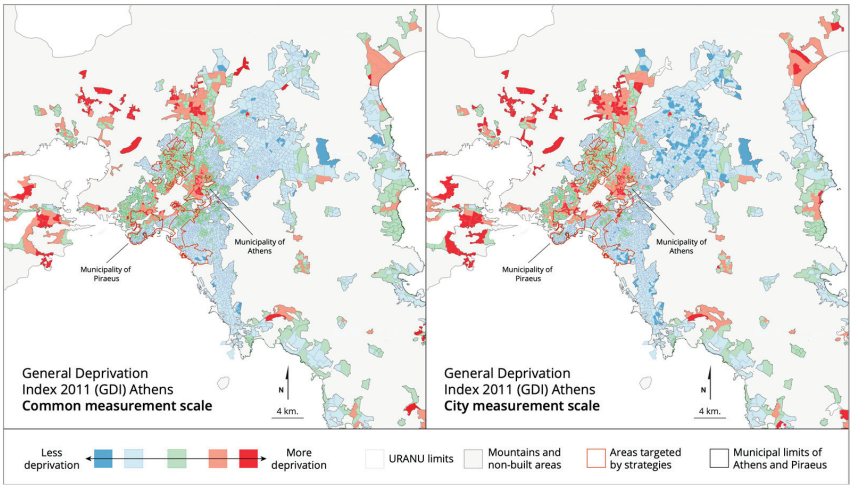


**Figure 2.** GDI for Athens (2011), common measurement scale (**left**) and city measurement scale (**right**).

This paper uses data from the 2011 national Census to estimate deprivation and the likelihood of vertical segregation. Although the 2021 census was carried out successfully, detailed data have not been made available at URANU level yet. Following the methodology published by Karadimitriou et al. [9], the General Deprivation Index takes into account three domains (employment, education and housing) and 20 composite variables, providing a multidimensional estimation of multiple deprivation (see Table 2). The three domains were given equal importance.

The calculation of the lack of housing space and vulnerability variables is linked to a '20 square meters per capita' threshold. As 'population living under housing poverty', we consider the part of the population to which corresponds a per capita surface smaller than 60% of the mean of the sq m per capita of the total population in each city. For Volos this threshold was 20.2 sq m per capita, for Athens and Larissa it was 20.0 sq m per capita, for Patra it was 19.7 and for Thessaloniki and Heraklion it was 19.3. As we consider these differentiations negligible, and in order to take into consideration the classification used by ELSTAT, we decided to use a common threshold of 20.0 square meters. The occupational categories are coded according to the ISCO-08 [23] (International Labour Office (ILO), 2012) model (International Standard Classification of Occupations) used by ELSTAT in more detail as routine occupations we refer to unskilled and manual workers. Karadimitriou et al. [9] use the population living in the basement or ground floor apartments as a composite

variable of the housing domain. For the analysis of our paper, the ground floor population was not taken into account.

**Table 2.** Variables taken into account to calculate the General Deprivation Index per city, URANU level 2011.

| Domain | Group | Variables (%) |
|---|---|---|
| Employment | Structural inactivity | Economically inactive<br>Women homeworkers (20–54 years old) |
| | Chances of access to employment | Unemployed<br>Young unemployed (15–34 years old))<br>Mature unemployed (50–64 years old)) |
| | Lack of role models | Managers and professionals (30–64 years old) |
| | Quality of employment | Routine occupations |
| Education | Lack of high Education level | Higher education (20–64 years old) |
| | Low Education level | Up to 9 years of education (20–64 years old) |
| | Education dynamic | Not in education (15–18 years old)<br>Not in education (19–27 years old) |
| Housing | Extremely negative housing conditions | Population in irregular dwellings<br>Population in dwellings without heating |
| | Lack of housing space and vulnerability | Population in dwellings with <20 sq m/cap.<br>Tenants in <20 sq m/cap.<br>Routine occupations living in <20 sq m/cap.<br>Unemployed in <20 sq m/ca. |
| | Tenure and vulnerability | Population in rented dwellings<br>Routine occupations among tenants<br>Unemployed among tenants |

First, we organized a detailed dataset including the 4447 URANUs of the six Cities and the 20 variables organized in 10 groups. Subsequently, a step-by-step identification procedure of the most deprived areas was carried out. The variables were standardized, according to the distance from the mean, in standard deviation multiples, singling out the areas where values indicating higher deprivation are maximized. Eventually, a deprivation index was calculated for each domain and finally a General Deprivation Index (GDI). In more detail, for an initial value $\chi$:

- a value of 1 was assigned for $\chi <$ mean;
- a value of 2 was assigned for mean $< \chi <$ mean + 0.5 stdev;
- a value of 3 was assigned for mean + 0.5 $< \chi <$ mean + 1 stdev;
- a value of 5 was assigned for mean + 1 stdev $< \chi <$ mean + 2 stdev; and
- a value of 7 was assigned for mean + 2 stdev $< \chi$.

Subsequently, a deprivation index was calculated for each domain (e.g., Deprivation Employment Index = (Group 1 + Group 2 + Group 3 + Group 4)/4), and finally a General Deprivation Index (GDI) = Deprivation Employment Index + Deprivation Education Index + Deprivation Housing Index with a minimum value of 3 and a maximum of 21. This procedure was followed for all cities jointly (using as measurement a common scale for each variable for the whole dataset, the general standard deviation and the general mean), and for each city separately (using as measurement a scale specific to each city, the local standard deviation and the local mean). This approach can offer an enhanced analytical view of the spatial profile of deprivation in each city as well as a sense of the difference in deprivation between cities.

Insofar as the micro-segregation in deprived areas is concerned, we initially explored vertical segregation in high-rise areas and then the horizontal segregation trends in low-rise areas. With regard to vertical segregation, we followed the methodology published by

Maloutas et al. [10]. We analysed where this phenomenon could potentially manifest itself by identifying high-rise URANUs where the population residing in apartment buildings exceeds 66% of the total population (the average in the six cities) and where the population residing in lower floors (ground floor and semi-basement) and upper floors (4th floor or higher) account for more than 30% of the total population. Then, we counted the number of URANUs with potential for vertical segregation where the population was also experiencing high levels of deprivation. High-rise areas with vertical segregation potential are a sub-set of the high-rise areas in Greek cities. For example, there is limited vertical segregation potential in areas where the population residing in lower floors and upper floors do not account for more than 30% of the total population. This situation is rather common in apartment blocks built after the mid-1980s, located mostly in the suburbs, where the blocks have pilotis instead of ground floor and semi-basement apartments.

The method used in this paper to locate low-rise areas, is novel. We analyse the URANUs where more than 40% of the population per URANU reside in detached or irregular dwellings, 40% being the average of the six cities. Furthermore, apartment buildings in those areas are often of smaller scale, often two floors with one apartment per floor, typical outputs of the south European family housing strategy [24]. Therefore, we identified as low-rise URANUs where population residing in apartment buildings exceeds 66% of the total but where more than 90% of the population resides in apartment buildings of up to two floors.

In order to compare the deviation of each city from the average profile, we used either simple percentages or we calculated a location quotient (LQ). The LQ is estimated by comparing the presence of a variable or an index—expressing the socioeconomic segregation, vertical or horizontal, or the level of deprivation—in a given spatial unit to its presence in the wider area of interest. A LQ score below 1 indicates that the selected variable is under-represented and a LQ score above 1 indicates that the selected variable is over-represented, compared to its presence in the rest of the residential space. A LQ of 1 indicates that the presence of the selected variable is proportional to its contribution in the rest of the residential space.

## 3. Results

The analysis is divided into two parts:

- The estimation and mapping of the General Deprivation Index with a common measurement scale for all cities, as well as with a scale specific to each city, based on [8,9], and the comparison of these patterns with the ITI activity areas identified in nine ITI SUDs (four in the Athens metropolitan area and five in the other Greek cities);
- The estimation of the URANUs with high vertical segregation potential, and a comparative analysis with URANUs where the population experiences high levels of multiple deprivation.

### *3.1. Measurements of the GDI in Greek Cities*

#### 3.1.1. Athens

As already analysed in the literature [9], the metropolitan area of Athens has a cluster of highly deprived areas in Athens' city centre and along the old industrial core, as well as several deprived areas in the outer periphery of the city. It is worth noting here that, although there is a marked difference between East and West, this is not as pronounced as one would have expected. This means that the traditional working-class areas of Western Athens are not the most deprived in the city, and in fact the conditions there seem to be gradually improving between 1991, 2001 and 2011 [9]. Insofar as the ITI activity areas are concerned, Municipality of Athens' activity area is predominantly a cluster of deprived urban quarters. In Piraeus, there are some deprived areas mainly in the north of the municipality, bordering Eleonas, the old industrial core of metropolitan Athens. The entire municipal area of Piraeus is covered by the ITI SUD and, although we were not able to locate the ITI SUD 'enclaves', the IUIP's 'Special Restoration Zones' appear to be more

focused on poor urban fabric conditions. In the Southern Sector the deprived areas are rather small and at the fringe of the activity area—also bordering Eleonas. In the Western Sector's Strategy, the most deprived areas (as measured in this paper) are mostly outside the ITI activity areas.

#### 3.1.2. Thessaloniki

Thessaloniki is the only city in Greece where deprivation, when measured on a scale common between cities, is somewhat comparable to Athens. There is a clear divide between the eastern and western parts of the city (Figure 3). The western part has clusters of deprived areas, whereas the eastern part has a couple of deprived outliers. The periphery of the city, and especially the rural communities to the east, appears to be comparatively more deprived when measured on the city-specific scale. The ITI activity areas are quite broad but they mostly overlap with the deprived areas identified in this paper (and not only with those, as they cover much of the dense urban area of the city).

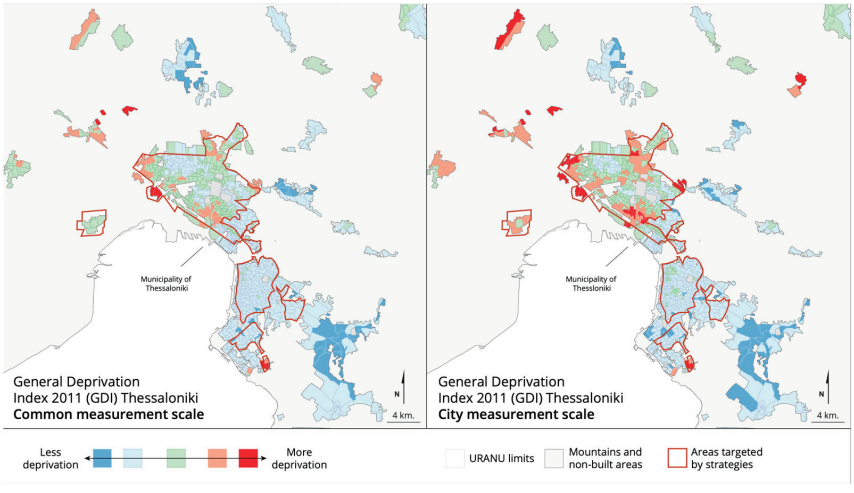


**Figure 3.** GDI for Thessaloniki (2011), common measurement scale (**left**) and city measurement scale (**right**).

#### 3.1.3. Patra

Deprivation in Patra (Figure 4), when measured on the common scale, is not particularly pronounced, although the city appears to have a north–south divide and there are a handful of high deprivation enclaves to the south of the city. When measured at the city-specific scale, the differences between north and south really come to the fore. The three ITI activity areas located in the south of the city cover deprived areas but not the most deprived enclaves.

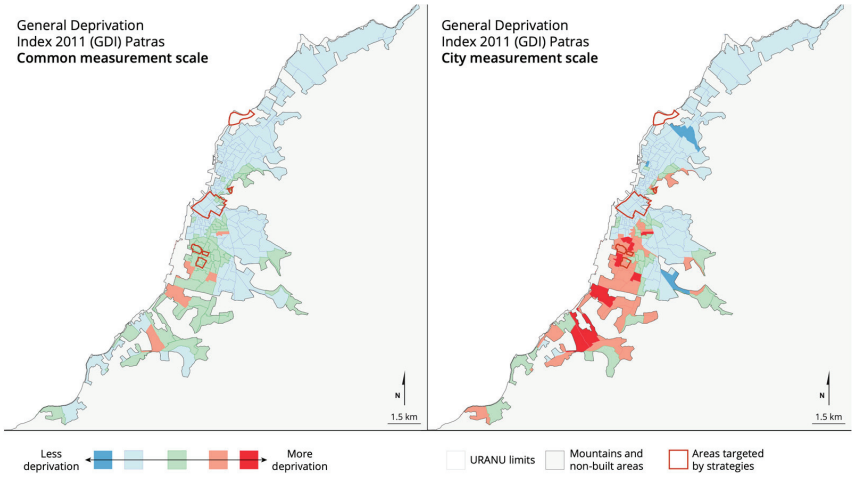


**Figure 4.** GDI for Patra (2011), common measurement scale (**left**) and city measurement scale (**right**).

### 3.1.4. Heraklion

Heraklion (Figure 5) also appears to have a handful of high deprivation areas, mainly around the old town and at the edges of the city. As in the other cities, the differences become more pronounced when the city-specific scale is used. The ITI activity area overlaps with some deprived and highly deprived areas, as measured on the city measurement scale.

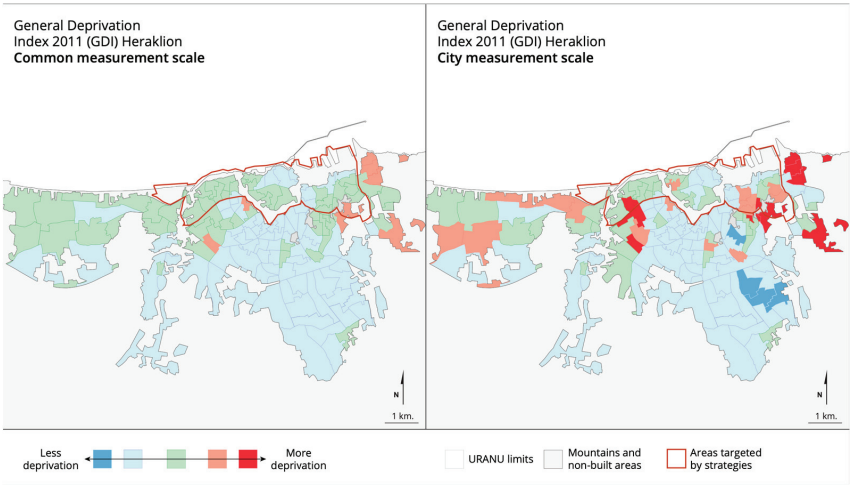


**Figure 5.** GDI for Heraklion (2011), common measurement scale (**left**) and city measurement scale (**right**).

### 3.1.5. Larissa

Larissa (Figure 6), when measured on the common scale, appears to be a city without high concentrations of deprivation, except one area in the north which is an ITI activity area. However, when measured on the city-specific scale, deprivation also seems to be concentrated in two more areas in the north, which were not targeted.

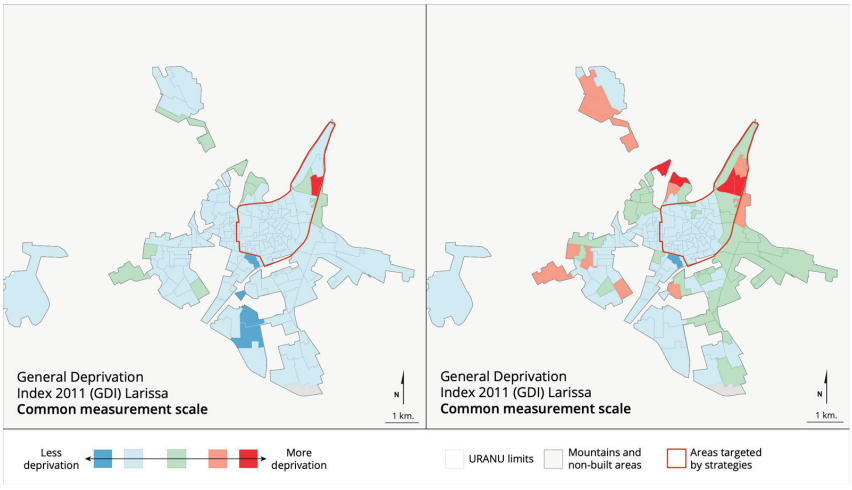


**Figure 6.** GDI for Larissa (2011), common measurement scale (**left**) and city measurement scale (**right**).

#### 3.1.6. Volos

In Volos (Figure 7), the ITI activity area leaves out most of the deprived URANUs in the western edge of the city, when measured at the common scale. The measurement at the city-specific scale reveals that a larger proportion of highly and very highly deprived areas has been included in the ITI SUD activity areas.

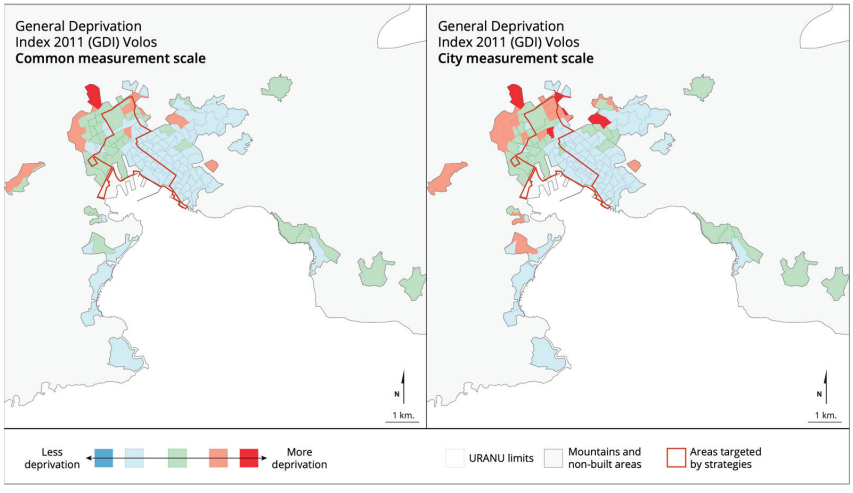


**Figure 7.** GDI for Volos (2011), common measurement scale (**left**) and city measurement scale (**right**).

### *3.2. Deprivation and Micro-Segregation*

In Table 3, the location quotient (LQ) is used in order to give a conclusive insight to the distribution of residents in each city, compared to the overall profile of the dataset. According to the GDI typology, 1/4 of the population reside in areas close to the average profile and more than half (56.9%) in areas of low or very low deprivation. A significant 17.8% live in areas of high or very high deprivation. Strong differentiations are observed between big and smaller cities. Athens greatly influences the average profile since the LQ

analysis reveals limited differences in that city. In Thessaloniki, deprivation seems to be less acute, scoring lower on the 'very high' category but higher on the high. Patra and Heraklion are more deprived than the average profile, with Patra scoring very low (0.36) in the less deprived areas and Heraklion scoring very high (1.59) in the highly deprived areas. Larissa and Volos have a low score in the extremes, showing a profile closer to the average.

**Table 3.** Comparison of the GDI (city measurement scale) to the overall profile (LQ) [1].

| City | Very Low | Low | Average | High | Very High |
|---|---|---|---|---|---|
| Athens | 1.10 | 0.99 | 1.05 | 0.89 | 1.04 |
| Thessaloniki | 1.06 | 0.99 | 0.91 | 1.28 | 0.80 |
| Patra | 0.36 | 1.07 | 0.65 | 1.61 | 1.09 |
| Heraklion | 0.69 | 1.01 | 0.98 | 0.85 | 1.59 |
| Larissa | 0.14 | 1.13 | 0.92 | 0.95 | 0.92 |
| Volos | 0.00 | 1.10 | 0.97 | 1.08 | 0.75 |
| Average profile (total population) % | 4.3 | 52.6 | 25.3 | 12.7 | 5.1 |

[1] The higher the score of LQs, above 1.00, the sharper positive the differentiation of a city from the whole dataset. The lower the score of LQs, below 1.00, the sharper the negative differentiation of a city from the whole dataset. A score of 1.00 indicates that the relation between vertical segregation and the level of deprivation in a city follows the average profile.

Following the analysis of deprivation, we investigated the effects that segregation, vertical or horizontal, might have in the social dynamics at the micro scale. This analysis, first, focuses on the main constituent of the high-rise areas in Greek cities, the apartment buildings (*polikatoikies*). These apartment buildings were built privately to tackle acute housing need, in the absence of social housing provision. The intensive provision of this type of housing in the 1950s–1980s led to the rapid expansion of urban areas in Greek cities. Today, 67.3% of the population in Thessaloniki reside in apartment buildings, 65.7% in Athens and between 40% and 46% for the remaining cities. The housing stock created via this process accommodated the inflow of migrants from Eastern Europe, from the early 1990s to the mid-2000s, but also subsequent migration flows. Increased homeownership, combined with lack of social housing, preserved spatial proximity independently of social and ethnic status.

The analysis of URANUs with vertical segregation potential (see Table 4) reveals that Athens and Larissa have the highest proportion of URANUs (more than 40%) where 2/3 of the population live in apartment blocks and at the same time around 1/3 of the population lives on or below the ground floor and on or above the fourth floor. This reflects the very densely built form of those two cities. However, in Larissa only one URANU with vertical segregation potential (5.6% of the highly deprived areas of the city) is also highly deprived. Thessaloniki and Patra have similar percentages of URANUs with vertical segregation potential (around 30%) but in Patra only two URANUs of this type are also highly deprived. This observation reveals an important differentiation; in Thessaloniki 15.3% of the deprived areas comprise high-rise housing stock with vertical segregation potential as opposed to 4.9% in Patra, even though the same proportion of the population resides in such high-rise areas.

**Table 4.** URANUs with vertical segregation (VS) potential, by city and by level of deprivation.

| City | VS Potential (%) | Deprived URANUs with VS Potential | | |
|---|---|---|---|---|
| | | Number | Percentage (%) of All URANUs | Percentage (%) of All Deprived * URANUs |
| Athens | 47.3 | 168 | 5.6 | 34.3 |
| Thessaloniki | 32.5 | 27 | 3.1 | 15.3 |
| Patra | 31.6 | 2 | 1.2 | 4.9 |
| Heraklion | 22.0 | 2 | 1.5 | 8.3 |
| Larissa | 42.1 | 1 | 0.8 | 5.6 |
| Volos | 24.4 | 0 | 0.0 | 0.0 |

* As deprived URANUs, we consider those scoring high or very high on the deprivation index.

Heraklion and Volos have the lowest percentages of URANUs with vertical segregation potential and, again, very low numbers of deprived URANUs in those categories. Having said that, the overall number of highly and very highly deprived URANUs is very low in all cities except Athens and Thessaloniki. In Athens, around 1/3 of the deprived areas also have vertical segregation potential.

This analysis shows that deprivation clusters in medium-size Greek cities are mostly to be found in low-rise areas at the urban fringe. To better understand this phenomenon at the micro-scale, we looked further into selected variables for the three domains of deprivation already used (see Table 5). For the employment domain, we chose the LQ of 30–64-year-old Managers and Professionals (MPs) and the LQ of Routine Occupations (ROs). For the education domain, we chose the LQ of 20–64-year-old individuals with a Higher Education (HE) degree and the LQ of people with Low Education Level (LE). Finally, for the housing domain, we chose the LQs for Lack of Heating (NH) and for the presence of Irregular Housing (IH).

**Table 5.** Profiles of low-rise deprived areas compared to the average city profile. Location quotient (LQ) (2011).

| City | Employment | | Education | | Housing | |
|---|---|---|---|---|---|---|
| | MP | RO | HE | LE | NH | IH |
| Athens | 0.44 | 1.60 | 0.46 | 1.88 | 2.49 | 7.79 |
| Thessaloniki | 0.40 | 1.51 | 0.35 | 1.92 | 0.74 | 7.13 |
| Patras | 0.59 | 1.35 | 0.49 | 1.51 | 1.66 | 1.48 |
| Heraklion | 0.59 | 1.42 | 0.48 | 1.52 | 1.60 | 5.27 |
| Larissa | 0.51 | 1.57 | 0.46 | 1.73 | 2.53 | 2.83 |
| Volos | 0.53 | 1.49 | 0.48 | 1.61 | 2.25 | 6.25 |
| Deprived area population | 0.48 | 1.70 | 0.50 | 1.70 | 2.09 | 3.50 |
| Total population | 18.2% | 7.3% | 27.6% | 22.9% | 3.4% | 0.2% |

The analysis for the employment and education domains did not reveal important differences between cities. More specifically, there are relatively minor differentiations at the micro-scale between cities for MP, RO, HE and—to a lesser extent—LE. The lower presence of MP and HE combined with higher presence of RO and LE hints at slightly higher deprivation in big metropolitan areas (Athens and Thessaloniki). Patra and Heraklion's pattern hints at lower deprivation levels, while Larissa and Volos follow a common —and more balanced—pattern between them, and are located in-between the two other pairs of cities.

The housing domain, however, is what made a difference in the identification of deprived areas, although the differences between the cities are not pronounced. Overall, individuals living in dwellings without heating represent only 3.4% of the population and those residing in irregular housing are only 0.2%. The location of those dwellings, of very

low quality, is highly linked to low-rise areas, since 73.9% of irregular housing and 28.8% of houses without heating are to be found there.

An important finding is that Thessaloniki scores lower than the other cities in the NH variable, maybe due to its colder climate. Athens scores very high in this variable, indicating that the housing stock without heating is over-represented in low-rise deprived areas of the capital. Larissa and Volos share a common profile, scoring high on both Housing domain variables. Patra and Heraklion have similar scores in the NH variable, even though a lower score for Heraklion would have been expected due to its warmer climate. However, Patra scored low in IH while Heraklion scored extremely high. This finding, of irregular housing concentrated in low-rise deprived areas of the urban network, should be linked to poor housing quality in the fringe of the cities, probably in Roma settlements located at the urban fringe. This is supported by evidence from Maloutas and Arapoglou and Maloutas et al. [13,25] but would require on-site visits in order to be verified.

## 4. Discussion and Conclusions

The analysis in this paper confirmed that the deprivation index manages to produce a refined mapping of urban socioeconomic space at the micro-level, especially when it is calculated at the city-specific measurement scale. Furthermore, by putting the deprived low-rise neighbourhoods under the spotlight, we were able to point at the potential influence of the conditions of Roma populations in very deprived areas, and therefore their relevance for place-based urban initiatives.

The comparative analysis between cities reveals that Athens is where multiple deprivation and the potential for vertical segregation are more pronounced, followed by Thessaloniki. This is connected to the scale and size of those cities, which allows a finer social stratification to emerge and to spatially express itself. Greek middle-sized cities have smaller and fewer areas of high deprivation, compared to Athens and Thessaloniki. There are patterns of spatial concentration of deprivation in all cities, which, however, become more visible if measured on a city-specific scale. However, if measured on a common scale with Athens, then all cities appear to have far fewer highly deprived areas, which are mostly concentrated at the urban fringe, or further out. In many cases, these are places where probably the Roma have settled. In light of these findings, research on the urban geography of Greek cities could expand its scope to look beyond the divisions between working-class areas and white-collar areas, which appear to be less pronounced in medium-sized Greek cities: the centre–periphery divisions also seem to be quite significant and, in addition, they are likely to reflect the clustering of severely deprived groups.

The ITI SUDs target large clusters of deprivation areas in some cases, like in the Municipality of Athens and in Thessaloniki. In other cases, they appear to be targeting areas without significant deprivation issues. This can be explained to an extent because the guidance provided by the NCA, reflecting relevant EU regulations, steered Urban Authorities to focus their ITI SUDs on a range of policy issues. Therefore, several strategies aspired to take advantage of the development dynamics of their intervention areas (for example three out of the four ITI SUDs in Metropolitan Athens) and all of them focused on built environment issues, as well as on economic development and innovation.

According to the NCA guidance [8], ITI SUDs could target areas "with distinct demographic characteristics", where the Roma have settled. However, many of the ITI SUDs we analysed did not explicitly seek to remedy the acute needs of highly segregated areas (which are anyway rare in medium-sized Greek cities). Instead, in many cases, ITI SUDs address socio-economic needs of broader groups, as well as the Roma and other vulnerable groups, horizontally (i.e., actions to support such groups cover the entire intervention area, not only the activity areas).

In several ITI SUDs, the socio-economic analysis is used as a way to describe the profile of the activity areas. It is only in Thessaloniki's and in the Municipality of Athens' ITI SUDs where the activity areas cover clearly identified high deprivation clusters. The other ITI SUDs mostly target moderately deprived areas and some highly deprived areas, often

partially. As mentioned, this could be attributed to the methods of socio-economic and spatial analysis used in the ITI SUDs (and the IUIPs, where these existed), which took into account parameters which are not necessarily relevant to the measurement of deprivation.

The focus of ITI SUDs on a reasonably wide range of policy issues, and therefore on the spatial expressions of those issues, is nothing unusual and it allows policy-makers to address key issues as seen from different angles. These issues reflect EU policy and the guidance provided to Urban Authorities rightly steered them in that direction. However, in light of the findings of this paper, we argue there would be scope to develop a nation-wide methodology for measuring multiple deprivation, so as to use it uniformly in all ITI SUD analyses in the future as one additional metric. The use of this metric would allow for a more refined mapping of key socio-economic characteristics that are of high policy concern and which tend to be spatially concentrated, in the Greek context. Taking deprivation explicitly into account when designing the ITI SUD investment programme would indeed help Urban Authorities to refine their place-based targeting of resources, so far as socio-economic issues are concerned. It would be worth bearing in mind that a common measurement scale with Athens would mask local variations in smaller cities, while the exclusive use of city-specific scales would exaggerate them. This would be a key aspect to be taken into account when considering the measurement scales and the intervention 'cut-off' points (i.e., the values above which an area would be deprived and highly deprived and therefore the focus of place-based interventions).

Finally, vertical segregation might be a factor worth exploring further when it comes to targeting place-based interventions. However, it is only in Athens and less so in Thessaloniki where there are significant numbers of URANUs with high vertical segregation potential which are highly and very highly deprived. In the other Greek cities, highly and very highly deprived areas are mostly low-rise, and we have substantive indications that a relevant micro-segregation parameter may be the presence of Roma people.

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# Exploring Urban Amenity Accessibility within Residential Segregation: Evidence from Seoul's Apartment Housing

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**Abstract:** Residential segregation refers to the phenomenon where people of different socioeconomic backgrounds live in spatially separated areas. It is essential to ensure equitable access to urban amenities for all residents in pursuit of the normative values in urban planning. To achieve this planning goal, the disparity in accessibility to urban amenities needs to be appropriately diagnosed. Private apartments and public rental apartments are representative types of residences where residential segregation is likely to occur in the context of South Korea, since these two types show considerable differences in education, income, and occupations. The objective of this study is to develop an analysis framework for diagnosing the difference in accessibility to urban amenities between the two residential types, and to empirically demonstrate their utility in the planning process. The most highlighted methodological novelty of the proposed analysis framework is that it includes not only global indicators for diagnosing the overall level of accessibility in the entire study area and assessing its statistical significance but also local indicators that represent local variations in accessibility. The empirical analysis conducted on Seoul revealed that not only were there significant local variations in accessibility between the two segregated residential areas, but the overall differences across the entire area were also pronounced. The proposed framework is useful in supporting decision-making processes for locating new public facilities or identifying regional priorities for guiding the placement of private amenities, with the aim of mitigating differences between segregated residential areas.

**Keywords:** residential segregation; disparity; urban amenity accessibility; local variations

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## 1. Introduction

Segregation refers to the phenomenon where specific groups or individuals live separated from other groups or individuals due to social, economic, legal, or cultural reasons.

This often occurs based on criteria such as race, religion, or socioeconomic status, and can manifest in various forms such as spatial/social separation, differences in educational opportunities, and isolation in the job market [1]. Residential segregation is a term that emerged in the field of urban sociology, particularly during the 1960s, amid heightened racial tensions in the United States. It refers to the tendency for people of different races, ethnicities, and socioeconomic backgrounds to reside in spatially separated areas [2–4]. The phenomenon of residential segregation has been occurring from the past to the pre-sent and continues to receive sustained attention [5–7].

To delineate residential segregation spatially and socially, research has been conducted from various academic perspectives including urban planning, urban and social geography, and social sciences [3,8–11]. Particularly from an urban planning perspective, residential segregation not only implies spatial/social separation but can also lead to inequalities in the use of urban amenities. Urban amenities typically support the daily life needs of city dwellers, including transportation, commuting, commercial, leisure, and educational purposes, and thus should be equitably accessible to the majority of city

dwellers [12–15]. Furthermore, accessibility from residential areas to urban amenities is a key indicator in evaluating citizen's quality of life and equity in urban planning [16]. Insufficient accessibility of urban amenities can exacerbate adverse socioeconomic outcomes and inequalities [14]. Therefore, while it is important to delineate residential segregation spatially and socially, diagnosing disparities in access to urban amenities is necessary to pursue normative values in urban planning.

Residential segregation is generally determined by socioeconomic factors, with income being a predominant socioeconomic factor [2]. Income determines the housing costs that can be afforded, so it is an important factor in choosing a place to live [17,18]. Moreover, numerous studies have shown that housing costs determine the accessibility to living amenities [19–22]. However, in the field of urban planning, equitable access to urban amenities for citizens is required in order to pursue normative values [14,23–27]. Spatial and social inequalities are becoming increasingly important issues among urban planners [28]. Reduced accessibility from residential areas to urban amenities signifies the presence of inequality, leading to deprivation, social exclusion, and a decrease in quality of life [29,30]. Therefore, analyzing accessibility within the spatial context for urban residents is crucial for accurately identifying micro-level residential segregation [31–33].

Various studies have been conducted to measure the accessibility of urban amenities based on residential differentiation [33–39]. The results of these studies can be categorized into transportation characteristics, land use and building features, and leisure and cultural attributes. In terms of transportation characteristics, it has been found that areas with high housing costs have well-maintained road and pedestrian networks near the residences of the people living there. Regarding land use and building characteristics, it has been confirmed that groups with higher incomes have good accessibility from their residences to workplaces (for commuting), schools (for education), and commercial (for shopping) locations. Additionally, recreational and cultural facilities centered around parks also showed favorable accessibility for groups with higher incomes (or housing costs)

Several studies related to residential segregation and local public services (public sector amenities) hold significant meaning when inequalities among groups emerge [39]. However, inequalities encompass not only public amenities necessary for the daily lives of urban residents but also various amenities operated by the private sector. The roles and characteristics of urban amenities in the public and private sectors differ. Yet, it is the public's role to determine the zoning of the land where all urban amenities are located [40,41]. The location of different types of urban amenities is greatly influenced by the zoning of the land. One of the primary goals of urban planners is to pursue justice and equality in the distribution of various amenities within the city [42]. Therefore, it is important to measure residential differentiation based on access to urban amenities from a public perspective and contribute to the formulation and implementation of urban policies.

In the context of South Korea, residential segregation is anticipated to manifest in both public and private housing sectors. Specifically, the phenomenon of residential segregation is expected to be most pronounced in Seoul among various South Korean cities [43]. This is directly related to the urbanization process of Seoul. The urbanization of Seoul is closely linked to South Korea's rapid economic growth since the mid-20th century [44]. Beginning in the 1960s, the implementation of the Five-Year Economic Development Plans spurred nationwide economic growth, leading to Seoul's rapid transformation into a major population and industrial hub. In the 1960s, Seoul's population was approximately 2 million, but by the 1990s, it had surpassed 10 million. During this period, urbanization was primarily driven by large-scale public projects and private-sector development, with a significant focus on the supply of apartments in both public and private sectors. Public housing sectors are offered at low cost to support housing stability for low-income households and are widely distributed in Seoul, the capital of South Korea [45–47]. In contrast, private housing sectors demand high housing costs. Public housing in South Korea encompasses diverse architectural forms including apartments, single-family homes, multi-family residences, and multi-unit dwellings. These are classified by the government into categories for sale

and for lease. Among these, apartments represent the highest proportion within these housing categories [47]. However, compared to their counterparts in the private sector, public apartments generally suffer from inferior construction quality and are often located at significant distances from urban employment centers and amenities [46]. If we premise that accessibility to urban amenities is generally better for private apartments compared to public apartments, it can be inferred that residents of private apartments, with their higher purchasing power, enjoy the benefit of consuming or accessing urban spaces with better amenities compared to residents of public apartments. The disparity in accessibility between private and public apartments ultimately leads to a structural inequality in residential segregation driven by economic disparities. Considering the role of urban planning, this conclusion implies the necessity for public intervention efforts at the urban planning and management level to mitigate the structural inequality caused by economic disparities in the consumption of urban space. Considering prior research on urban amenity accessibility, which correlates with residential costs (income), it is feasible to assess micro-level residential segregation by analyzing the disparities in accessibility to urban amenities between public and private housing types. This study differentiates itself by focusing on urban amenity accessibility within the context of residential segregation. While previous studies have primarily addressed urban amenities or residential segregation independently, this research integrates both aspects to highlight the socioeconomic disparities arising from urban planning and housing policies.

The objective of this study is to develop an analysis framework for diagnosing the difference in accessibility to urban amenities between the two residential types and to empirically demonstrate their utility in the planning process. The proposed framework was applied to Seoul to derive insightful results and suggest relevant policy implications. The study is organized as follows: Section 2 outlines the methods used to measure residential segregation between two types of apartments and defines the indicators for estimating accessibility to urban amenities. In Section 3, the study area is introduced, and the processes of data acquisition, construction, and content used for the analysis are explained. Section 4 applies the framework to empirical data, presenting the analysis results and offering detailed interpretations. Section 5 discusses the specific policy implications that emerge from the interpretation of these results. Section 6 concludes the study by summarizing the key findings, evaluating the effectiveness of the research in achieving its objectives, and discussing the limitations and future research directions.

## 2. Methodology

### *2.1. Degree of Residential Segregation*

In this study, we first measure the level of residential segregation between two types of apartments to confirm that these two types are spatially separated across the entire study area. Building upon this foundation, we propose a methodology designed to evaluate the disparities in access to urban amenities between the two types. A widely used measure for quantifying the degree of residential segregation is the Segregation Index ($SI$), of which the mathematical properties were intensively discussed by Duncan and Duncan in 1955 [48]. The original segregation index is delineated in Equation (1).

$$0 \leq SI = \frac{1}{2}\sum_{i=1}^{m}\left|\frac{w_i}{W} - \frac{n_i}{N}\right| \leq 1 \quad (1)$$

In the equation above, $w_i$ and $n_i$ represent the numbers of white and non-white individuals, respectively, in spatial unit $i$ (e.g., census block group). $W$ and $N$ denote the total numbers in each of these population groups. Consequently, Equation (1) calculates the sum of proportional differences across all spatial units, which converges to either 0 or 1. This convergence indicates either a perfect mix of proportions or complete residential separation between the two distinct racial groups. That is, A $SI$ value approaching 1 signifies pronounced spatial segregation within residential areas, indicating minimal overlap in the residential distribution of the two racial groups. Conversely, an $SI$ value nearing 0

reflects a high degree of residential integration, suggesting substantial co-residence among the groups.

The original segregation index, as delineated in Equation (1), encounters the well-documented checkerboard problem, wherein identical values are produced irrespective of varying configurations of spatial units that maintain consistent demographic proportions. In response to this limitation, Wong (2003) proposed a spatial version of the $SI$, which is formally established in Equation (2) [49,50]. This adjustment enhances the measurement's sensitivity to the geographical distribution of population groups.

$$0 \le SI(d) = \frac{1}{2}\sum_{i=1}^{m}\left|\frac{w_i(d)}{W(d)} - \frac{n_i(d)}{N(d)}\right| \le 1 \quad (2)$$

In Equation (2), the parameter $d$ functions to define the geographical extent of the neighborhood, determining how spatial proximity is calculated within the model. $w_i(d)$ represents the total number of white individuals summed across all spatial units within the distance $d$. Similarly, $n_i(d)$ is calculated in the same manner, representing the total number of non-white individuals. As $d$ increases, the number of spatial units included in the sum also increases, thereby reducing the proportional differences between spatial units. As shown in the equation, $W(d)$ and $N(d)$ denote the totals of $w_i(d)$ and $n_i(d)$, respectively ($=\sum_{j=1}^{m} w_j(d)$) and ($\sum_{j=1}^{m} n_j(d)$). Assuming the demographic ratios within each spatial unit remain the same across all units being considered, the presence of large proportional differences in geographically adjacent units leads to a higher cumulative sum of these differences compared to cases where such adjacency is absent. This methodology accounts for variations in the configuration of spatial units, effectively addressing the checkerboard problem, which arises when identical segregation indices result from different spatial arrangements. Consequently, this results in a proportional escalation of the segregation index.

By defining $w_i(d)$ and $n_i(d)$ in Equation (2) as the counts of public and private apartments, respectively, it is possible to measure the degree of residential segregation between these two types of apartments. Furthermore, visualizing the difference in ratios contained in Equation (2) ($=\frac{w_i(d)}{W(d)} - \frac{n_i(d)}{N(d)}$) on a choropleth map enables the identification of areas where the ratio of the total number of apartments to public (or private) apartments is relatively high in spatial unit $i$. When the difference in ratios is positive in spatial unit $i$, it indicates that the ratio of public apartments to private apartments is higher, suggesting that the localized residential segregation of public apartments is relatively more pronounced in that locality.

### *2.2. Level of Service (LoS)*

The utility received by an urban resident living in apartment $i$ when traveling to facility $j$ is defined as $U(d_{ij})$ in Equation (3).

$$U(d_{ij}) = e^{d_{ij} \times \frac{log_e^{tsw}}{td}} \quad (3)$$

In the equation above, $d_{ij}$ represents the distance from urban resident $i$ to facility $j$. The parameters $td$ and $tsw$ denote the threshold distance and threshold spatial weight, respectively. The utility function $U(d_{ij})$ reaches its peak value of 1 when the distance is zero, and it declines to its lowest value at the designated threshold distance. In essence, Equation (1) encapsulates the distance–decay effect by defining the diminishing utility with increasing distance, reaching its minimal value at the designated threshold distance. As the distance increases, the utility gradually decreases, and the utility corresponding to the threshold distance is represented by the threshold spatial weight. Equation (3) implies that at the threshold distance, the utility is set to be almost negligible by defining the threshold spatial weight value as a number close to 0. If $d_{ij}$ is, for example, 10 km, given that $td$ and $tsw$ are 10 and 0.01, respectively, then $U(d_{ij})$ is calculated to be 0.01 ($= e^{10 \times log_e^{0.01}/10}$). For the same parameters, the utility assigned to a resident located 5 km away, which is half the

distance of 10 km, is 0.1. This is 10 times higher than the utility for a resident who is 10 km away ($=e^{5\times log_e^{0.01}/10}$).

Given the prior explanation of the distance–decay effect based on *td* and *tsw* as fundamental parameters, it is crucial at this juncture to emphasize the importance of technically substantiating these parameters to establish a sound rationale. One possibility to this end is to premise that in areas with a higher concentration of facilities, each facility typically serves a smaller geographic area, whereas in areas with fewer facilities, each facility tends to cover a relatively larger expanse. This underscores the utility of converting the total area of the target region divided by the number of facilities into an equivalent circle radius for effective estimation of *td*. In the case of *tsw*, 0.01 is conventionally considered a sufficiently small value. To draw an analogy, consider the context of the standard normal distribution: a significance level of 0.01 represents a criterion for assessing cases that are so unlikely to occur that they are seldom observed. Thus, setting *tsw* at 0.01 for a given *td* is considered sufficiently small, conforming to standard practice.

Once $U(d_{ij})$ has been estimated using the method described above, the level of service provided to a resident in apartment $i$ is defined as Equation (4), indicating the cumulative utilities derived from all facilities within the study area.

$$LoS(i) = \sum_{j=1}^{n} U(d_{ij}) \tag{4}$$

Equation (4) shows that the proximity of more facilities to location $i$ contributes to increasing the $LoS(i)$ value, and a higher $LoS(i)$ value signifies that residents in apartment $i$ have better access to the services provided by these facilities.

### *2.3. Local Disparity in Accessibility (LDA)*

The local disparity of apartment $i$ in accessibility to urban amenities is defined as $LDA(i)$ in Equation (5). This measure highlights the ratio discrepancy between the proportion of $LoS(i)$ and the proportion of the population in apartment $i$.

$$LDA(i) = \left(H(i)/\sum_{j=1}^{n} H(j)\right) / \left(LoS(i)/\sum_{j=1}^{n} LoS(j)\right) \tag{5}$$

$H(i)$ indicates the count of households in apartment $i$, and $\sum_{j=1}^{n} H(j)$ sums the households across $n$ apartments within the study area. The proportion refers to the share or segment of the total sum, as denoted by $H(i)/\sum_{j=1}^{n} H(j)$ and $LoS(i)/\sum_{j=1}^{n} LoS(j)$, respectively. A value of $LDA(i)$ greater than 1 indicates a lower level of service relative to the demand population. This signifies relatively poor accessibility to urban amenities. Visualizing $LDA(i)$ on a map may shed light on identifying areas lacking in urban amenities and provide spatial insights that aid policy efforts to enhance amenities in localities suffering from under-provision.

### *2.4. Global Diagnostics of Disparity (GDD)*

While $LDA(i)$ highlights the local discrepancies between the demand and supply of urban amenities, it is valuable to examine the overall tendency of disparities across the entire study area. By conducting a comparative analysis of accessibility disparities between two distinct, geographically segregated housing types across the entire target area on a global scale, it is possible to ascertain which type exhibits lower accessibility. For this purpose, the estimated $LDA(i)$ values are statistically summarized as the average of local disparity values, denoted as $\sum_{i=1}^{n} LDA(i)/n$, and termed Global Diagnostics of Disparity ($GDD$) in this paper. Monte Carlo randomization is then employed to construct the null statistical distribution of the summary statistic, $GDD$. Should the estimated $GDD$ values for the two types of apartments exhibit a discernible difference, it could be inferred that the significant disparity in accessibility observed between the residents of public and private apartments is largely attributable to the residential segregation between these groups.

The initial step in constructing the statistical distribution of $GDD$ through Monte Carlo randomization is predicated on the assumption that there is no inherent statistical difference in the $GDD$ values across two apartment types. This assumption is fundamental as it establishes a neutral baseline for comparison. For illustrative purposes, let us consider a scenario involving 1000 public apartments. It is feasible to randomly select 1000 units from a comprehensive pool that includes both public and private apartments to calculate the $GDD$ values. Repeating this selection and calculation process multiple times enables the construction of a statistical distribution for the $GDD$ values of 1000 randomly chosen apartments. Given that the $GDD$ value aggregates $LDA(i)$ values, the Central Limit Theorem suggests that with a sufficiently large sample size, this empirical distribution will approximate a normal distribution.

In the subsequent analytical phase, the mean and variance of these simulated $GDD$ values are computed, facilitating a comparative analysis with the $GDD$ values from the empirical dataset of, for example, public apartments. Within this framework, the use of z-values enables the assessment of statistical significance, potentially revealing any disparities or anomalies in the empirical $GDD$ values of public apartments. The statistical significance for private apartments can be evaluated using the same methodology. Equation (6) denotes how to convert the observed $GDD$ value into a z-value, utilizing the mean and variance from the simulated standard normal null distribution.

$$z[GDD] = \frac{Obs_{GDD} - Exp_{GDD}}{\sqrt{Var_{GDD}}} \tag{6}$$

In Equation (6), $Obs_{GDD}$ denotes the observed value of $GDD$. $Exp_{GDD}$ and $Var_{GDD}$ correspond to the expected value and variance of simulated $GDD$ values, respectively. The converted $z$-value is interpreted using the conventional critical value criteria of the standard normal distribution, as detailed in Table 1.

**Table 1.** Criteria for interpreting $z[GDD]$.

| Critical z-Value | Overall Demand–Supply Disparity Level |
|---|---|
| Less than $-2.57$ | Very Low |
| $-2.57$ to $-1.96$ | Low |
| $-1.96$ to $-1.64$ | Moderate Low |
| $-1.64$ to 1.64 | Not Significant |
| 1.64 to 1.96 | Moderate High |
| 1.96 to 2.57 | High |
| Greater than 2.57 | Very High |

The critical $z$-value establishes a threshold used to categorize levels of excess demand, facilitating analytical interpretation. For example, a $z[GDD]$ value exceeding 2.57, such as 3.7, signifies an exceptionally high local disparity in accessibility throughout the study area. This observation underscores a pervasive shortfall in urban amenities, particularly in terms of service facility accessibility. Conversely, a $z$-value less than $-2.57$, such as $-2.8$, reflects a substantial surplus of urban amenities. Moreover, $z[GDD]$ values of 1.2 or $-1.0$ indicate an absence of sufficient statistical evidence to ascertain either an overall excess or deficiency in the demand for urban amenities. By analyzing the $z[GDD]$ values for two distinct types of apartments, it is possible to statistically discern differences in accessibility to urban amenities that are attributable to residential segregation.

In this study, we perform an empirical analysis on various urban amenities, focusing on two apartment types utilizing the previously described analytical methodology. Figure 1 below presents a flow chart explaining the procedural elements of the methodology proposed in this study.

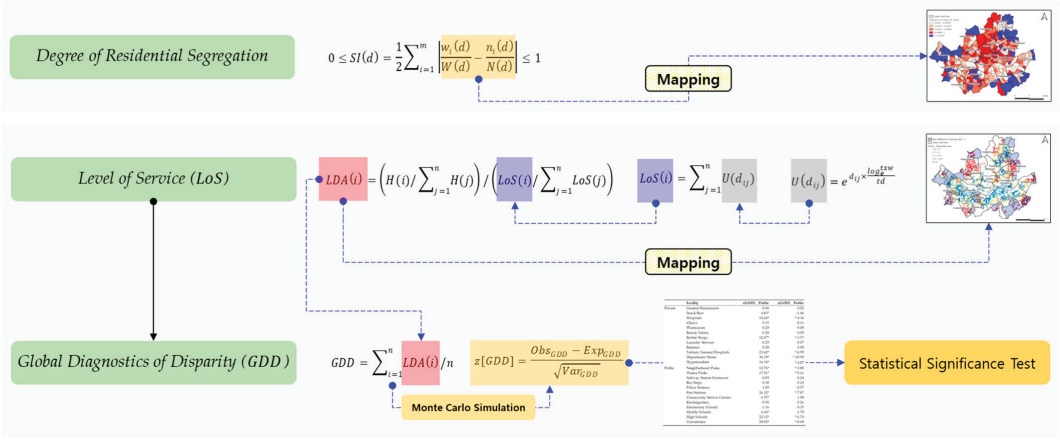


**Figure 1.** Methodological flow diagram.

We initially estimate the level of residential segregation between these apartment types empirically. By visualizing the local components of *SI(d)* using a choropleth map, we exploratively examine the spatial discrepancies in the level of local residential segregation between the two types of apartments. We then derive spatial insights to identify areas with relative shortages through the map visualization of *LDA(i)* values, which highlight local accessibility discrepancies. Furthermore, we statistically estimate GDD to assess the prevalence of supply shortages across the target area. This analysis allows us to explore how accessibility to urban amenities differs under the spatial structure of residential segregation between the two apartment types throughout the target area. Based on these findings, we evaluate the usefulness of the empirical results as decision-making support information, aiding in the development of policy measures aimed at reducing the disparities induced by the differentiation between the apartment types.

## 3. Study Area and Data

This study estimates the accessibility to urban amenities for residents living in private apartments and public apartments. We conducted an empirical analysis focusing on the city of Seoul, South Korea. Figure 2 below is a key map illustrating the location of Seoul.


**Figure 2.** Key map of the location of Seoul.

According to the Seoul Administrative District Statistics provided by the Seoul Open Data Plaza, the total area of Seoul is approximately 605.21 square kilometers. And, as reported by Statistics Korea, the population stands at 9,384,739, as of March 2024.

For the empirical analysis, the dataset was constructed as follows: The location information of public apartments was sourced from the public rental housing panel data by the Seoul Housing & Urban Corporation, and private apartment data were obtained through the Real Transaction Price Disclosure System by the Ministry of Land, Infrastructure and Transport. Urban amenities were categorized into private and public amenities. Private amenity data were sourced from the Ministry of the Interior and Safety's local administrative service information, while public amenity data were derived from building-type shape information and educational institution locations provided by the Ministry of the Interior and Safety and the Seoul Metropolitan Office of Education. The reference year for all data is 2021, and detailed information is presented in Table 2.

**Table 2.** Data sources and collection methods.

| Data Type | Data Sources | Collection Methods |
| --- | --- | --- |
| Public Apartments | Seoul Housing & Urban Corporation | Public rental housing panel data |
| Private Apartments | Ministry of Land, Infrastructure and Transport | Real Transaction Price Disclosure System |
| Private Amenities | Ministry of the Interior and Safety | Local administrative service information |
| Public Amenities | Ministry of the Interior and Safety; Seoul Metropolitan Office of Education | Building type shape information; Location information of educational institutions |

According to the empirical data, Seoul encompasses a distribution of 24,214 private and 2180 public apartment buildings. Figure 3 below visualizes the spatial distribution of private and public apartments in Seoul on a map.

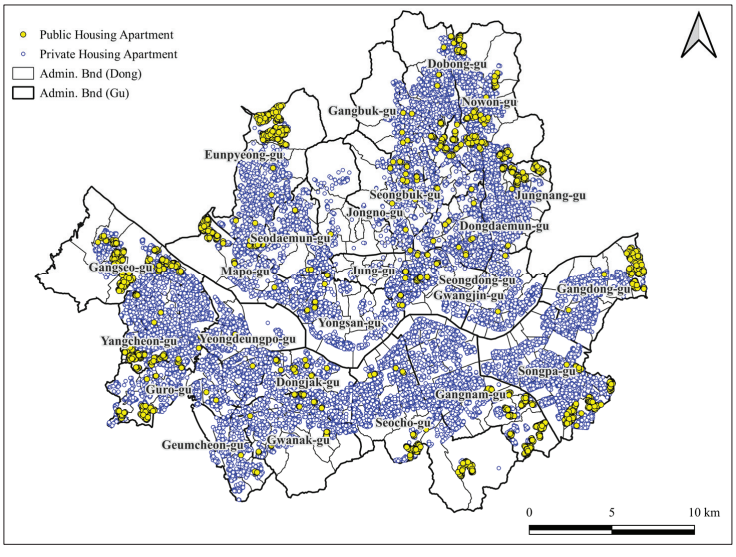


**Figure 3.** Spatial distribution of public and private apartments.

Figure 3 clearly illustrates the spatial pattern of residential segregation between public and private apartments. Public apartments are supplied by the government primarily to provide affordable housing to those less privileged, rather than for profit. Consequently, although some are located within the inner areas of Seoul, due to the constraints of available

public resources, most are predominantly situated in the outer regions of Seoul where land prices are relatively lower. For reference, the thick black line represents the boundaries of the 25 district-level administrative divisions (Gu) that make up the entire city of Seoul, while the thin gray line indicates the 426 geographically encompassed sub-district divisions (Dong) within these districts. An empirical analysis was conducted on 24 types of service facilities that provide urban amenities to the two previously introduced apartment types. Table 3 below presents the aggregated counts by type of the 24 facilities located in Seoul.

**Table 3.** Counts by type of the 24 facilities (urban amenities).

| Primary | Secondary | Facility | Counts |
|---|---|---|---|
| Private | Neighborhood | General Restaurants | 124,061 |
| | | Snack Bars | 37,644 |
| | | Hospitals | 553 |
| | | Clinics | 17,886 |
| | | Pharmacies | 5433 |
| | | Beauty Salons | 29,134 |
| | | Barber Shops | 2560 |
| | | Laundry Services | 4151 |
| | | Bakeries | 4008 |
| | Region | Tertiary General Hospitals | 59 |
| | | Department Stores | 36 |
| | | Hypermarkets | 93 |
| Public | Leisure | Neighborhood Parks | 1209 |
| | | Theme Parks | 419 |
| | Transportation | Subway Station Entrances | 2014 |
| | | Bus Stops | 11,250 |
| | Safety | Police Stations | 243 |
| | | Fire Stations | 177 |
| | Administration | Community Service Centers | 426 |
| | Education | Kindergartens | 905 |
| | | Elementary Schools | 608 |
| | | Middle Schools | 394 |
| | | High Schools | 301 |
| | | Universities | 62 |

As summarized in Table 3, the 24 facilities are classified into two primary categories: private and public. Private amenities are further divided into two secondary categories: neighborhood and area. Public amenities, on the other hand, are categorized into five secondary categories encompassing leisure, transportation, safety, administration, and education. Among others, general restaurants are the most numerous, totaling 124,061, followed by snack bars with 37,644. Beauty salons (29,134) and clinics (17,886) also rank high in terms of the number of establishments.

## 4. Results

### *4.1. Level of Residential Segregation*

To calculate the $SI(d)$ value defined by Equation (2), the number of two types of apartments was aggregated at the Dong level. The spatial proximity, denoted as $d$, was defined as the result of dividing the total area of Seoul by the number of Dong and then converting this quotient into the radius of a circle. The spatial proximity value was calculated to be 1345 m. Utilizing this value to derive $SI(1345)$ yields approximately 0.67, which is close to one, indicating that the two types of apartments exhibit a distinct residential segregation pattern throughout the entire area of Seoul. And, this diagnostic result of residential segregation aligns quite well with the spatial distribution of the two types of apartments, as visualized in Figure 3. For reference, not aggregating neighboring spatial units results in the value being essentially equivalent to $SI$, which shows a slightly higher level of residential segregation.

Mapping the differences in ratios ($=\frac{w_i(d)}{W(d)} - \frac{n_i(d)}{N(d)}$) at the Dong level as defined in Equation (2) on a choropleth map is effective for visually assessing the spatial distribution patterns of local residential segregation. Figure 4 below is a choropleth map created using a five-level quantile classification of the differences in ratios.

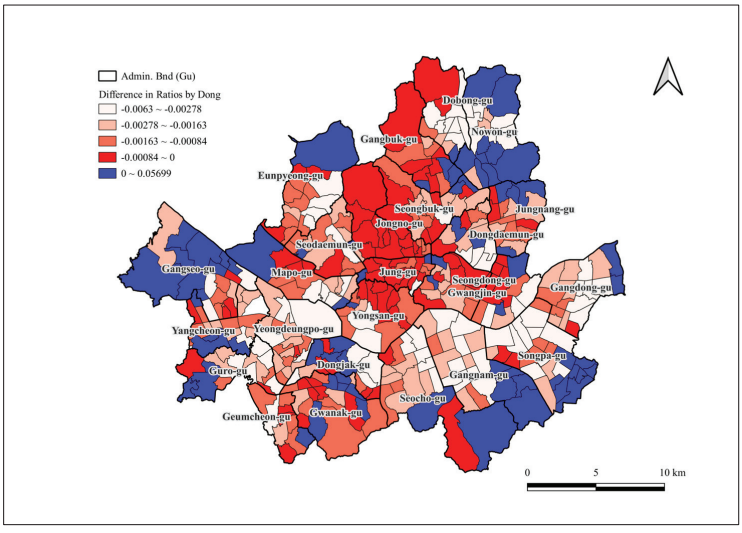


**Figure 4.** Quantile map showing local residential segregation by Dong.

On the map, the areas in blue represent Dongs where the difference in ratios is positive, indicating localities where the residential segregation of public apartments is relatively more severe. The map above clearly delineates spatial separation between the areas in blue and those in red tones. This visual representation aligns closely with the interpretation that the previously mentioned $SI(d)$ value of 0.67 in the target area, being close to 1, suggests a strong tendency towards residential segregation.

### *4.2. Local Disparity in Accessibility (LDA)*

By calculating the $LDA$ values as specified in Equation (5) for all public and private apartments, the results can be visualized using a choropleth map. This map enables the exploratory identification of areas within Seoul that exhibit discrepancies between the demand for and the supply of service facilities, thereby highlighting regions with reduced urban amenity accessibility.

For the 24 urban amenity facilities, the $LDAs$ of 24,214 private and 2180 public apartment buildings were calculated. As previously mentioned, the number of facilities in a given area of Seoul determines the service radius. A higher count of facilities corresponds to a smaller threshold distance $td$ in Equation (3), implying that the geographic area served by each facility is more restricted. The following Table 4 shows the empirically estimated threshold distances for each facility. This estimation was performed by dividing the area of Seoul by the number of facilities and then converting these values into the radii of circles, as previously mentioned.

Higher-order services such as department stores, tertiary general hospitals, hypermarkets, fire stations, and universities display relatively large threshold distances of more than 1 km. In contrast, lower-order services that provide everyday necessities, such as general restaurants, snack bars, bakeries, laundry services, hospitals, clinics, subway stations, and bus stops, show service provision areas of less than 500 m. Mid-order services like kindergartens, elementary schools, and middle schools are indicated to have threshold distances between 500 m and 1 km.

**Table 4.** Empirically estimated threshold distance (*td*) of the 24 facilities (urban amenities).

| Private Facility | *td* | Public Facility | *td* |
|---|---|---|---|
| General Restaurants | 39 | Neighborhood Parks | 376 |
| Snack Bars | 72 | Theme Parks | 628 |
| Hospitals | 590 | Subway Station Entrances | 309 |
| Clinics | 104 | Bus Stops | 131 |
| Pharmacies | 188 | Police Stations | 890 |
| Beauty Salons | 81 | Fire Stations | 1043 |
| Barber Shops | 274 | Community Service Centers | 672 |
| Laundry Services | 215 | Kindergartens | 461 |
| Bakeries | 219 | Elementary Schools | 563 |
| Tertiary General Hospitals | 1807 | Middle Schools | 699 |
| Department Stores | 2313 | High Schools | 800 |
| Hypermarkets | 1439 | Universities | 1763 |

Note: The unit of measurement for '*td*' is meters.

Figures 5 and 6 below are choropleth maps illustrating the spatial distribution patterns of $LDA$ values for facilities with varying threshold distances: general restaurants, which have the smallest service extent, and department stores, which have the largest, as referenced in Table 3. In Figure 3, dark red indicates apartments with high $LDA$ values, which are predominantly located on the outskirts of Seoul. This pattern can be interpreted as being due to the fact that high-order goods such as department stores are located in densely populated and high-footfall areas, including central Seoul districts like Gangnam-gu. The Gangnam-gu District is recognized as one of the central business districts (CBDs) in Seoul, distinguished by its well-developed business and commercial functions. Furthermore, as highlighted in the Introduction, the high cost of living associated with proximity to or within CBDs presents challenges for the location of public apartments in these areas. Consequently, the outer areas of the city have a relatively smaller service supply ratio in the numerator of $LDA$ due to their greater distance from these centers. Figure 4 depicts the $LDA$ values for general restaurants. In contrast to department stores, general restaurants, which are lower-order goods necessary for everyday services, have a threshold distance of less than 40 m, as indicated in Table 4. As a result, the distribution pattern of dark red values for general restaurants does not form clusters around specific areas but is rather dispersed around large-scale residential zones.

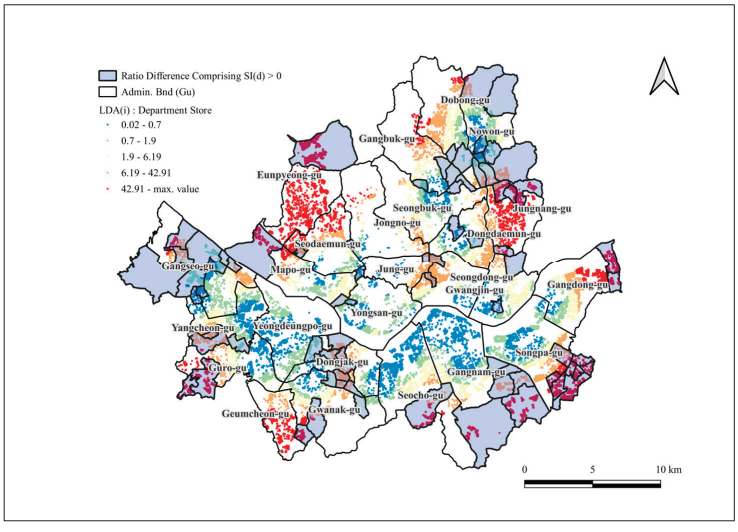


**Figure 5.** Spatial distribution of $LDA(i)$ values of department stores.

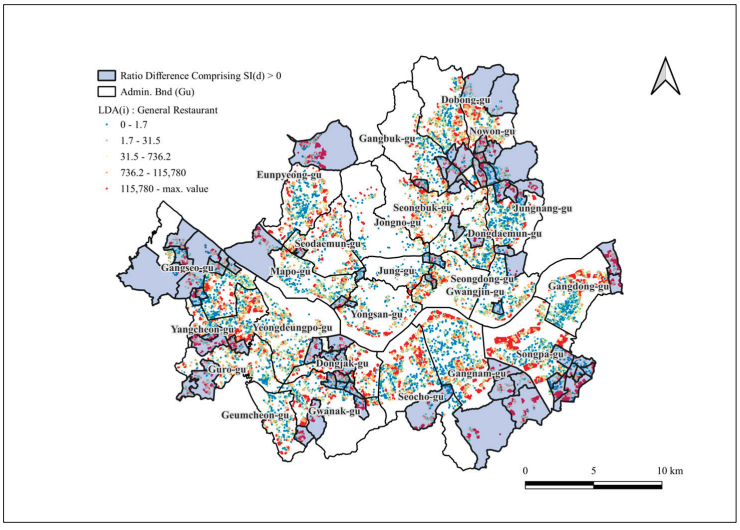


**Figure 6.** Spatial distribution of $LDA(i)$ values of general restaurants.

It should be noted, in Figures 5 and 6, that the pale blue areas on the outskirts of Seoul represent regions with high residential segregation, characterized by a relatively high proportion of public apartments, as depicted in Figure 4. In Figure 5, it can be observed that areas with high residential segregation largely coincide with regions where department store service provision is relatively lacking. However, as can be seen in Figure 6, general restaurants do not appear to show a significant overlap pattern between areas of high residential segregation and regions with high $LDA$ values, unlike department stores. In essence, empirically examining the differences in urban amenity accessibility between public and private apartments within a spatially distinct residential segregation structure yields valuable decision-support information for devising strategies to mitigate the accessibility gap of urban amenities between these disparate housing types.

With these findings, by identifying regions with poor accessibility, this information can serve as foundational data for assigning priorities to private incentives or public interventions aimed at improving living conditions.

### *4.3. Global Diagnostics of Disparity (GDD)*

Under a spatial structure marked by significant residential segregation between the public and private apartments, it is possible to assess the overall level of difference in accessibility to urban amenities between the public and private apartments. By conducting a comparative analysis of accessibility disparities between two distinct, geographically segregated housing types across the entire target area on a global scale, it is possible to ascertain which type exhibits lower accessibility. To this end, as previously explained, the average $LDA$ values for public and private apartments, calculated across 24 facilities, were defined as $GDD$. The corresponding $z$-scores, denoted as $z[GDD]$, were then estimated. This methodology facilitated an empirical examination of the overarching differences in urban amenity accessibility throughout the study area. Table 5 below provides a summary of the estimated $z[GDD]$ values for 24 facilities, encompassing both public and private apartments.

**Table 5.** *z*[GDD] values of 24 facilities (urban amenities) for the two apartment types.

| | Facility | $z[GDD]$ _ Public | $z[GDD]$ _ Private |
|---|---|---|---|
| Private | General Restaurants | −0.06 | 0.02 |
| | Snack Bars | 4.83 * | −1.46 |
| | Hospitals | 14.60 * | −4.36 * |
| | Clinics | 0.35 | −0.11 |
| | Pharmacies | −0.29 | 0.08 |
| | Beauty Salons | −0.28 | 0.09 |
| | Barber Shops | 12.07 * | −3.57 * |
| | Laundry Services | −0.29 | 0.07 |
| | Bakeries | −0.28 | 0.08 |
| | Tertiary General Hospitals | 23.40 * | −6.99 * |
| | Department Stores | 36.19 * | −10.99 * |
| | Hypermarkets | 16.34 * | −4.87 * |
| Public | Neighborhood Parks | 12.76 * | −3.80 * |
| | Theme Parks | 17.91 * | −5.41 * |
| | Subway Station Entrances | −0.85 | 0.24 |
| | Bus Stops | −0.38 | 0.10 |
| | Police Stations | 1.85 | −0.57 |
| | Fire Stations | 26.12 * | −7.87 * |
| | Community Service Centers | 6.55 * | −1.98 |
| | Kindergartens | −0.90 | 0.26 |
| | Elementary Schools | −1.16 | 0.35 |
| | Middle Schools | 6.04 * | −1.78 |
| | High Schools | 22.12 * | −6.70 * |
| | Universities | 28.82 * | −8.68 * |

* Facilities with *z*[GDD] values exceeding 2.57.

As previously discussed, $z[GDD]$ signifies the overall disparity between demand and supply. A value exceeding 2.57, as shown in Table 1, indicates a general lack of urban amenities provision. Facilities exceeding a $z[GDD]$ value of 2.57 are marked with an asterisk (*) on the right side of the *z*-value. These facilities indicate a statistically significant prevalence of apartments where demand outweighs the supply of urban amenities. In the case of public apartments, apart from major community facilities such as general restaurants, clinics, pharmacies, beauty salons, laundry services, bakeries, subway station entrances, and bus stops, such supply shortages are prevalent. Conversely, a negative *z*-value indicates an excess of supply relative to demand, and when it falls below −2.57, as denoted by an asterisk (*) on the right side of the *z*-value, such a disparity is statistically highly significant. If the *z*-value markedly exceeds 2.57 in public apartments, while significantly falling below −2.57 in private apartments, it indicates a pronounced disparity in urban amenities accessibility between the two types of apartments across the entire target area. This implies that residents of public apartments endure relatively greater inconvenience in accessing these urban amenities compared to residents of private apartments. According to Table 4, the urban amenities associated with this category encompass a range of services, spanning from lower-order commodities such as snack bars, bakeries, subway station entrances, and neighborhood parks to higher-order services, including department stores. Figure 7 shows a diagram comparing the *z*-values of the 24 urban amenities for the two types of apartments visually.

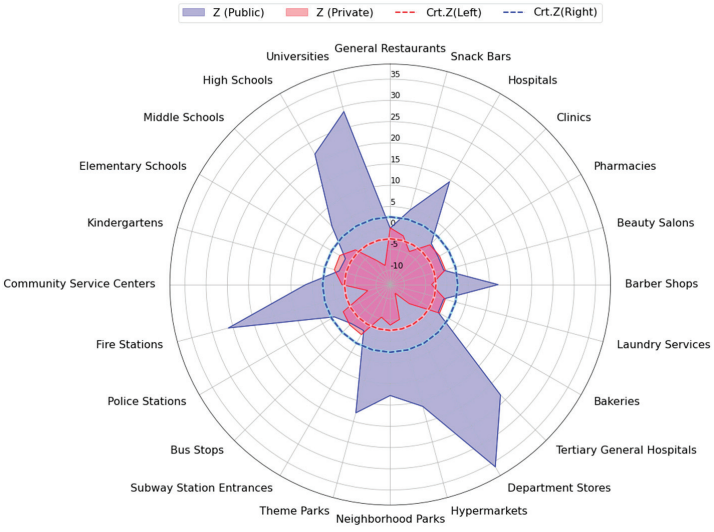


**Figure 7.** Comparison of $z[GDD]$ values of the 24 facilities (urban amenities) for the two types.

In Figure 7, the cases where the blue line extends outward while the red line contracts inward indicate urban amenities where residents of public apartments experience relatively more pronounced inconvenience. In the figure above, it becomes apparent that in the case of private apartments, the z-values contract inward, while for public apartments, they predominantly expand outward, except for certain facilities. The larger the area between the red and blue solid lines in the figure, the greater the implication of disparity in urban amenity accessibility across the target area between public and private apartment types. Additionally, the red dashed circle and the blue dashed circle represent the range of values corresponding to the critical values of $-2.57$ and $+2.57$ for the z-values, respectively. While most of the private apartments fall within the range of the orange line, public apartments extend well beyond the range of the blue line. This implies a significant disparity in the overall urban amenity accessibility between public and private apartments. Therefore, from the perspective of urban amenity accessibility, multifaceted policy efforts are needed to reduce the gap between residents of public and private apartments.

## 5. Discussion

Residential segregation generally manifests between two distinct groups based on income levels, as observed by Massey and Denton (1993) [2]. Furthermore, income determines housing costs, which consequently lead to spatial inequalities stemming from these disparities [17]. This study developed and conducted an empirical analysis of an analytical framework to assess the differences in urban amenity accessibility between public and private apartments. The essence of the research is to use this framework to measure the accessibility of urban amenities for these two types of apartments in Seoul and to derive micro residential segregation from these differences.

Empirical analysis reveals that residents of private apartments in urban areas typically enjoy superior access to urban amenities, whereas access for residents of public apartments is comparatively deficient. This disparity in facility access among these housing types may be viewed as an outcome of spatial segregation. The findings align with previous studies that quantified residential segregation by accessibility metrics [33–39]. A recurring theme in both this and prior research is the enhanced access to urban amenities for urban dwellers in high-cost housing areas, which perpetuates spatial inequalities

The spatial inequality between public and private apartments can be attributed to the urban spatial structure characteristics. In central Seoul, where private apartments

predominate, the sharp rise in land values during the city's growth phases essentially excluded low-income groups from accessing housing. This exclusion has intensified with the city's ongoing expansion and increasing density, necessitating that public apartments be primarily situated in the outskirts of Seoul, where land values are comparatively lower. This spatial distribution results in low-income groups being excluded from areas with excellent access to urban amenities, thus becoming a primary cause of residential conflict. The urban spatial structure is influenced by the location of the Central Business District (CBD), with previous studies indicating that areas closer to the CBD face higher housing costs and have superior access to urban amenities. The pronounced segregation between public and private apartments within the city's spatial structure not only contradicts the normative goals of urban planning, which aim to ensure equitable access to urban amenities for all residents, but also exacerbates urban residential conflicts.

The findings of this study have significant theoretical implications for the fields of urban sociology and urban planning. Firstly, this study provides empirical evidence that supports the spatial dimension of residential segregation as proposed by Massey and Denton (1993) [2], highlighting how income disparities translate into spatial inequalities within urban contexts. This reinforces the theoretical understanding that spatial segregation is a crucial aspect of urban inequality, which needs to be addressed through comprehensive urban planning policies.

Secondly, this study contributes to the urban planning literature by demonstrating the critical role of accessibility to urban amenities in shaping residential segregation. The observed disparities in amenity access between public and private apartments underscore the importance of considering accessibility as a key factor in urban planning. This aligns with previous research by Kwan (1998) and Talen (2003) [51,52], which emphasized the significance of equitable access to urban amenities in promoting social inclusion and enhancing the quality of life for urban residents.

Thirdly, the findings suggest that the spatial distribution of housing types within a city is a determinant of urban inequality. This has implications for the development of urban policies aimed at reducing spatial segregation and promoting equitable access to amenities. This study supports the notion that urban planners must prioritize the equitable distribution of urban amenities to mitigate the adverse effects of residential segregation, as highlighted by Fainstein (2010) [53,54].

The case of Seoul is particularly significant when compared to other cities with similar patterns of socio-spatial segregation. For example, cities like New York and London exhibit pronounced spatial inequalities driven by high housing costs. In these cities, areas inhabited by higher-income groups tend to have superior access to public services and amenities, whereas lower-income areas suffer from inadequate access. This pattern has been observed in studies by Fainstein (2010) for New York and Hamnett (2003) for London [55,56]. By drawing parallels with these cities, this study underscores the universality of issues related to urban amenity accessibility and residential segregation [55,56]. Recognizing that these patterns are not unique to Seoul but are prevalent in many global cities provides a broader context for understanding the implications of this study's findings. It highlights the common challenges urban planners face and the need for policy interventions that ensure equitable access to urban amenities across different urban contexts.

To improve access to essential urban amenities, targeted policy efforts focused on location are necessary. First, increasing the supply of public apartments in downtown areas with robust accessibility can naturally promote greater access for low-income groups and reduce disparities. In Seoul, where constructing new public apartments downtown is challenging due to high land costs and strict regulations, the strategy of purchasing and converting existing private apartments into public housing can mitigate accessibility disparities. Second, promoting the location of related facilities around public apartments with poor accessibility is essential. Establishing public–private partnerships to encourage the location of private facilities and relaxing land use regulations can ensure essential amenities are accessible in underserved areas. Finally, developing integrated urban amenities can

significantly enhance overall accessibility. Easing zoning regulations and development controls, particularly in Seoul, could foster the establishment of integrated amenities and mitigate disparities.

## 6. Conclusions

This study has demonstrated that residential segregation fosters spatial separation and leads to significant disparities in access to urban amenities due to spatial inequalities. This issue fundamentally undermines the urban planning principle that urban amenities should be equitably accessible to all residents. To address this, we developed and applied a micro-level residential segregation analysis framework to assess the accessibility of urban amenities for public and private apartments in Seoul, Republic of Korea.

According to the empirical analysis summarized in Table 5 and Figure 7, which evaluates the overall accessibility of the target area, public apartments exceeded the threshold z-value of 2.57 in 13 out of the 24 facility types. In contrast, private apartments did not exceed the threshold z-value for any facility type. Furthermore, there were 10 facility types where private apartments exhibited z-values smaller than the negative threshold of $-2.57$. This clearly demonstrates the significant disparity in facility accessibility between public and private apartment types. Additionally, as illustrated in Figures 5 and 6, local differences in facility accessibility also exhibit distinct spatial patterns. The findings indicated that access to urban amenities from public apartments is notably low. These findings highlight the need for better strategic placement of public apartments and improved provision of amenities in areas with poor access.

This study has the following limitations. Urban amenities are facilities that city residents use in daily life, and as such, the measurement of accessibility to these amenities was made based solely on physical distance without considering more realistic factors like travel time by various transport modes or network distance. Additionally, the socioeconomic characteristics of individuals were not reflected in the measurement of accessibility to urban amenities. In other words, the demand for urban amenities, which varies according to individual factors such as age, gender, and income, was not considered. Therefore, future research should calculate accessibility to urban activities by socioeconomic strata based on network distance that accounts for accessibility by different modes of transportation, and measure residential segregation accordingly.

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# Between Struggle, Forgetfulness, and Placemaking: Meanings and Practices among Social Groups in a Metropolitan Urban Park

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**Abstract:** Urban spatial segregation in Santiago de Chile, a prevalent feature of Latin American cities, underscores socioeconomic disparities and shapes the city's socio-spatial dynamics. This segregation, driven by land prices and private ownership, has pushed disadvantaged groups to the periphery and limited their access to desirable areas reserved for wealthier segments of society. Quebrada Macul Park, situated within this segregated urban landscape, serves as an emblematic case that challenges and expands the classical definition of urban segregation. It exemplifies the complex negotiations over space utilization among social groups, defined by socioeconomic, generational, and interest-based differences. This study employs micro-segregation studies in a broad sense, both as a conceptual framework and as a methodological tool to analyze these dynamics. Through qualitative methodologies, including six in-depth interviews with diverse stakeholders (social and ecological activists, longtime residents, and park employees) and five participant observations, the research investigates the varied uses and meanings attributed to the park. The findings reveal that the park's evolution from a space frequented by low-income dwellers to a diverse metropolitan park has sparked debates over its public versus private character, mirroring the power struggles among distinct social factions. The park serves as a profound identity marker for its historical inhabitants, who initially fought for the right to use it and today experience nostalgia due to its widespread popularity. Meanwhile, the struggle to establish the park as a public space challenges the city's segregation dynamics and might promote social cohesion within urban natural environments.

**Keywords:** public parks; meanings of place; place identity; micro-segregation; urban change

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## 1. Introduction

Social phenomena are intrinsically linked to specific locations, demanding a spatial analysis that incorporates factors like the scale of places and metrics for social proximity and distance (Logan, 2012 [1]). These components are fundamental for comprehending segregation, which fundamentally entails the spatial division among individuals and groups (Logan, 2012 [1]). Specifically, "micro-segregation" sheds light on how socio-spatial fragmentation and social stratifications are mirrored on a smaller scale than that of neighborhoods, employing a micro-spatial lens (Maloutas & Karadimitriou, 2022 [2]). Recent research has delved into the nuances of residential micro-segregation (i) within affluent neighborhoods, examining the implications of residential closeness on social control and distancing practices (Pfirsch, 2023 [3]), (ii) its impact on social capital at sub-neighborhood levels (Calderón-Figueroa, 2024 [4]), and (iii) its subtle manifestations even in areas perceived positively by their residents (Vámos, Kagy & Novak, 2023 [5]).

Additionally, the study by Dixon and Durrheim (2003 [6]) on a South African beach demonstrates that despite the abolition of formal racial segregation in many post-apartheid

societies, the dynamics of public space use still adhere to micro-segregation patterns, "informal segregation", maintaining clear boundaries between socially distinct groups, thereby facilitating interactions among those perceived as similar (socially homogeneous groups). This "together apart" dynamic in public spaces was subsequently tested in a multi-ethnic coffee shop in the North East of England (Clack et al., 2005 [7]), in a classroom in Northern Ireland (McKeown et al., 2016 [8]), in public squares in the city center of Santiago de Chile (De Tezanos-Pinto, 2016 [9]), and more recently in studies on the use of public space and everyday urban mobility using GPS measurement techniques (Dixon et al., 2019 [10]). These studies test the effects of segregation not only at the macrosocial level- where segregation in access to education or work are key forms but also in "everyday life" activities (McKeown & Dixon, 2017 [11]). Indeed, when considering micro-segregation in the dynamics of public space usage, a different set of challenges emerges. It becomes imperative to decipher how individuals negotiate not just their living spaces but also their interaction with the city's public areas (Dixon et al., 2022 [12]. Over two decades ago, Dixon (2001 [13]) already advocated for moving beyond viewing spaces merely as containers, emphasizing the significance of spatial practices in facilitating intergroup contact and daily interactions among socially diverse urban groups.

Santiago de Chile stands as a prominent example of a city grappling with pronounced social and spatial segregation, as extensively documented (Sabatini et al., 2001 [14]). Its urban landscape is a complex interplay of homogeneous and heterogeneous patterns, evolving from its inception into a metropolis defined by distinct socioeconomic enclaves demarcated along geographical lines (Espinoza, 1988 [15]). The legacy of this socio-spatial structure persists, starkly evident in the glaring disparities between affluent neighborhoods and marginalized peripheries. Market forces significantly influence the spatial distribution of social groups, fostering fragmented spaces where exclusivity and privilege converge. Traditional narratives of desegregation fall short in capturing the nuanced realities of Santiago's urban dynamics, epitomized by the emergence of closed condominiums as emblematic nodes within the city's mosaic (Álvarez, 2008 [16]; Sabatini et al., 2001 [14]). Consequently, the acknowledgment of gated communities as manifestations of self-segregation underscores the multifaceted nature of urban spatial inequality in Santiago, navigating historical legacies, market dynamics, and contemporary social aspirations. This phenomenon has been particularly noteworthy in the Municipality of Peñalolén, given its urban expansion in recent decades, attracting affluent groups (Romano et al., 2012 [17]. This intricate tapestry of segregation exacts tangible costs on residents, delineating access to resources, opportunities, green areas, and quality of life across the city's stratified landscape as well as a gradual erosion of collective rights to communal goods.

To this day, Santiago continues to engage in ongoing debates regarding the measurement and conceptualization of urban segregation amidst its culturally diverse neighborhoods (Fuentes et al., 2022 [18]; Garretón et al., 2020 [19]; Ruiz-Tagle & López, 2014 [20]). While the social-mix agenda has significantly influenced desegregation policies, its impact remains limited (Ruiz-Tagle & Romano, 2019 [21]). Despite these discussions, there remains a gap in the Chilean research landscape concerning the comprehensive exploration of micro-segregation and its psychosocial interaction processes. This research aims to examine how interactions, potentially influenced by broader processes of segregation, shape people's perceptions and experiences of space. Our study aims to explore the dynamics of micro-segregation, specifically focusing on its influence on the process of meaning attribution and the utilization of public spaces. We use Quebrada Macul Park in the Peñalolén Municipality of Santiago as a case study for this investigation. This southeastern urban area is known for its distinct patterns of neighborhood-level segregation (Álvarez, 2008 [16]; Garretón et al., 2020 [19]; Mardones, 2009 [22]). In this context, micro-segregation serves as a foundational concept to unravel how the negotiation of space utilization and the process of meaning-making are intricately linked with historical inequalities among local social groups.

### *1.1. Urban Segregation and the Dynamics of Micro-Segregation*

Research on urban segregation reveals that the delineation of physical spaces within a city can reflect and influence the social and economic dynamics within that territory. Latin American cities, in particular, display stark contrasts, with enclaves of affluence adjacent to zones marked by poverty, environmental decay, and significant inequality. Socio-spatial segregation, deeply entrenched in systemic injustice, often results from urbanization processes that disproportionately allocate public resources and reinforce structural socioeconomic disparities (Musset and Peixoto, 2016 [23]). The impact extends beyond geographic divisions, influencing the dynamics of inclusion and exclusion at both broad urban and nuanced microecological levels, affecting how individuals and groups interact within seemingly homogeneous spaces (Bettencourt, Dixon & Castro, 2019 [24]; Dixon, 2001 [13]).

Segregation not only fragments social groups and spaces but also hampers positive intergroup contact, posing challenges to social integration. Such patterns persist in various contexts, where, regardless of the setting, groups differentiated by ethnicity, religion, socioeconomic status, or gender tend to self-segregate, engaging primarily within their own circles. This self-isolation reinforces social exclusion, erecting barriers and widening the distances between groups, thus stifling opportunities for communication, particularly in contexts rife with entrenched intergroup disparities or social inequalities (Bettencourt, et al., 2019 [24]; Dixon et al., 2022 [12]; McKeown & Dixon, 2017 [11]). For instance, Dixon et al. (2022) [12] illustrate how mobility practices within religious communities in Belfast contribute to maintaining high levels of (micro) segregation, limiting the shared use of spaces and thoroughfares by opposing groups.

The dynamics within highly segregated urban environments manifest in how spaces are used and traversed. Dixon et al. (2022) [18] synthesize this relationship into three key points: firstly, places can act as arenas for expressing and contesting collective meanings, values, and symbols tied to identity; secondly, our sense of belonging extends beyond personal feelings, intertwining with historical experiences of intergroup processes and shared perceptions of who is entitled to inhabit certain spaces; thirdly, identification with or emotional connection to "our space" often entails conflicting processes of disassociation and emotional detachment from "their space." Thus, communities anchor their identities within their territories, which in turn have been shaped by a history of segregation and inequitable distribution, influencing both the utilization of these spaces and the identity processes they engender (Musset & Peixoto, 2016 [22]).

From this understanding, it is clear that the use and significance ascribed to spaces are shaped by the groups that frequent them and their collective experiences within these places. Therefore, a place is recognized as the culmination of both individual construction and collective meanings, continuously shaped by those who inhabit and those who are excluded from it due to prevailing inequalities.

### *1.2. The Affective Bond between People and Places*

Building on the discussion of urban segregation, it is essential to explore the affective-identity bond between individuals and their environments. Altman and Low (1992) [25] conceptualize a place as not just a physical location but as a space imbued with diverse meanings through personal, group, or cultural engagements. This dynamic interplay, as outlined by Altman and Rogoff (1987) [26] and further elaborated by Gifford et al. (2011) [27], posits that the relationship between individuals and their surroundings is a reciprocal one, where both entities exert influence upon each other. This intricate relationship underscores the challenge in disentangling the psychological facets of an individual from the environmental context, highlighting the intertwined nature of material, economic, cultural, and social elements of any given space (Winkel et al., 2009 [28]).

The interaction with a place fosters the development of place identity, a concept deeply connected to one's sense of belonging and the unique experiences elicited by various environments (Hay, 1998 [29]; Hernández et al., 2010 [30]). Proshansky (1978) [31] and others have articulated how this aspect of personal identity is shaped by our physical

surroundings, providing continuity and distinctiveness to our existence. This cognitive framework underpins the formation of self-concept, personality structure, and overall identity (Proshansky et al., 1983 [32]). Concurrently, place attachment represents the emotional dimension of our connection to specific environments, denoting a desire to form a lasting bond with a particular place (Altman & Low, 1992 [25]; Fullilove, 1996 [33]; Giuliani, 2003 [34]; Vidal et al., 2010 [35]). These concepts play a pivotal role in shaping our interactions within physical spaces, ensuring that as we coexist within a given locale, our identities become intertwined with its physical landscapes (Speller et al., 2002 [36]; Valera, 1997 [37]; Vidal & Pol, 2005 [38]).

Research has underscored the benefits of developing a strong place attachment, including better adaptation to one's environment, enhanced psychological stability, and contributions to social well-being (Scannell & Gifford, 2017 [39]; Rowles, 1990 [40]; Rollero & Piccoli, 2010 [41]). This process, influenced by various scales of attachment, also emphasizes the role of local memory, regional, and national identities in forging these bonds (Lewicka, 2008 [42]). Furthermore, studies have shown that place attachment can vary with the length of residency, with longer-term residents, particularly homeowners, exhibiting stronger attachments (Brown et al., 2003 [43]; Nielsen-Pincus et al., 2010 [44]; Comstock et al., 2010 [45]).

Gifford (2014) [46] highlights how the physical characteristics of a city, along with the personal attributes of its residents, shape perceptions of the urban environment, influencing community behaviors and interactions. This interplay significantly impacts how citizens engage with their public spaces, suggesting that the unequal distribution of high-quality urban environments can adversely affect residents in less affluent areas, perpetuating cycles of segregation (Beck, 2009 [47]). Bailey et al. (2012) [48] found that individuals from marginalized city sectors exhibit lower levels of place attachment, primarily due to negative perceptions of social cohesion within their neighborhoods. This indicates that in segregated contexts, the underdevelopment of place attachment can have detrimental effects on social relations, reinforcing the exclusion and spatial demarcation among different social groups (McKeown & Dixon, 2017 [11]; Livingston et al., 2010 [49]).

In summary, the concepts of place identity and place attachment are crucial for understanding the intricate relationship between individuals and their environments. They offer insights into how urban spaces are utilized and experienced, further illuminating the challenges posed by urban segregation and the importance of equitable access to communal spaces. However, recent critiques have challenged the depoliticized view of person–place relationships predominant in environmental psychology, advocating for a consideration of the historical and political processes that influence the delineation and use of urban spaces by power-holding entities (Di Masso et al., 2008 [50]; Manzo, 2005 [51]; Pinto de Carvalho & Cornejo, 2018 [52]).

### *1.3. Identity and Segregation of Urban Spaces: Emerging Controversies over Public and Green Areas*

Following the exploration of the affective-identity bond between people and places, it becomes imperative to delve into how public spaces serve as focal points for observing urban segregation—a phenomenon that has historically partitioned cities into unequal segments (Nightingale, 2012 [53]). In less affluent neighborhoods, this segregation is manifested through increased social, economic, and racial disparities, often exacerbated by the privatization of communal spaces (Toolis, 2017 [54]). Such conditions have sparked community efforts to reclaim or retain control over urban areas, leading to significant discourse among social groups with varying stances on spatial entitlements (Di Masso & Dixon, 2015 [55]).

Some scholars have emphasized that conflicts over space often reflect deeper struggles over identity and belonging, posing the critical question: Who is deemed worthy of controlling public spaces, and on what grounds? (Di Masso, 2012 [56]). While these battles are grounded in the psychological ties individuals form with their environment, they are also deeply entangled with broader political, economic, and cultural processes that shape the power dynamics within urban territories (Cresswell, 2004 [57]; Devine-Wright,

2009 [58]; Di Masso, 2012 [56]; Gieryn, 2000 [59]). Such conflicts underscore a collective resistance against dominant narratives that seek to redefine spatial norms and limits, championing the social constructions and emotional bonds that communities establish with their environments.

Within cities, green spaces are a focal point for understanding citizens' bonds with their community and environment. Arnberger and Eder (2012 [60]) envision a positive relationship between access to and qualities of green spaces with community attachment: urban residents who expressed higher appreciation for green spaces showed greater levels of community attachment and a heightened perception of quality of life. Similarly, De la Barrera et al. (2016 [61]) describe how green spaces foster a sense of community and belonging, influencing the type of use these places receive within the city. The same study found that lower-income neighborhoods with limited access to green spaces utilized the available parks more frequently and developed a stronger attachment to them (Barrera et al., 2016) [61]. This underscores the role of urban green areas in fostering place attachment and enhancing perceptions of well-being among urban residents (Dinnie et al. (2013) [62]; Knez et al., 2018 [63]; Zhang et al., 2015 [64]).

However, social reality shows that there is an inequitable distribution of economic resources for public spaces, leading to an unfair allocation of green areas (Colodro et al., 2014 [65]; Fernández, 2022 [66]), which further exacerbates the debate on segregation in major cities.

Moreover, the expansion of urban areas has led to disparities in access to greenery, disproportionately affecting low-income and minority groups who find themselves in areas devoid of such vital spaces (Mayen, 2022 [67]; Kephart, 2022 [68]; Saporito & Casey, 2015 [69]). Observations of increased congestion in parks within socioeconomically segregated areas contrast starkly with the experiences of more affluent communities (Sister, Wolch, & Wilson, 2009 [70]). This disparity prompts a reevaluation of the role governmental bodies play in developing and distributing green spaces to mitigate segregation and foster inclusivity, as highlighted by recent research underscoring the importance of vegetated areas in facilitating social connections and enhancing community well-being (Bazrafshan et al., 2021 [71]; Callaghan et al., 2020 [72]; Jabbar et al., 2022 [73]; Reyes-Riveros et al., 2021 [74]).

Thus, green spaces emerge as critical arenas for understanding and addressing urban segregation and micro-segregation, revealing the complex interplay of intergroup dynamics, spatial disputes, and the quest for equitable access to nature. Recognizing and addressing the political and social narratives surrounding the allocation and use of such spaces are crucial for exploring the psychological dimensions of place attachment and identity. These efforts contribute to a broader understanding of how communal ties and memories associated with physical spaces can influence collective actions aimed at overcoming urban segregation and fostering a more inclusive cityscape.

## 2. Research Context

Santiago de Chile, mirroring other Latin American metropolitan areas, is characterized by pronounced residential and non-residential segregation, marked territorial inequality, and spatial fragmentation (Agostini et al., 2016 [75]; Marchant et al., 2022 [76]; Fuentes et al., 2022 [18]; De Mattos et al., 2014 [77]; Garretón et al., 2020 [19]). This segregation is intricately linked to the city's vastness and its socioeconomic divides, prompting scholars to suggest area-based desegregation policies and diversity in land use as crucial strategies for urban planners aiming to foster social integration (Garretón et al., 2020 [19]). The Peñalolén district, situated in the southeastern part of Santiago, exemplifies unique patterns of segregation, showcasing small-scale divisions between affluent and less affluent groups and instances of micro-segregation, such as the enclosure of upscale residential areas (Álvarez, 2008 [16]; Mardones, 2009 [13]; Garretón et al., 2020 [19]; Romero et.al., 2012 [17]).

Already in a study by Romero et al. (2012 [17]), Peñalolén was described as having a remarkable segregated conformation, with individuals of higher socioeconomic status, primarily residing in the eastern and Andean piedmont regions. Conversely, the majority demographic consists of individuals with lower economic means predominantly situated

in western locales, notably in areas such as La Faena, Peñalolén Alto, and Lo Hermida (see Figure 1 below), historically associated with informal settlements. Tobalaba Avenue has served as a tangible social divide within the municipal confines. This study also indicated that private residential developments were constituted as gated communities with restricted access and settled in the piedmont areas seeking social exclusivity, familial security, and environmental amenities. These socially segregated zones exhibit starkly contrasting environmental contexts, notably concerning access to urban green spaces and environmental amenities. Lower socioeconomic groups tend to have limited access to urban vegetation compared to their wealthier counterparts. This district-level segregation, coupled with personal narratives, underscores the critical nature of segregation from both a broad and individual perspective (Krellenberg et al., 2011 [78]; Vásquez & Salgado, 2009 [79]; Salgado, 2013 [80]).

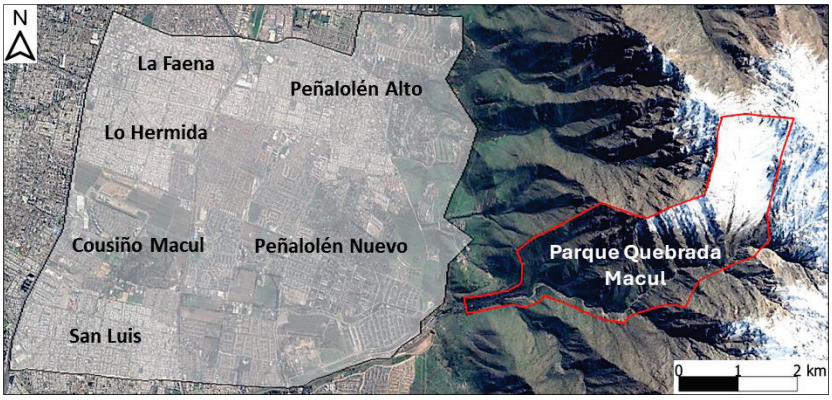


**Figure 1.** Area of study showing the six main neighborhoods encompassing the urban area of the Municipality of Peñalolén and Quebrada Macul Park (red polygon) located in the southeastern area of the Municipality.

The natural area known as Quebrada Macul, located in the adjacent mountainous zone of Santiago, offers a compelling case for analysis. Originally a free natural area, it was transformed into a public park in 2006, following local opposition to privatization plans. The park has since become a symbol of environmental and social significance, bridging the gap between different social groups and fostering a sense of community amidst ongoing urban transformations (Beyá, 2019 [81]). Based on the literature review, we expect that parks can become places that address these more "fixed" dynamics of micro-segregation, even within the realm of everyday urban mobility and among socially diverse groups sharing space in Quebrada Macul Park, not only in terms of vegetation and green areas but also leading to a shared supra-ordinal social identity: going to the park and enjoying ecological aspects might allow to challenge social boundaries between groups. In this sense, the current study aims to explore the diverse uses and meanings attributed to Quebrada Macul over the past two decades, hypothesizing its role as a territorial icon promoting unity and intergroup contact.

*Area of Study*

Quebrada Macul Park is a natural area of ~600 hectares located on the southeastern corner of the urban area of the Municipality of Peñalolén, close to the "newer Peñalolén" neighborhood ["Peñalolén Nuevo"], following a creek that goes for several kilometers in an eastern direction towards the Andes Mountains (Figure 1). The park is located outside the urban limit of Santiago, within the "Ecological Preservation Zone", which is a regulated area that restricts urban development to preserve the environment and the natural landscapes (Vicencio & Rodríguez, 2023 [82]). Today, while administrated by the

Municipality of Peñalolén, the park is a mixture of private and public lands, implying the requirement of agreements with private owners to allow for free entrance and movement of people within the premises.

Elevations go from 1000 masl in the park entrance to approximately 2700 on the mountain's top. Annual precipitation during the last ten years in the area has ranged between 99.4 and 380.4 mm, with an average of 242.6 mm per year. However, higher areas within the park may receive considerably larger amounts of precipitation, which has generated deadly landslide events in the past (Lara et al., 2018 [83]). Vegetation is conformed mainly by sclerophyll and xerophytic native species on higher areas and a mix of native and exotic vegetation species in areas close to the urban zone.

Infrastructure is very basic, consisting mostly of trekking paths, lookout spots, and information boards. Several natural ponds in the creek lower area are used for recreational bathing during the summer season.

## 3. Materials and Methods

*Research Approach*

This study employs a qualitative case study approach to delve into the intricate relationships within our research phenomenon without aiming for widespread generalization (Goertz, 2012 [84]). This method allows for an in-depth exploration of theoretical connections found in the literature, facilitating analytical and case-to-case generalizations to enhance understanding of similar scenarios in future research (Treharne & Riggs, 2015 [85]). Drawing inspiration from ethnographic methodologies, we anticipate that this approach could foster theoretical generalizations about contested natural spaces in Latin American cities, aligning with Burawoy's (2009 [86]) concept of "multi-case ethnography".

To gather comprehensive insights, we conducted six in-depth interviews averaging 1 h and 28 min each with key informants who provided verbatims on different key themes guided by the researcher, such as: (i) the park's history, (ii) its significance to various social groups, and (iii) its role in shaping collective identity (a summarized interview guideline—translated from Spanish—is included at the end of the article as Appendix A.1) Interviews were semi-structured so guidelines were followed in a flexible manner, keeping the natural rhythm of conversation with each informant. The inclusion criteria ensured that participants were legally adult, had knowledge of Quebrada Macul's history, and had diverse active roles at any point in the park's lifecycle. This purposive sampling method (Hernández et al., 2014 [87]; Patton, 2002 [88]) yielded a diverse group of informants: three activists, long-term residents, and park employees—all of whom have deep-rooted connections to the park, having lived nearby and frequented it since childhood.

Additionally, five participant observations were conducted, varying in duration from 3.5 to 6.5 h, to capture a broad spectrum of visitor interactions across different times and days (the participant observation's guideline—translated from Spanish—is included at the end of the article as Appendix A.2). This strategy aimed to observe a range of social activities within their natural context (Kawulich, 2005 [89])—see Figure 2a,b. Observations were meticulously documented by at least two research team members, who noted aspects such as (i) the socio-spatial environment, (ii) group behaviors, and (iii) how they use the space, while also gathering demographic data from willing participants, which was pursued through brief structured face-to-face surveys, aiming to characterize informants in terms of their belongingness to social groups—defined in this research in terms of place of residence to understand relationships between macro- and micro-segregation dynamics. The survey asked the following questions: (i) gender; (ii) age, (iii) educational level, (iv) occupation, (v) municipality of residence, (vi) region in Chile. This approach ensured the preservation of the setting's authenticity and participant confidentiality, as well as systematic registration of demographic data to analyze patterns of use and meaning in the park, considering different social groups.


(PO1)

(**a**)

(PO4)

(**b**)

**Figure 2.** (**a**,**b**) Photographs of participant observations in Quebrada Macul Park[1].

For data analysis, we applied a thematic analysis method as outlined by Guest et al. (2012) [90] or what Braun and Clarke (2019) [91] call a "codebook thematic analysis: incorporating triangulation with peer coders to bolster the study's methodological rigor (Treharne & Riggs, 2015 [85]). This analytical phase aimed to merge various data types, supporting our "place-assemblage" methodological framework, which is crucial for examining socially contested public spaces (Di Masso & Dixon, 2015 [55]). The comprehensive sample for this research, including interviewees, observation participants, and survey respondents, is detailed in Table 1, offering a holistic view of the study's empirical foundation.

**Table 1.** Summary of qualitative participants in the research, considering the gathering technique[2].

| ID | Date | Place | Gathering Technique | N Sampling | Gender | N Extended | Duration | N° Research Team |
|---|---|---|---|---|---|---|---|---|
| ESE1 | 23.11.2023 | Residence | In-depth interview | 1 | F | 1 | 1:41 hrs | 2 |
| ESE2 | 24.11.2023 | Park | In-depth interview | 1 | M | 1 | 1:53 hrs | 2 |
| PO1 | 30.11.2023 | Park | Participant Observation | 13 | 7F/6M | >200 | 3:30 hrs | 4 |
| PO2 | 01.12.2023 | Park | Participant Observation | 10 | 6F/4M | 32 | 3:30 hrs | 4 |
| PO3 | 02.12.2023 | Park | Participant Observation | 6 | 2F/4M | 51 | 6:30 hrs | 2 |
| PO4 | 03.12.2023 | Park | Participant Observation | 11 | 4F/6M/1O | >80 | 6:30 hrs | 2 |
| ESE3 | 04.12.2023 | Residence | In-depth interview | 1 | F | 1 | 1:22 hrs | 2 |
| ESE4 | 13.12.2023 | Residence | In-depth interview | 1 | M | 1 | 1:11 hrs | 2 |
| ESE5 | 20.12.2023 | Park | In-depth interview | 1 | M | 1 | 1:28 hrs | 2 |
| PO5 | 22.12.2023 | Park | Participant Observation | 8 | 4F/4M | 22 | 6.30 hrs | 3 |
| ESE6 | 26.01.2023 | Residence | In-depth interview | 1 | M | 1 | 1:11 hrs | 2 |
| | | Totals | | 54 | 25F/28M/1O | >391 | Average: 1:28ESE/3:12T | |

In the final phase of our research, we engaged in quantitative analyses utilizing secondary data provided by the Municipality[3], which enabled a detailed characterization of park visitors in 2021. Employing frequency analyses in Excel with the municipal data, we delineated the distribution of visitors by their district of residence over the previous three years. This analysis encompassed a sample size of 162,133 visitors, who, on average, were 33.08 years old (sd = 10.45 years, min = 10, max = 99 years old). Any data entries suggesting implausible ages (greater than 150 years or less than 0 years) were meticulously removed from the final dataset to ensure accuracy.

This study was conducted under the auspices of the Ethics Committee of Universidad Adolfo Ibáñez, adhering strictly to the confidentiality and voluntary participation of all involved, in line with the ethical principles for human research as outlined in the Belmont Report. This ethical oversight guaranteed that all stages of the research were conducted with the highest standards of integrity and respect for the participants' privacy and autonomy.

## 4. Results

### *4.1. From Private Land to Public Use: History of an Intergroup Conflict*

In the exploration of the transformation from a privately owned mountain hill to a leased public park, a crucial theme emerged from interviews with key informants: the persistent tension between labeling a space as private or public and how different social groups use it. At the beginning of the 20th century, Peñalolén was a predominantly rural commune comprising plots of land and farms (peñalolen.cl). However, from the mid-century onwards, public social housing policies were implemented, which attracted lower-income inhabitants and resulted in the formation of neighborhoods that are now known as La Faena, Lo Hermida, Peñalolén Alto, and San Luis (see Figure 1 above). Until the beginning of the 21st century, the inhabitants of the Peñalolén district cherished Quebrada Macul as a communal treasure, a heaven for summer leisure, spa-like relaxation, and the unfettered celebration of national holidays, thanks to its open accessibility to all local residents.

> "People said 'let's go up and stay there', 'I used to date up there', said people. I remember popular eateries -'fondas'- that were done in the hill. There were a lot, a lot of people saying that the hill belonged to them".
>
> (Javiera, activist[4])

> "We used to come with my uncles during the summer. I was five and a half, almost six years old. And I am [more than 70] years old, so we have been coming here for a little while now…".
>
> (Bernardita, activist)

During interviews, longtime residents of Peñalolén described accessing the ravine through unregulated pathways, maneuvering through the spaces between the trees and ravines formed by the hill. However, this unregulated access during the period resulted in problematic behaviors. Activities such as using trees for bonfires and altering the riverbed to create makeshift pools heightened the risk of forest fires and other adverse impacts. These individuals, residing in economically disadvantaged circumstances and modest housing, freely enjoyed the ravine as if it were an extension of their own backyard. Indeed, certain interviewees referred to the hill as "the soul of Peñalolén," highlighting its central role in the commune's identity and its significance in shaping the community.

> "[The Quebrada Macul] is everything for the people of Peñalolén. I believe that if tomorrow the hill disappears, it will not be Peñalolén. The first thing you do in the morning after it rains, you go out and see if [the hill] is snowed or not, or if it is going to rain because the sky is closing, [and] the hill is closing. It tells us what's going to happen. . . It's everything! It gives us the day, it gives us the time, it gives us everything".
>
> (Javiera, activist)

Despite its frequent and unrestricted use, it is essential to note that the entire area is privately owned. This aspect is significant because, despite the community's attachment to and identification with it, access depended on the owners' discretion. Tensions escalated in 2003 with the proposal to privatize the area for educational and recreational purposes, directly conflicting with the community's longstanding tradition of unrestricted access. This shift not only challenged local customs but also demonstrated how alterations in the management of communal spaces can heighten conflicts between public access and private interests, often influenced by affluent and influential individuals.

During this period, Peñalolén was also experiencing rapid urbanization, attracting an influx of affluent residents to reside in gated communities, notably in Peñalolén Nuevo adjacent to Quebrada Macul (Romero et al., 2012 [17]). Concurrently, tensions began to emerge between longtime residents and affluent landowners in the region, highlighting a significant issue: the proposal to transform the hillside into a site for a university, event center, and tourist attractions—a multimillion-dollar project devised without consultation with the area's established inhabitants.

> "I told him [another social leader from the neighborhood] 'there is an already approved project and, from the study I have been doing, I understand it means that the Quebrada Macul that people have been using for years will be closed [privatized]'. 'I had no idea about this' [he told me]".
>
> (Darío, activist)

Activists unearthed that this initiative had bypassed standard public policy protocols, leaving local governing bodies in the dark about the intended privatization of this verdant expanse. Furthermore, this situation highlights the private ownership of the park and the landowner's authority to sell or alter its traditional use. Once again, the privilege of excluding long-term residents is underscored, illustrating the power dynamics inherent in processes of inclusion and exclusion.

This revelation set in motion a series of negotiations among diverse social factions, alongside a concerted political campaign to gather signatures from the community, leading to a unified stand against the privatization effort. Such a movement galvanized social leaders, who invested their efforts wholeheartedly into the campaign, pledging to restore the hill to its communal status. This struggle underscored a deeper tension where the contest over space mirrors the broader battle for inclusion and equitable access in urban development processes.

> "We met social leaders because an ecological activist came to the Community Union –a social organization of neighbors- to ask for help to recover the Quebrada Macul. I had some beautiful photos of the place, so he asked me to please come

with him to the meeting. [. . .] We spent a long time at the fairs sharing this [information], so people would realize that they had to fight for the hill. [. . .] After our victory, our leader talked to the owner, and other processes started from there".

(Javiera, activist)

During this period, the district was in the midst of a mayoral election campaign. The fight for the hill's preservation emerged as a central theme for one of the candidates, aligning his platform with the community's fervent desire to protect their beloved space. This candidate's successful election in 2005 marked a significant turning point. Under the guidance of the newly elected mayor, prominent figures from the community were invited to play a pivotal role in the efforts to recover Quebrada Macul Park. Below, Figure 3 illustrates the comprehensive negotiation process that ultimately led to the successful reclamation of the area by its rightful and resolute stewards, the community.

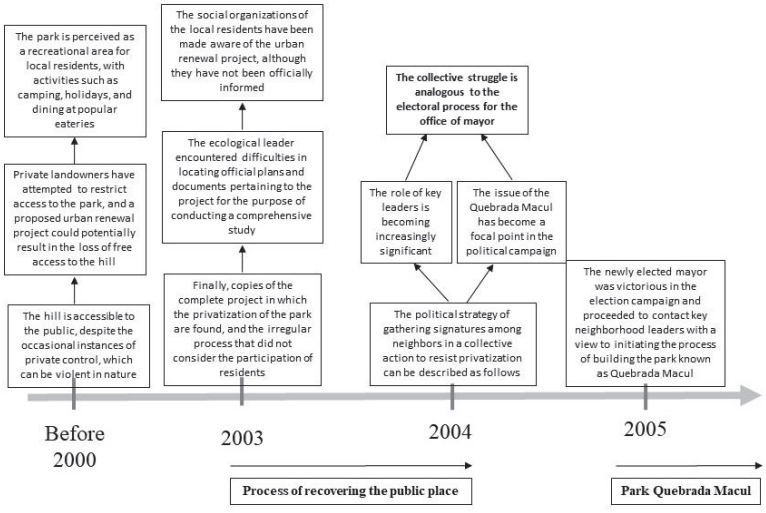


**Figure 3.** Summary of events leading to the recovery process of Quebrada Macul Park.

Following extensive negotiations and changes in power dynamics, Quebrada Macul transitioned from an informally utilized natural space, albeit under private ownership, to an officially recognized public park leased to the Municipality of Peñalolén for a period of 99 years. While this transition ensured users continued free and universal access, it also introduced environmental conservation measures, including area enclosure, pathway improvements, and the deployment of park rangers to educate visitors on environmental preservation. This new phase in the park's management elicited mixed reactions from the community, as revealed in our interviews:

"We liked to come [to the hill] at night, and spend the night, have a barbecue and then come down the next day. But if we entered there [the official entrance of the park after 2005] they would not let us; so, we entered the hill through unofficial routes. One day a park ranger told us: 'hey guys, you have to go to the official entrance to register yourselves' [. . .]: a friend went down to register and that was the first sign that the park was been protected. For us, [and] I think [for] many people in Peñalolén, we started [. . .] changing the concept".

(Miguel, park employee)

"It was super complicated to work with them, because of the bonfires, the people camping [in] the Guayacán sector, when we went patrolling rounds, it was easy

> to find 20, 30 tents, neighbors camping for a month, two months, camping the whole season. It was a hard but fun work, some people were very welcoming, whereas others less so".
>
> (Miguel, park employee)

Miguel's interview sheds light on the tension arising from the prohibition of certain traditional activities within Quebrada Macul, sparking conflict among established residents nostalgic for the past and resistant to new norms. His unique perspective, transitioning from a frequent park visitor in his youth to a park ranger, underscores the complexities encountered. The enforcement of rules against customary practices like overnight camping and barbecues has stirred discord within the community, underscoring a larger narrative of urban segregation. This scenario illustrates a rift between enduring customs and contemporary management and conservation policies, reflecting broader disputes over space usage and regulatory changes.

> The integration of the private Universidad Adolfo Ibáñez, funded in 2001 and often called "the white elephant," in allusion to its high economic status and disruptive architecture (see Figure 4 below), added another layer to the narrative, symbolizing the clash between affluent, educated classes and the local community's interests:
>
> "[And what the building of the University provoked among neighbors?] Rejection, yes, like the association with the destruction of the hill, like how ugly it looks there. I think the same thing happened when we saw the first gates up here because we are [were] so used to going to the hill without anybody telling us anything".
>
> (Miguel, park employee)

Whether directly or indirectly, the urban recovery project focused on Quebrada Macul sparked conflicts among various social groups. The questions raised about "acquired rights" and the sense of ownership that longtime residents had over the hill illustrate the complex interplay between community traditions and environmental stewardship.


**Figure 4.** Universidad Adolfo Ibáñez seen from Avenida Grecia, at a linear distance of approximately 800 m. Picture modified from Google Street View[5].

*4.2. There Is No Unity without Memory: From Struggle to Oblivion*

The preservation of Quebrada Macul as a public park intertwines with the local identity, where informants reflect on the hill's role within the community's social fabric, emphasizing its significance against the backdrop of segregation dynamics.

> "We, as [people from] Peñalolén, are used to leaving the house and looking at the hill, it is something that is above us. [. . .] There are many people from Peñalolén who do not know the park either, they may have grown old and never visited the Quebrada Macul. But they like the hill!".
>
> (Miguel, park employee)

Quebrada Macul thus emerges as a symbolic–material space central to Peñalolén's identity, crafting collective meanings of belonging and landscape. The hill, observed daily by residents, becomes a unifying element in their spatial experience, shaping their identity in relation to their environment and their perspective within it.

Within this setting, both social and ecological leaders, alongside longtime residents, share a profound connection to the ravine and the hill, deeply intertwined with their sense of identity. The battle to preserve Quebrada Macul is more than just a physical contest; it is intricately linked with the identity of those involved, weaving through their biographical narratives.

> "It is the only thing for the complete community, the Peñalolino -people from Peñalolén- without its creek stops being Peñalolino, and many people was saying 'how can they not let me enter?'. I tell you I am 65 years old, when I was 50, 48 years old, I was like my son when I started to fight for the Quebrada Macul. And there were people who were 70 years old and said 'mijita, you have to fight for that', so I said, 'why am I going to fight for it?'. And people said '[because] we went picking blackberries in the fields, up there by the hill', and all the people had something to do with the place, some practice related".
>
> (Javiera, activist)

> "[What does all this place mean to you?] My life itself. And every day it hurts that every day you see more and more damage. So really, if I could not let anyone in here and take care of this like gold, it would be... Because it really is a very beautiful part and it is being damaged all the time and ending up being the responsibility of the people who sometimes come here, which is not all of them, and most of them are more harmful".
>
> (José, long-term resident)

The case of José, a long-term resident, is particularly noteworthy as he describes Quebrada Macul as an integral part of his identity. Furthermore, he views people from outside as potential threats, particularly in relation to the urbanization process. On the other hand, Bernardita draws a poignant contrast between Quebrada Macul and Villa Grimaldi[6]—a site entrenched in the memory of political imprisonment and torture during the dictatorship era. This comparison illuminates the complex relationship between public spaces and historical trauma:

> "During the dictatorship, they would*n*'t even let us talk to the neighbor across the street. We had a very bad time, we had a very bad time [...]. Although it is also very important because thanks to this we started to get together, we started to spread the word, because we could not continue with the situation that we were in".
>
> "Look, the Quebrada Macul is like the reverse of the Villa Grimaldi [...]. The Villa Grimaldi is pain, death, and the Quebrada Macul is recreation, relaxation, enjoyment, being out in the fresh air. It is the opposite".
>
> (Bernardita, activist)

This comparison underscores a link between the political context of Peñalolén's emergence and the significance attributed to Quebrada Macul. Bernardita's reflections reveal the hill's role in fostering a sense of unity and resilience among Peñalolén residents, contrasting sharply with the oppressive history symbolized by Villa Grimaldi. Her narrative suggests that Quebrada Macul, during times of political strife, emerged as a sanctuary that bolstered community cohesion and served as a bastion against the forces of political trauma and exclusion.

The mobilizations of 2006, steeped in deep emotional significance, are recalled by community leaders with a sense of poignant nostalgia, highlighting apprehensions that the newer generations may not share the intense bond with the park's history and the efforts invested in its restoration. This sentiment of disconnection, as echoed by the leaders and

evidenced through our interviews, signals a notable generational transition in how the park's importance is perceived and remembered.

> "[Does your daughter go to the park Quebrada Macul?] No, no. She has no idea. 'It's pretty and everything -she tells me-, you may like it mom, but I'm not going because I'm not interested in it'. So, I see those attitudes. I see it in my own people".
>
> (Javiera, activist)

> "We have been losing the memory, I don't know how to explain it, sensations related to the park seem lost, for the same reason that I explained before: generational changes".

> "I believe that with all the [recent] massification, they have been losing the local communities in this role of identity of the park".
>
> (Miguel, park employee)

> "[What key agents do you think have been important to the history of the creek?] The park rangers".
>
> (Hernán, long-term resident)

The palpable depth of emotion expressed by those who engaged in the campaign to save Quebrada Macul, coupled with their prevailing nostalgia, underscores a profound connection to the park's history. This sentiment arises from the belief that the once robust collective effort has been diluted by a gradual lapse in memory. Participants observe a weakening in the social cohesion as the narratives of struggle and solidarity, vital in redefining the park's identity, risk being overlooked by subsequent generations.

This situation poses pivotal inquiries: How do the historical conflicts between different social factions, along with the dynamic interplay of personal and collective identities shaped by the activism for the park, impact the contemporary significance and utilization of Quebrada Macul? To what degree do the park's day-to-day engagements either reinforce or alter the socio-political cleavages that have marked its recent past?

### *4.3. More Contemporary Forms of Unity in the Park: Public Usages Today*

Quebrada Macul has evolved from its origins as a simple ravine in Peñalolén to become a park of metropolitan renown. Following quantitative analyses utilizing secondary data provided by the Municipality, we found that the park has been visited by an average of 147,390 visitors each year during the 2021–2023 period, coming from the 34 municipalities conforming the conurbation known as Greater Santiago, but also from visitors coming from other regions of Chile. Nevertheless, the larger proportion of visitors comes from nearby municipalities, particularly from Peñalolén (Figure 2a below). Indeed, while the Municipality of La Florida shares the lower boundary of the park and has a total population 50% larger than Peñalolén, visitors from Peñalolén more than doubled those from La Florida. In relative terms, the number of visitors coming from Peñalolén during the last three years represents more than 36% of the total population of the municipality (Figure 2b).

As Quebrada Macul Park attracts visitors from all Greater Santiago municipalities, it can be seen as a metropolitan-scale recreational area, providing free and open access to the mountains for residents of the whole city, independently of their socioeconomic status or financial capacity. Furthermore, data indicate that the majority of visitors originate from municipalities adjacent to Peñalolén areas, which are economically less affluent compared to those located in the eastern part of Santiago (compare Figure 5b,c). This is key in a city like Santiago, where residential segregation and economic inequalities are still a relevant problem, both at the city (Figure 5c) and municipal (Figure 5d) levels. Indeed, Peñalolén resembles the level of segregation of the city level, showing contrasting clusters of areas of low vulnerability spatially separated from those of high vulnerability (Figure 5d).

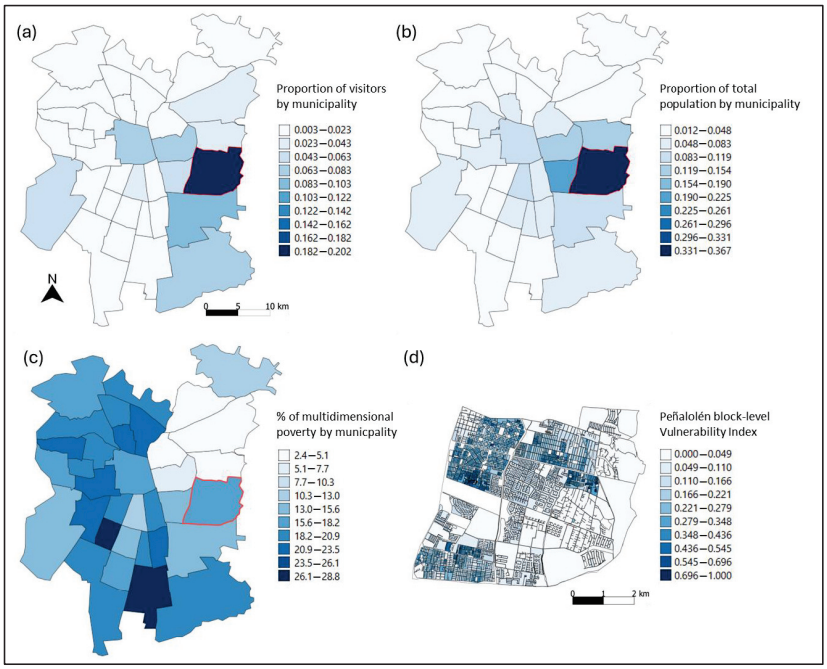


**Figure 5.** Additional characteristics of the study area. Figures represent: (**a**) proportion of the total number of visitors (period 2021–2023) by municipality conforming the Greater Santiago area; (**b**) proportion of the total population of each municipality represented by the respective number of visitors (period 2021–2023) coming from those municipalities; (**c**) percentage of people living in each municipality categorized in poverty conditions by the Casen 2017 national survey multidimensional index; (**d**) vulnerability index at the block level for the municipality of Peñalolén based on the Chilean 2017 Census data, higher numbers corresponding to higher vulnerability. Red lines in figures (**a**–**c**) indicate the urban boundaries of Peñalolén municipality shown in (**d**). Visitors' data for figures (**a**,**b**) were provided by the Municipality of Peñalolén.

The park enjoys convenient access via a major thoroughfare, where its primary entrance is situated. Visitors typically arrive either by public transportation, disembarking within a short walking distance of approximately two kilometers, or by car, utilizing nearby parking facilities.

As shown above in Figure 5, the geographical distribution of visitors over the past three years illustrates that the park now attracts guests from across the entire Metropolitan Region and beyond. This shift is highlighted by a marked increase in visitors from various parts of Santiago and other regions, attracted not just for leisure but also by the park's rich biodiversity, although mostly representing people from Peñalolén and nearby areas, excluding the wealthier western neighborhoods. This change signifies a departure from its earlier identity as merely a local spot, reflecting a broader public usage and appreciation that transcends its original communal boundaries.

The park's status as a cherished green oasis in an urban setting is underscored by being "connecting with nature", the central theme that visitors referred to as the motivation to visit (to have an idea, 15/48 of our interviewees gave this as their principal motivation to visit the park, namely, around one third of the total of interviewed people during participant observations), followed by "disconnect from the city" as the second central theme (12/48 of our interviewees gave this as their principal motivation to visit the park, namely, a quarter of the total of interviewed people during participant observations). These qualitative data highlight the park's role as a sanctuary amidst the concrete landscape. The social dimension

of the park is also evident, with "spending time with friends" (7/48) and "with family" (4/48) emerging as significant motivations, mentioned five and four times, respectively, affirming the park's role as a cornerstone for community gatherings. The emergence of activities such as sports and trekking reflects the park's evolving allure, attracting a wide array of visitors seeking diverse experiences (Field Notes, PO1[7]).

The swell in visitors from across the Metropolitan Region denotes a shift in the park's role from a local to a metropolitan amenity, potentially diluting its historical narrative yet simultaneously creating new platforms for social interactions. Throughout our observations, the park's diverse use by various groups was evident. Notably, school groups utilized the park for their year-end activities, with a teacher highlighting Quebrada Macul's accessibility and educational value as primary reasons for their selection (Field Notes, PO1), although there was limited engagement between children from different schools. We also documented a group of approximately 30 adults from Peñalolén's public health service, catering to chronic disease patients (Field Notes, PO1). On a similar note, a group of young people was seen enjoying the park for its social and natural appeal (Field Notes, PO1).

As mentioned, the notion of "escaping the city" was a recurring motif across all participant observations. Visitors consistently described their time in Quebrada Macul as stepping into a different world, one that offers respite from the urban rush of Santiago. This feeling of retreat from the city's bustle is more than just a physical distance—it represents a mental and emotional sanctuary for urban dwellers. A 32-year-old visitor, who we encountered during participant observations and then had the chance to interview, encapsulated this sentiment by sharing his transformative experience within the park's natural embrace, suggesting that the park's environment allows for a temporary dissolution of the city's invisible yet pervasive boundaries.

> "So, and we, at least when I go there, I share with the kids, "kids, if you are going to get into the waterfall, focus your mind. Be thankful you're here, be thankful you're underwater," and that's how we do it. We go underwater and we always ask for something from nature, to give us focus, to give us energy to be able to rethink ideas as I said, to be able to make decisions correctly and not in a crazy way. To get here from the city and they can have a clearer vision of what they need to do. In other words, if they have the shit or the muddy in certain things, everything has a solution. Or if they're sad or something, life goes on; They have to keep fighting."
>
> "On a psychological level, yes, it's an escape. So, if [the hill] is not there, I think it would have a significant psychological impact on people. There's no hill, there's no water".
>
> (Hernán, long-term resident)

The waterfall area is particularly bustling on a Sunday with approximately 100 visitors engaged in a variety of leisure activities, like bathing, sunbathing, and talking. Despite the presence of large groups and an apparent blurring of boundaries, social interactions predominantly occurred within established circles (Field Notes, PO4).

While previously formed relationships often dominate the interaction patterns within the park, its environment does encourage the creation of diverse social groups. The formation of socially heterogeneous groups for park visits represents a new form of communal engagement within the park's space. One example of this is the initiative of an interviewee to create a WhatsApp group for members of a sports club, bringing together a diverse mix of 8 adults and 3 children from various districts of Santiago for group outings to the park, illustrating the capacity of parks to serve as venues that encourage the formation of new relationships across established social divides (Field Notes, PO4). This is complemented by another group observed who met exclusively to visit the park through Facebook, despite members not knowing each other beforehand (Field Notes, PO4). One of our interviewees also mentioned initiating various groups to visit the park, coordinating through WhatsApp

or other platforms, with participants hailing from different districts across the city (Field Notes, PO3).

> "[And they suddenly meet right there on the hill?] Sure, 'and –they ask- when do we go up again?' 'When we can!' [he replies]. So, you create a WhatsApp group, it's all different nowadays. And we're already on our way!"
>
> (Hernán, long-term resident).

The evolving significance of Quebrada Macul indicates a shift from its historical context of political activism to a contemporary focus on environmental stewardship, a sentiment that resonates strongly with the new generation. The park is now celebrated as an urban retreat, providing a vital connection to nature amidst the cityscape. This change has welcomed a new cohort of visitors to the park, who, while differing from past activists in their relationship with the ravine, they share a commitment to cultivating and maintaining the park's ecological and communal integrity.

These new guardians of the park prioritize environmental preservation and education, seeking to embed these values within the community, particularly among the youth. One informant passionately argues for the integration of environmental education into the school curriculum, underscoring the necessity of nurturing a sense of environmental responsibility from a young age:

> "I would like them [authorities] to add the specific branch of environmental education to the curriculum in schools. I think this is a struggle for all environmental educators, a permanent struggle [. . .]. It is very shocking that they [still] talk about the polar bear or that they talk about the giraffe, the rhinoceros, whereas in Chile we have a good [different] fauna. In schools, I think that this is the important change for the new generations".
>
> (Miguel, park employee)

This educational initiative can be seen as crucial for ensuring the continued protection of green spaces within urban confines, helping to mitigate the effects of urban segregation by fostering equitable access to natural resources and sustainable practices. The modifications at Quebrada Macul, with an aim to enhance safety and environmental preservation, have generated varied responses. A discernible continuity of struggle is observed among those deeply connected to the park's legacy, now channeled into a commitment to environmental stewardship—a contemporary reflection of the historical effort to retain the hill for the Peñalolén populace. This enduring dispute underscores a tension between traditional public access rights and the imposition of new rules that limit activities once freely enjoyed, such as barbecuing in the ravine. Park rangers, the enforcers of these new policies, face some resistance as they guide visitors towards sustainable practices. Although the initial resistance to these changes is gradually waning, a sense of nostalgia for the past freedoms of the park remains palpable among those who recall the days of fewer restrictions.

As Quebrada Macul evolves, it is increasingly serving as a hub for a multitude of interactions, bringing together groups and individuals from across the spectrum. This transformation has positioned the park as a communal crossroads where the usual barriers of social and geographical segregation become less pronounced, fostering a space where diverse demographics converge. The park's ability to provide escape and leisure is a testament to its value as a public space, standing in contrast to the segregated nature of urban environments where such tranquil refuges are often unequally distributed.

At its core, the park has served as a vivid representation of the broader discussions surrounding micro-segregation, oscillating between private and public ownership. Initially, disputes centered around landowners, municipal authorities, and the local populace. More recently, the discourse surrounding the park has evolved into a debate on the permissibility of various activities, contrasting newly implemented conservation-oriented regulations with established freedoms. Our research did not reveal segregation explicitly based on economic status or residential location within the city. However, it was observed that while intergroup interactions are often initiated outside the park—via social media or through

connections like sports clubs and health organizations—within the park, these groups predominantly engage in their activities, showing limited interaction with others despite the fluidity of social boundaries.

The appeal of Quebrada Macul, attracting people from different districts and backgrounds, offers a precious opportunity for fostering desegregation, particularly within urban areas. The park's transition from a battleground of social activism to a hub for environmental learning mirrors a shift in community engagement and priorities, indicating that despite the evolution of the struggle, the park continues to play a pivotal role in shaping the community's identity and shared experiences. These developments underscore the ongoing struggle for equitable access to green spaces in urban areas, reflecting a microcosm of larger societal debates on segregation, community rights, and the evolving relationship between urban dwellers and their environment.

## 5. Discussion

The findings of this research illuminate the contentious dynamics of public–private negotiations over spaces, often culminating in significant conflicts among diverse social groups, particularly within the realms of segregation and micro-segregation. In the specific context of Peñalolén, a district characterized by its socioeconomically diverse population, affluent landowners initiated a substantial redevelopment project aimed at transforming the hills into a complex for the upper class, including a university, an event center, and upscale housing. This action was counteracted by the concerted efforts of social and ecological leaders, who volunteered their time to champion the collective cause of preserving the Quebrada Macul ravine for community access, effectively halting the privatization process. Such conflicts highlight the underlying power struggles over spatial occupation, where the battle for physical space simultaneously represents a contest over symbolic control and the assertion of rights by different groups (Di Masso & Dixon, 2015 [55]). The successful prevention of privatization by socially and ecologically minded leaders exemplifies a collective triumph. This event captures the essence of the struggle for spatial justice, as the community's efforts to reclaim the ravine also served as a bid for social empowerment, resonating with the concept that place struggles are replacing traditional class struggles, as posited by Lussault (2015) [93].

Previous studies have emphasized the importance of public spaces in understanding segregatory dynamics within cities (Goicoechea, 2018 [94]; Legeby, 2012 [95]). Similarly, research has revealed unequal access to green areas within urban areas, with negative effects on residents' quality of life based on their geographical location within the city (Goicoechea, 2018 [94]; Mayen, 2022 [67]; Kephart, 2022 [68]; Saporito & Casey, 2015 [69]). Therefore, this research incorporates Quebrada de Macul Park as a green space symbol of the struggle for public space in segregated contexts, complementing existing research on segregation and micro-segregation dynamics in green spaces. Additionally, it addresses processes of privatization around public green spaces (Low, 2005 [96]; Velázquez, 2008 [97]). However, unlike existing literature on the subject, the present study aims to highlight the role played by narratives and social discourses in the struggle against spatial inequality, the citizen recovery of privatized areas, and the fight for inequitable access to green areas.

This disparity prompts a reevaluation of the role governmental bodies play in developing and distributing green spaces to mitigate segregation and foster inclusivity. Recent research underscores the importance of vegetated areas in facilitating social connections and enhancing community well-being, positioning green spaces as essential components in the fight against urban segregation (Bazrafshan et al., 2021 [71]; Callaghan et al., 2020 [72]; Jabbar et al., 2022 [60]; Reyes-Riveros, et al., 2021 [61]). Thus, green spaces are identified as crucial arenas for understanding and addressing urban segregation and micro-segregation, revealing the complex interplay of intergroup dynamics, spatial disputes, and the quest for equitable access to nature.

Further exploration reveals that the challenges of urban planning in Chile, notably the loss of natural ecosystems and the adverse impact of urban sprawl on biodiversity, are

intricately linked to the dynamics of social group interactions and psychosocial processes, sometimes leading to re-segregation and territorial stigma (Fernández et al., 2018 [98]; Pinto de Carvalho et al., 2023 [99]; Angelcos et al., 2020 [100]). Recognizing and addressing the political and social narratives surrounding the allocation and use of such spaces are crucial for exploring the psychological dimensions of place attachment and identity. These efforts contribute to a broader understanding of how communal ties and memories associated with physical spaces can influence collective actions aimed at overcoming urban segregation and fostering a more inclusive cityscape.

Despite these complexities, the findings of this study reveal a nuanced tension underlying the efforts to preserve Quebrada Macul: a balance between safeguarding the environmental integrity of the space and accommodating its traditional uses by the community. This balance is complicated by the differing power dynamics introduced by environmental education initiatives, which, while beneficial, introduce new paradigms of rights and responsibilities. These initiatives favor environmental rights, potentially at the expense of the "acquired rights" of the original inhabitants, who have historically engaged with the space in ways now deemed unsustainable. In the current case of Quebrada Macul's park, these processes could hint at a subtle form of segregation, where the park's accessibility and offerings may appeal differentially to various social strata and demographics, potentially influencing the types of interactions and experiences within its bounds. These phenomena underscore a complex interplay between the need for ecological conservation and the recognition of the traditional community's historical and social ties to the land. The challenge lies in navigating these power disparities, ensuring that environmental education does not inadvertently disenfranchise the very people who have been the stewards of Quebrada Macul, but rather integrates their lived experiences and rights into a holistic approach to environmental stewardship.

In summary, Quebrada Macul's history encapsulates ongoing conflicts over its identity, oscillating between being a communal refuge and a target for privatization. This struggle reflects larger patterns of urban gentrification and the displacement of traditional communities, raising concerns over inclusivity and the right to the city for all residents, regardless of social standing. Through this lens, the park's narrative offers critical insights into the struggles for social equity, environmental stewardship, and the right to the city in the face of ongoing urban development and segregation, emphasizing the vital role of public green spaces in the broader discourse on equitable urban development.

## 6. Conclusions

The transformation of Quebrada Macul from an open hill freely accessed by the community to a regulated metropolitan park illustrates the intricate challenges involved in the use and struggles over urban public spaces. While the implementation of environmental conservation measures is crucial for the park's long-term sustainability, it has sparked a reassessment of community traditions and practices. For some, regulated access symbolizes the loss of a cherished freedom, reflecting broader socio-political debates on the right to public spaces. Community narratives highlight a profound connection with Quebrada Macul, transcending its physicality to embody the collective memory and identity of Peñalolén's residents. The park has historically been, and continues to be, integral to their way of life, shaping their individual and communal identities, whereas it has been changing over the last decades by its massification.

All in all, the fight for the park has catalyzed activism within Peñalolén, driven by the personal histories of community leaders and broader socio-political dynamics. The park's narrative serves as a microcosm of the city's broader struggles, reflecting power dynamics, social disparities, and the resilience of a community facing attempts to reshape their environment. Its story stands as a testament to the community's steadfast determination to preserve their social and environmental heritage.

Thirdly, and finally, this research adds evidence to the idea that parks possess the potential to counteract entrenched patterns of micro-segregation within urban environ-

ments. Our research underscores that, while groups within parks maintain a degree of internal homogeneity, they coexist without clear delineations, fostering fluid boundaries. At times, these groups converge in different park settings, driven by a shared desire to utilize the space. We also found that some heterogeneous groups were formed, considering co-ordination between unknown people before the visit, when the motivation to escape the city was the common ground to meet each other. We conclude that Quebrada Macul Park offers an alternative to traditional urban landscapes, not only providing greenery and natural elements but also nurturing a collective social identity that transcends individual group affiliations. This shared participation in park activities and the appreciation of ecological aspects contributes to a sense of unity and belonging within the community and its history.

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**Data Availability Statement:** Every transcript of in-depth interviews can be provided if the corresponding author is reached; the audio files will not be provided for ethical reasons (confidentiality). Also, field notes and guidelines for participant observation can also be provided. The quantitative database is the property of a public institution, so its delivery cannot be committed to if requested: the authors undertake that they will attempt to do so.

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## Appendix A

*Appendix A.1. Summarized Interview Guideline Translated from Spanish*

Appendix A.1.1. Setting

- The person is in a comfortable space. It is suggested that they have something to drink, cell phone on silent and tell key contact(s) that they will be in an interview so that they can talk calmly, etc. Ask if she is comfortable and then begin the interview.
- The Informed Consent is reviewed, and doubts are clarified. The signature of the document is requested in case of agreement.
- At the end of the interview, complete the Identification Form with demographic data, remembering that all these data will be replaced by fantasy data to protect confidentiality. Finally, request any documents that the participant may have in his/her possession to include in the documentary review strategy.

Appendix A.1.2. Beginning and Rapport

To begin with, I would like to get to know you a little bit more:

- [If you are a key informant] Tell me a little about where you work and what your role is. [If you are a neighbor] Tell me a little about where you live and how long you have lived [define neighborhood or street intersection].
- How long have you known the Macul ravine?
- How has your relationship with the Macul ravine been historically? And currently?

Appendix A.1.3. Place History and Key Agents in the Park

Now I would like you to delve a little deeper into the history you know about the ravine, as well as what stages and key characters you remember in this history:

- To do this, first I am going to ask you to draw a timeline and mark the significant milestones and main actors that you consider relevant in the history of the Macul ravine, from your perspective. [Allow 10 min of silent work].
- Now tell me a little bit about what you wrote on the line and why those milestones and characters seem important to you.
- What would be the main historical stages you identify in the ravine? How would you describe them in terms of the uses given to the park and the meanings associated with it? [After talking, ask him to mark these stages on the line with another color].

Appendix A.1.4. Place Meanings and Shared Memories in the Park

Taking into consideration the historical process and its protagonists that you have just told me about:

- First, how much do you think the neighbors of Peñalolén know about the history of the ravine and its protagonists?
- How do you think the neighbors of Peñalolén have historically conceived the ravine, that is, what do you think it has meant to them?
- How many types of people and groups do you think have been linked to the ravine historically and currently? Can you describe these groups for me?
- What are the meanings that these groups construct in relation to the ravine? What are the similarities and differences between the meanings that the ravine has for these different groups that relate to it?
- In your opinion, how have these meanings changed over time?
- What role do you think the ravine plays in the identity of these groups? Do you think it is part of their sense of belonging?
- Which of the above groups do you identify with and what place does the park have for you and your group?
- If it did not come out spontaneously, tell us that today the ravine is being managed by the municipality as a free natural park. How do you think the Quebrada de Macul Park is perceived today?

Appendix A.1.5. The Park's Role in the Community's Identity and Future Projections

To end the interview and thinking about the role that this park has in the commune of Peñalolén more transversely:

- What do you think the Macul ravine has meant for the commune of Peñalolén? And what does it mean nowadays?
- What would you like QM Park to be like in 5 more years? Why?
- Is there any aspect of QM Park that you would like to change? Which one? It can be more than one.
- Is there any aspect of QM Park that you would like to keep or maintain as it is now? Which one? It can be more than one.
- Finally, let's do an imaginary exercise: if in another month the authorities of the commune announced that they were going to privatize and close QM Park to install a commercial space instead: What do you think would happen to the community with this decision? Which groups of the community would react and how? Why do you think these reactions would happen?

Appendix A.1.6. Closure

Thank you very much for this interview. It is interesting to hear your perspective on [complete with core elements of the discussion].

Before concluding, would you like to add anything that we have not discussed or emphasize some of the topics discussed that seem particularly relevant to you?

[Demographics to characterize the qualitative sample]

*Appendix A.2. Participant Observation Guideline Translated from Spanish*

Appendix A.2.1. Sample Information

- Day and time
- Observed place
- Who observed
- Time of observation

Appendix A.2.2. First Observation Axis

Description of socio-spatial environment: main locations, limits or boundaries of the space, general characteristics, description of sanitary conditions of the site, observation of trail signs and directions, maintenance/condition of trails, site furnishings and infrastructure, functionality of surfaces for various travel needs, presence of messages or signs, etc.

Appendix A.2.3. Second Observation Axis

Description of behaviors observed in the space and definition of main places of use (remember that a place is a space that carries human meanings and practices, which may constitute attachment/identity): which places are used the most; which places are used the least; how are places used; which behaviors are repeated; which isolated behaviors seem interesting and why; etc.

Appendix A.2.4. Third Observation Axis

Description of people who have visited or are visiting the park: Composition of groups of people/types of groups of people, what are/were they like; how many are/were they; what kind of behaviors do they display/show (whether they are families, groups of friends, etc.).

- Registration of demographic characteristics of the groups in a digital survey, applied face-to-face: see Annex 2 (bis) for details.
- Meanings of place associated with visitors, indicating the socio-demographic group to which they belong.
- Drawing of the stream and its uses (freehand, it is suggested to circle the number of people present in a given place and describe in 1-2 words their main uses and socio-demographic characteristics).

## Notes

1 Photographs were taken carefully attending confidentiality, not showing any identifiable face except researchers in the field—see Photograph 1.

2 N Sampling corresponds to people directly interviewed by the research team, whereas N Extended represents an approximation of people observed in the place, considering counting each group. For big groups, we considered an average of 30 people or more.

3 We contacted one person related with administration of parks and green spaces at the Municipality who provided us with an excel sheet containing anonymized data collected at the park entrance since 2021. This brief identification survey at the entrance yielded information such as: (i) the number of visitors, (ii) the municipality where the visitors reside, (iii) the ages of the visitors and (iv) the specific areas in the river they visit.

4 More detailed information on age and other demographics has been omitted in order to protect the confidentiality of the data, while highlighting the key role played by each interviewee.

5 URL: https://www.google.cl/maps/@-33.4797703,-70.5246359,3a,75y,151.46h,94.13t/data=!3m6!1e1!3m4!1sKO8VET7BX-y1JxNvEKso5w!2e0!7i16384!8i8192?entry=ttu (accessed on 7 May 2023).

6 Villa Grimaldi was a center where individuals were kidnapped, tortured, and exterminated. It was linked to human rights violations perpetrated by state agents during the dictatorship of Augusto Pinochet (1973–1990). In 1994, the site was opened to

the public as a place of memory. This designation applies to significant spaces that serve as a collective repository of past events, whether commemorated or not. These events may include acts of violence, such as murder or confrontation, or the erection of memorial objects, such as monuments or walls of names (Piper-Sharif, Fernández-Droguett & Iñiguez-Rueda, 2013 [92]). The site was opened to the community in 1994 and has since been inaugurated as part of the Peace Park, thereby consolidating its status as a place of commemoration and culture in Santiago (villagrimaldi.cl).

7 PO meaning Participant Observation a indicated in Table 1 (page 6) and the parragraph's number were data was coded.

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# Exploring Spatial Proximity and Social Exclusion through Two Case Studies of Roma Settlements in Greece

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**Abstract:** Roma groups in Greece are a long-standing socially deprived population that faces extreme social exclusion and segregation. Their marginalization includes limited access to education, employment, and housing. This paper explores their spatial position and social exclusion, comparing the social profile and life conditions in two case studies of Roma settlements with those of the municipal and regional units to which they belong. Methodologically, we analyze quantitative data from the 2011 Population Census to measure life conditions at three levels (settlement, municipal unit, regional unit), and we also use qualitative data from interviews with representatives of local agencies and residents of the two settlements to document our hypotheses on the causal relations between the spatial position and the social exclusion of Roma groups. The comparison shows that the two Roma settlements are clearly different from their entourage, assembling the lowest positions in the labor market, the weakest performances in education, the largest households, and the worst housing conditions. This case of extreme social exclusion in ghettoized spatial proximity raises the question about the significance of micro-segregation and the way it works in different contexts, as well as the need for further research for a more comprehensive understanding of the relation between social inequality and spatial distance.

**Keywords:** Greece; Roma; exclusion; deprivation; segregation; micro-segregation

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## 1. Introduction

Three young Roma, between 16 and 18 years old, were shot dead by police officers during the last two years in Greece. The Roma protests that followed confirmed the issues of stigmatization, social exclusion, and institutional exclusion that affect Roma ethnocultural groups in Greece [1] and in other European countries [2]. In recent years, EU organizations have provided an increasing amount of information about the poor conditions of life and the violation of the fundamental rights of a substantial part of the Roma population [3]. Different forms of anti-Roma prejudice engrained on "institutional racism" obstruct the capacity of Roma communities in Greece to claim and exercise their rights [4]. Moreover, the stigmatization and marginalization of Roma groups is a persistent feature of Greek society.

Roma are the largest ethnic minority group in the EU. Out of an estimated total of 10–12 million in Europe, about six million live in the EU, and most of them are citizens of an EU country. The estimated population share of the Roma in 2012 ranges from 10.3% in Bulgaria, 9.1% in Slovakia, 8.3% in Romania, 7% in Hungary, 2.5% in Greece, 2% in Czechia, and 1.6% in Spain, to less than 1% in most of the other EU countries [5].

Excessive force, police brutality, and misconduct against Romani people continue to be reported across the EU, in line with the 2020 findings of the European Union Agency for

Fundamental Rights [3]. The FRA report also revealed that Romani people are subject to widespread poverty, inadequate living conditions, poor health, exclusion from the labor market, and harassment [2].

The aim of this paper is to explore the spatial proximity and social exclusion of Romani people in Greece, using the detailed data on two settlements (*Dendropotamos* and *Kritiri*). These two settlements have different characteristics. The former is at the periphery of the metropolitan area of Thessaloniki, and the latter is at the outskirts of a small town (Tyrnavos) within a rural area in the region of Thessaly in central Greece. The two settlements are investigated in terms of social profile and spatial exclusion, providing evidence on the intensity and form of the segregation and social exclusion of Romani people in Greece. This exploratory investigation uses a mix of quantitative and qualitative methods in a complementary way.

On a broader level, this paper raises the issue of simultaneous social mix and exclusion in space. Usually, social mix is understood as the opposite of exclusion, referring to neighborhoods where social mix entails the cohabitation of diverse groups in its space. Roma settlements illustrate a different situation: administratively, such settlements are often part of a neighborhood with a socially mixed population but, at the same time, are extremely excluded within it. In fact, they are ghettoes populated exclusively by Roma groups. Roma settlements provide further evidence that spatial proximity does not necessarily entail social proximity [6], and that the question of micro-segregation [7] is multidimensional in terms of form as well as in terms of its impact on social reproduction.

## 2. The Social and Spatial Isolation of Roma Communities

Starting from the Chicago school, spatial segregation corresponds to social distance [8] in the form of a horizontal separation between neighborhoods, bearing distinct social, racial, and ethnic characteristics. The question was socio-spatial isolation, and assimilation processes were considered the main route of integration in the American reality. Today, these approaches seem interpretatively simplistic. Concepts such as the global and dual city involve processes of globalization, economic restructuring in a neoliberal context, and highlight intense polarization in the city as a form of segregation arising from new economic processes, leading to deepening inequalities and exclusions of social, ethnic, and racial groups [9–11]. In the European city, the particularities of the historical and social context contributed to a less intense and more complex form of segregation [12]. On the contrary, the spatial isolation of Roma groups in Europe looks much less connected to intricate economic processes and much more to offensive discrimination and intense segregation.

The question of Roma segregation and exclusion is far beyond the debates on segregation forms in Western cities and the impact of globalization and neoliberalism on urban diversity and inequality. The territorial confinement and social exclusion of Romani people is related to archetypical, yet still persistent, forms of extreme out casting throughout urban history [13,14], which even the inclusive policies of the welfare state failed to eradicate [15].

Most Roma settlements in the EU are located on the outskirts of cities or villages, separated from the 'mainstream' population by artificial obstacles (e.g., walls, roads, railways) or natural barriers (e.g., rivers, forests). Many of these settlements are not connected to water pipelines or sewage treatment and are close to landfills and to areas that are regularly flooded. The location of these settlements confirms evidence that access to social services and natural resources, as well as exposure to environmental risks are not equally distributed. The class and/or ethnic profiles of neighborhoods play an important role. In other words, the risks and distributions of adverse effects have a tendency to be imposed more on those who do not possess sufficient resources for their own protection and/or are disempowered, socially marginalized, and discriminated against [16,17]. Roma settlements provide extreme evidence of the unequal spatial distribution of advantage and disadvantage.

Attempts to build walls and segregate Roma settlements because of their different ethnic origin, class, or culture developed in central and eastern Europe (mainly in the Czech Republic, Slovakia, and Romania) in the post-socialist period and the rapid transition to the capitalistic economy. These attempts provide vivid illustrations of the perception of decision makers (and often of the majority) that isolation using cement and bricks may solve social and economic problems. The Roma ethnic minority should stay behind the wall [17]. The social and economic conditions for Roma groups, always worse in comparison to the non-Roma population, deteriorated rapidly during the transition period.

In southeastern Europe, and especially in Serbia, the spatial segregation of Roma settlements within cities is shaped by the long-standing ethnic distance and social exclusion. The broader context from the pre-socialist period historically formatted the background in which Roma settlements emerged in Serbia, as well as their current demographic, legislative, and urban degradation. Several forms of the segregation of Roma settlements include segregation as a consequence of racist hostility, institutional discrimination by city administration, and development-based conflicts. Examples of setting up a wall enclosing a Roma settlement in Kruševac, racist pressures that prevent the construction of housing for Roma in Belgrade, and the reluctance to improve and legalize Roma settlements in Novi Sad illustrate the various manifestations of segregation and division of urban space in Serbia [18].

The social exclusion of Roma in Europe as 'a phenomenon of exclusion from participation in social life, either due to a lack of basic skills and lifelong learning opportunities or as a result of discrimination' [19] is at the core of the EU approach to tackling this phenomenon through a range of institutional provisions, funding, and policies. However, the issue of social segregation, race discrimination, stigmatization, and spatial marginalization against social groups continues to be a further challenge for the debate that historically started from the human ecology approach of the Chicago school and the Jewish Ghetto [20]. This has been further discussed regarding the development of the Black ghetto [21] and its comparison with other forms of spatial marginalization [22].

A parallel debate appears in EU studies on the social exclusion of Roma communities under the lens of race and postcolonial approaches [23,24]. Moreover, studies regarding the social exclusion of Roma communities in Europe were developed especially after the enlargement of the EU and the admission of the former eastern socialist bloc countries [24–26]. Here, the discussion is enriched combining the class position with the spatial management of Roma groups in ghettoes (using walls or other physical barriers) [27]. This spatial management is a governance device operated by the dominant social groups, mainly by avoiding the symbolic 'contamination' of mainstream society through the spatial isolation of the undesirable motifs of delinquency and danger associated with Roma settlements in collective representations.

## 3. Roma Groups in Greece

### *3.1. Life Conditions, Roma Identity, and Ghettoization*

The Roma population in Greece, a mosaic of diverse—and sometimes conflictual—communities with unequal degrees of societal integration, is a de facto minority group. No accurate demographic information is available on the number of Roma living in the country. International organizations' reports provide varying estimates—ranging from 100,000 to 350,000 people, out of a total of approximately 11 million population in Greece [28]. Most Roma communities in Greece have a centuries-long presence in the area, preceding the establishment of the modern Greek state (1830). According to the estimation of the General Secretariat for Social Solidarity and the Fight Against Poverty [29], the number of Roma in Greece was approximately 117,500 or 1.13 percent of the country's population in 2021. This estimation is based on a survey of the country's 332 local authorities. In detail, 145 participated in the mapping, 122 responded that there was no Roma population in their territory, and 65 did not respond. The Roma population is probably greater than this estimation since several local authorities did not respond, and the mapping by those

who responded may not have been exhaustive. Other estimations raise the number of Roma in Greece between 160,000 and 220,000 [30] or more.

Greek Roma are composed by two distinct groups. The first is a relatively small group of approximately 20,000 Muslim Roma in the country's northeastern region of Thrace [31]. They are part of the broader Muslim minority recognized as such by the Treaty of Lausanne (1923), which allowed the stay of Muslims in the region of Thrace, despite the complete ethnic cleansing between Greece and Turkey in the early 1920s. The second and larger group of Roma were labelled "aliens of Gypsy descent" by the Greek authorities and remained effectively without nationality until the early 1950s. Naturalization processes started in 1955, when the country's Citizenship Code was amended. However, most Roma were granted citizenship after the fall of the military dictatorship (1974) [4,32].

The Roma population is spatially concentrated: 60 percent live in 20 municipalities (our of 332 municipalities in Greece) with at least 2000 members [29] (p. 34). A very large part of this group lives in totally segregated settlements, i.e., in settlements with exclusively Roma population and in peripheral degraded areas of Greek cities. This enhances school segregation (see also [3] (p. 40) by forming school units comprising only, or with a large percentage, of Roma children, which usually drives the non-Roma parents to develop strategies to avoid these schools.

A recent survey registered the harsh living standards and the limited mobility prospects faced by the Roma communities [33]. Importantly, 25.6 percent of the 125,000 Greek Roma identified in this survey live in substandard housing, and a further 22 percent squat illegally in settlements described as "shanty towns". According to a more recent report by the General Secretariat of Social Solidarity and Fight Against Poverty [29], 80 percent of the Roma population was living in ghettoized settlements in 2021 with very low housing conditions and very poor accessibility to basic amenities. These settlements are divided into three categories (labelled I, II, and III) in terms of housing quality and location. Type I comprises areas of extreme degradation (slums) where living conditions are not acceptable, with barracks, other precarious constructions, and a complete lack of fundamental infrastructure. Type II are settlements, usually at the outskirts of small or medium size agglomerations, with a mix of precarious housing forms (barracks, tents, mobile homes, containers, etc.) used as permanent residences, and with some elements of infrastructure (streets, water, and electricity supply). Type III are labelled 'neighborhoods' made of regular housing units (independent or apartments) mixed with mobile homes and containers, usually located at the degraded part of urban areas [29]. Type I hosted about 10 percent of the Roma population, and type II and III hosted 40 and 30 percent, respectively, while the rest (20 percent) lived more dispersedly within or outside urban tissues [29]. Those living more dispersedly usually have regular housing units (74 percent) and much better housing conditions than those living in settlements [29]. Type I settlements are usually outside the official city plan; type II are equally divided between locations within and outside city plans; and type III are usually within. Those living more dispersedly are almost always located in areas within city plans [29].

The evidence on the poverty and exclusion of Roma groups in Greece is presented in this paper, with a focus on the profile of two important Roma settlements in central and northern Greece (Figure 1).

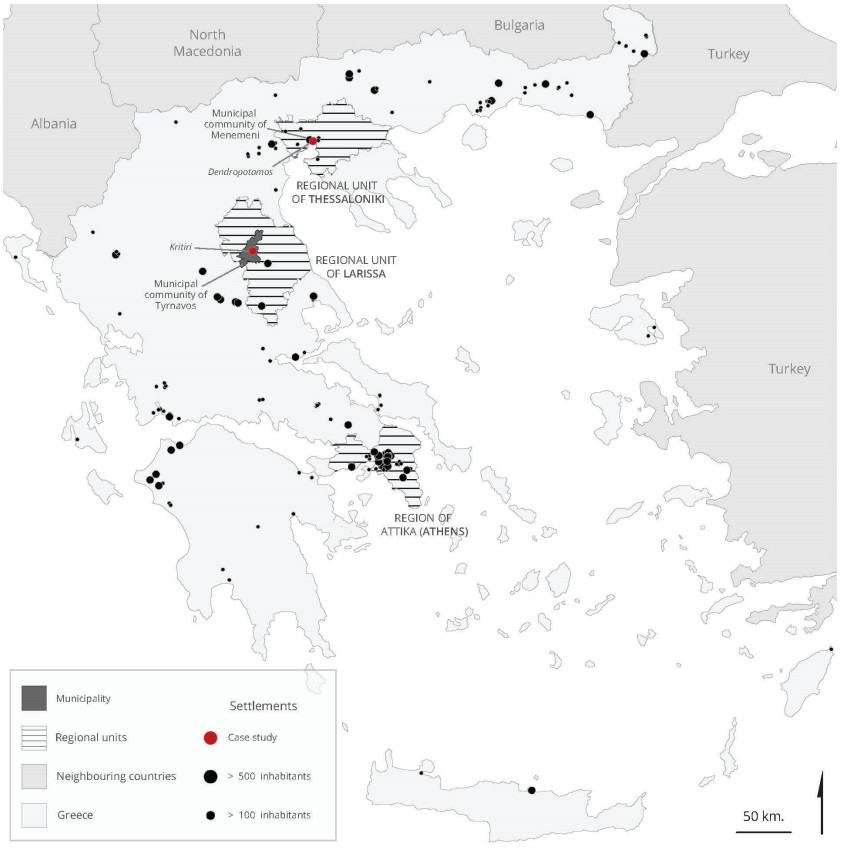


**Figure 1.** The two case study Roma settlements (*Dendropotamos* and *Kritiri*) and the distribution of Roma settlements (>200 inhabitants) across Greece. Mapping SN Spyrellis, data source [34].

Unemployment within the Roma population stands at 61.7 percent (compared to 8.3 percent for the general population, aged 15–64), with Roma women appearing to be completely absent from formal paid employment. With regard to education, almost half (41.2 percent) of Greek Roma are illiterate (compared to 1.2 percent for the general population, aged 15–64), and only 17 percent of minors of compulsory schooling age are enrolled in schools, compared to 97.5 percent of the general population [33,35].

The socio-discursive construction of Roma "otherness" has been based on stereotypes that devalue the nomadic or sedentary culture of their communities. Moreover, it has been developed within a national context, where rejection has been the usual way to deal with "otherness" [36]. The Greek state does not consider the Roma population as a minority group, but rather as a vulnerable social group which nevertheless does not belong to the Greek ethnicity, according to dominant perceptions. This official position does not derive from concerns about potential claims by Roma as a minority group. It is rather an indirect consequence of the official concern to recognize any minority ethnic group in Greece—mainly Muslims in Thrace or Albanian origin groups—which could potentially facilitate claims of national territory by neighboring countries. At the same time, this official viewpoint is shared by Roma groups and associations who consider themselves an integral part of Greek society. In this line, rough conditions and integration difficulties are attributed to cultural differences and preferences. Government officials express the widely held belief that Roma are responsible for many of the problems they face. "The Greek State would like to fully integrate Roma, but they do not like that a different style

of life is imposed on them" [28]. Therefore, the state half-heartedly applies policies to integrate and overcome the exclusion of Roma despite not expecting significant results, while the dominant perception and claim of the group itself can be summarized to "we are no different from you. . ." (DEN.INT.02).

Although Roma people protested throughout Greece as a separate group against police violence and the death of a seventeen-year-old Roma boy, at the same time, they are opposed to be recognized as an ethnic minority and are suspicious of any institutional measure for positive discrimination in their favor. Living in a nation-state dominated by solid nationalism with entrenched hegemonic ethnic categories that are historically embedded in the structures of the new State, the Roma are perhaps the lowest (ethnic) category in the pyramid of power relations [37]. They tend to have a very low index of social mobility, even when compared to the new poor immigrant groups who massively arrived in Greece from the early 1990s to the late 2000s (i.e., Albanians, Pakistanis, Georgians, Bulgarians, etc.). The latter may be lagging behind 'mainstream' Greek society, but they have improved their situation since their arrival to Greece, while Roma groups remain in a condition of perpetual stagnation. Interestingly, there is a comparable situation between the stagnating conditions for the Afro-American minority and the social mobility of immigrants from different parts of the world in the US.

The issue of the social exclusion and segregation of the Roma is closely linked to the social construction of their otherness, the reproduction of stigmatization, and perhaps the failure of inclusive policies in Greece. At the same time, the extreme ghettoization of Roma seems invisible due to the social construction of their otherness, which 'justifies' their spatial togetherness with their social exclusion. In this sense, it is paradoxical that in the public debate the areas of concentration of immigrants at the center of Athens are often labelled as ghettoes—even though native Greeks remain the main ethnic group [38]—while settlements exclusively inhabited by Roma are rarely labelled as ghettoes.

### *3.2. Roma Communities and Multiple Deprivation in the Two Major Greek Cities*

In this part, we explore the spatial correlation between deprivation and Roma communities in Athens and Thessaloniki. This analysis depicts the relation between the social context of urban residential areas and the areas on which the Roma communities are established. The social profile of residential areas is depicted using the General Deprivation Index (GDI). The example of the two principal metropolitan areas in Greece, Athens and Thessaloniki, in which more than 44% of the country's population in 2011 were concentrated, is considered indicative. For the mapping of Roma settlements in 2016, presented by Linos et al. [34], we used a population threshold of 500 in order to provide a clearer pattern of the major settlements of this group, and also to protect the anonymity of smaller, lesser known Roma communities. The GDI analysis is made on the spatial level of URANUS [35], an aggregated version of 2011 census tracts, which divides Athens to 2999 and Thessaloniki to 884 spatial units with an average of 1200 residents. We used the data of the 2011 national Census since the 2021 census detailed data are not yet available.

The mapping of deprivation in Figure 2 is based on the methodology published in Karadimitriou et al. [39], analyzing the evolution of deprivation in Athens since the 1990s and in Karadimitirou and Spyrellis [40], comparing deprivation in the six largest Greek cities. The computation of the GDI, for the needs of this paper, takes into account three general domains (employment, education, and housing). We organized a detailed dataset which included 3883 URANUS of Athens and Thessaloniki and 20 variables organized into 10 groups, therefore providing a multidimensional estimation of multiple deprivation. The three domains are given equal importance in the calculation of the GDI (Table 1).

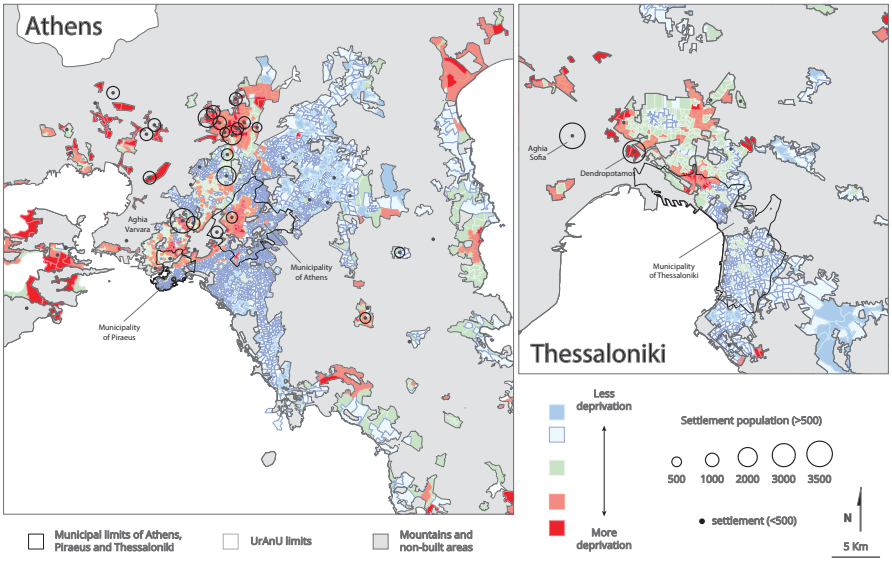


**Figure 2.** The spatial distribution of deprivation (GDI) in 2011 and the location of Roma settlements in 2016 in Athens and Thessaloniki. Source: Karadimitriou and Spyrellis [40], Linos et al. [34], adjusted by S.N. Spyrellis.

**Table 1.** Variables taken into account to calculate the General Deprivation Index per city, URANUS level 2011. Source: Karadimitriou and Spyrellis [40].

| Domain | Group | Variables (%) |
|---|---|---|
| Employment | Structural inactivity | Economically inactive<br>Women homeworkers (20–54 year old) |
| | Chances of access to employment | Unemployed<br>Young unemployed (15–34 year old))<br>Mature unemployed (50–64 year old)) |
| | Lack of role models | Managers and professionals (30–64 year old) |
| | Quality of employment | Routine occupations |
| Education | Lack of high Education level | Higher education (20–64 year old) |
| | Low Education level | Up to 9 years of education (20–64 year old) |
| | Education dynamic | Not in education (15–18 year old)<br>Not in education (19–27 year old) |
| Housing | Extremely negative housing conditions | Population in irregular dwellings<br>Population in dwellings without heating |
| | Lack of housing space and vulnerability | Population in dwellings with <20 sq m/cap.<br>Tenants in <20 sq m/cap.<br>Routine occupations living in <20 sq m/cap.<br>Unemployed in <20 sq m/ca. |
| | Tenure and vulnerability | Population in rented dwellings<br>Routine occupations among tenants<br>Unemployed among tenants |

This method was chosen to pinpoint the extreme scores, singling out the areas where values indicating higher deprivation are maximized. Subsequently, a step-by-step identification procedure for the most deprived areas was carried out. The variables were

standardized, according to the distance from the mean, in standard deviation multiples, singling out the areas where values indicating higher deprivation are maximized. Eventually, a deprivation index was calculated for each domain, and finally, a General Deprivation Index (GDI). This procedure was followed for each city separately, using as measurement a scale specific to each city, the local standard deviation, and the local mean.

In more detail, for an initial value of $\chi$,

- a value of 1 was assigned for $\chi <$ mean,
- a value of 2 was assigned for mean $< \chi <$ mean + 0.5stdev,
- a value of 3 was assigned for mean + 0.5 $< \chi <$ mean + 1stdev,
- a value of 5 was assigned for mean + 1stdev $< \chi <$ mean + 2stdev, and
- a value of 7 was assigned for mean + 2stdev $< \chi$.

A deprivation index was calculated for each domain (e.g., Deprivation Employment Index = (Group1 + Group2 + Group3 + Group4)/4), and finally, a General Deprivation Index (GDI) = Deprivation Employment Index+ Deprivation Education Index + Deprivation Housing Index with a minimum value of three and a maximum of twenty-one.

The calculation of the lack of housing space and vulnerability variables is linked to a '20 $m^2$ per capita' threshold. We define the 'population living under housing poverty' as the portion of the population whose per capita living space is less than 60% of the median per capita living space for the total population in each city.

The nuances of red indicate the more deprived areas, while those of blue are the less deprived. Green areas are close to the average. The black dots indicate the location of Roma settlements, while the size of the circles is proportional to their population. The capital's metropolitan area has a cluster of highly deprived areas in the city center and along the old industrial zone, as well as several deprived areas in the outer peri urban zone of the city, especially on its western parts. Deprivation in Athens does not seem to follow the traditional dichotomy [41] between western-working class-and eastern-bourgeois-areas. On the other hand, we observe a strong association between the location of Roma settlements and the level of deprivation. The central municipalities of Athens and Piraeus do not host Roma settlements, with the sole exception being those found in the ex-industrial extremely deprived zone of Eleonas in western Athens. The municipality of Agia Varvara, on the west of the city, is the "capital" of the Roma community, with 15 percent of the population of Roma ancestry. This municipality has the highest levels of Roma integration in Greece, Ref. [34] possibly related to the large number of members of the Roma groups living outside ghettoized settlements. Finally, the most important concentration, in the form of a complex of settlements on the western and north-western fringe of the city (municipalities of Acharnes, Zefiri, Fyli, and Aspropyrgos), is cut off from the rest of the city, "squeezed" between the southern slope of mount Parntiha and circumscribed by different highways and railroads. Figure 2 illustrates how Roma settlements, with limited exceptions are located in the most deprived areas of the city.

A similar situation is observed in Thessaloniki. The deprived areas are around the western part of the city, close to the port, the train station, and the industrial zone, while smaller clusters are to be found on the outer periphery of the metropolitan area [42]. Like in Athens, deprivation does not closely follow socioeconomic segregation patterns, since an important part of the working-class neighborhoods are mapped as areas of average deprivation. Furthermore, the central municipality does not host Roma settlements. In Thessaloniki, we identify two major communities, located on the western part of the city close one to the other: *Dendropotamos* with a population of 2700 people, which will be presented further down as a case study, and *Aghia Sofia*. According to Figure 2, the *Aghia Sofia* settlement is located at an "unbuilt" area, despite it having a population of 3500 people. In fact, there is no census tract attributed in this area, therefore this settlement, surrounded by industrial installations and cut out by the highway, was not properly registered by the census, consequently concealing the area's deprivation level. This case reveals that Roma settlements can be excluded from the rest of the urban agglomeration and become invisible in different ways.

## 4. Methodology

### *4.1. The Investigation Methods*

Methodologically, in this paper, we use mixed research methods combining quantitative and qualitative data. We analyze quantitative data from the 2011 Population Census, but we also use qualitative data from interviews with representatives of local agencies and residents of the two case study areas of *Dendropotamos* and *Kritiri* (Appendix A).

Regarding the analysis of quantitative data, we used variables related to the level of education, the occupational position, the household structure, the main sources of income, and housing conditions from the 2011 Population Census that could exemplify the important differences in the social profiles of Roma settlements and their surrounding areas. The data for each case study area are presented at three levels: (1) the settlement (*Dendropotamos* and *Kritiri*), (2) municipal community (*Menemeni* and *Tyrnavos*), and (3) the broad administrative unit (Regional Units of Thessaloniki and Larissa). By analyzing the data at these three levels, we provide a clear image of the inclusion/exclusion of the two settlements in their immediate surroundings, but also in the broader region in which they are part of. The use of these quantitative data provides a mapping of the different social profiles and segregations of the Romani people in the two settlements.

Semi-structured in-depth interviews were conducted with representatives of local agencies and residents of the two case study areas. These interviews followed an interview guide with 10 questions, referring to the relationship and the opinion of the interviewee about the settlement; to the question and the intensity of social exclusion; and to the ways to proceed for improving the integration and the living conditions of the Romani people in the settlements. All the ethical principles were followed during the interviews, with all the interviewees agreeing to take part voluntarily after being informed about the procedure and the purposes of the research project.

The interviews were carried out in two phases: in November 2020 in the settlement of *Dendropotamos*, and in June and July 2021 in the settlement of *Kritiri*. Five interviews were conducted in each settlement. All the interviews were conducted in person and at the location of the two settlements. Their duration ranged from 14′ to 65′. The qualitative part of this investigation added the experiential perception of stakeholders and residents of the two settlements about the social and spatial exclusion of Roma groups. The relatively small number of interviews prevented from exploring the potential impact of their personal features (e.g., gender, age, member or not of the Roma community) but complemented and corroborated the findings of the quantitative analysis.

This investigation of the social and spatial segregation of Roma groups is focused on two areas of Greece with different territorial characteristics (urban and rurban [1]). The investigation is carried out, firstly, at the level of each of the two settlements (*Dendropotamos* and *Kritiri*), and then in comparison with the external environment, i.e., the municipal communities and the regional units they belong to.

### *4.2. The Territory and Its Features*

The two investigated settlements (*Dendropotamos* and *Kritiri*), whose main features are briefly presented in Table 2, are inhabited exclusively by Romani populations and show several similarities in terms of their structure, but also some differences related to their immediate and broader administrative surroundings.

In particular, the settlement of *Dendropotamos* (officially *Agios Nektarios*) is located southwest of Thessaloniki and administratively belongs to the municipality of Ampelokipi-Menemeni. The settlement is below sea level and is protected from flooding due to the neighboring settlement of Kalochori, which acts as a dike. *Dendropotamos* is clearly separated from the rest of the urban tissue by natural and artificial barriers (Figures 3 and 4). This separation reinforces the introversion of the settlement and impedes the attempts to integrate the Romani population, while delinquency and unemployment are clearly "localized" within the settlement. The exclusion and separation of *Dendropotamos* from the rest of Thessaloniki is not only witnessed by the natural and artificial barriers, but also

perceived through the clear differentiation in the morphology of the buildings and the differences in the daily life rhythms and the dressing and posture of the residents.

**Table 2.** The main features of the two case study areas. Source: EKKE [35], data processed by the authors.

| | *Dendropotamos* | *Kritiri* |
|---|---|---|
| Municipal community | Menemeni | Tyrnavos |
| Regional unit | Thessaloniki | Larissa |
| Population | 3227 (2011) | 1415 (2011) |
| Active population | 952 (2011) | 305 (2011) |
| Area | 0.41 km$^2$ | 0.68 km$^2$ |
| Type of area | Urban area within the official plan | Rurban area outside the official plan |
| Type of settlement [1] | III | II |

[1] II: mix of precarious housing forms; III: regular housing units mixed with precarious housing forms (see Section 3.1).

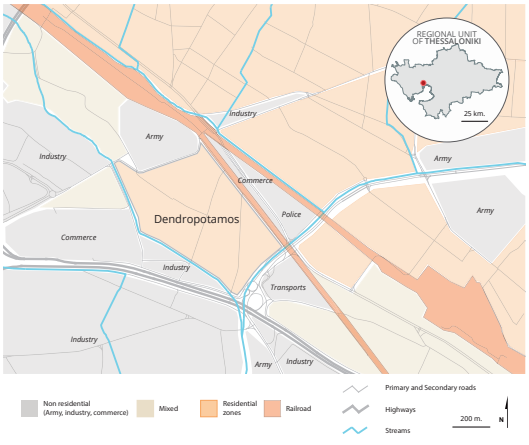


**Figure 3.** The settlement of *Dendropotamos*. Mapping by S.N. Spyrellis.

**Figure 4.** Views of the *Dendropotamos* settlement. Photos by D. Kourkouridis.

The settlement was first inhabited after World War II by Romani people who bought and built self-promoted houses on the cheap land plots of an area abandoned or neglected by its original owners due to poor conditions. *Dendropotamos* was the first Romani settlement in Thessaloniki. Here, 128 permanently settled families were registered in 1979 as part of the regularization of Romani citizenship, and another 200 families were registered in 1986. Today, the population of *Dendropotamos* officially amounts to 3227 people. However, according to unofficial data, the population is estimated at 5000, comprising the many individuals not registered in *Dendropotamos* or elsewhere.

The population of *Kritiri*, according to the 2011 census, amounts to 1415 inhabitants. This number is considered quite small. The population of the settlement, according to estimates by the municipality, is approximately 2500 inhabitants, even sometimes reaching 3000 inhabitants, following the constant movement of Romani people for seasonal jobs.

The settlement of *Kritiri* is located on the north-eastern outskirts of the small city of Tyrnavos (11,000 inhabitants), one kilometer from its center. Administratively, it belongs to the municipality of Tyrnavos and to the regional unit of Larissa. The location of the settlement is compatible with the nomadic life of the Romani people. However, this compatibility does not seem to be the main cause of the settlement's location. The latter may facilitate the mobility of its inhabitants, but, at the same time, *Kritiri* is a strictly demarcated settlement, separated from the continuous urban fabric of the city of Tyrnavos by natural and human-made barriers (roads, agricultural land, business building stock, etc.) (Figures 5 and 6).

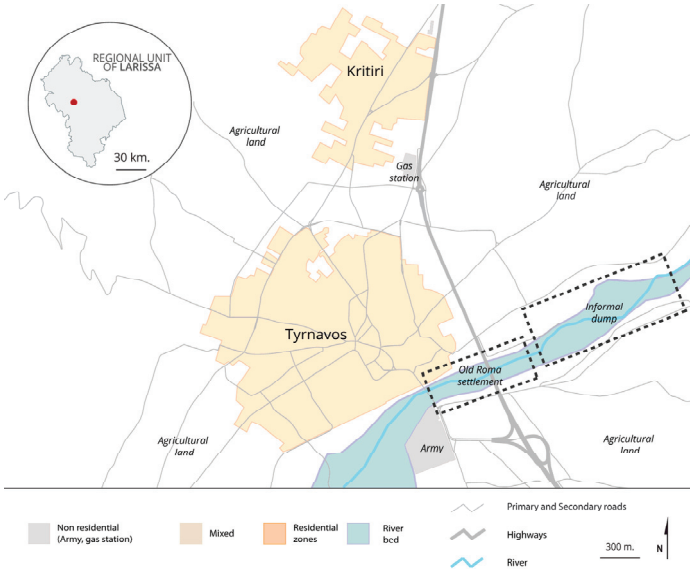


**Figure 5.** The settlement of *Kritiri.* Mapping by S.N. Spyrellis.

Historically, Romani people first appeared in the city of Tyrnavos about 150 years ago by a small number of Romani stagehands. Initially, the Roma settled at the south-eastern entrance of the city in an area next to the river Titarisios, which caused flooding problems and led to an informal dump very close to the settlement. The lack of basic infrastructure and the minimal provision of health and other services made it imperative to seek a better area with more decent living conditions. This led to the relocation of the Roma community to the new location of *Kritiri.* From 1988 onwards, the first land plots were bought in *Kritiri*, at the crossroads in the north exit of the city.

**Figure 6.** Views of the *Kritiri* settlement. Photos by D. Kourkouridis.

## 5. Results: The Socio-Spatial Profile of *Dendropotamos* and *Kritiri* Settlements and Their Surrounding Areas

The investigation in the two case study areas focused on a few indicators of the quality of life that we assumed appropriate to illustrate the extreme deprivation in Roma settlements, and, at the same time, the very significant difference of the level of quality of life between the settlements and their immediately neighboring areas. These indicators refer to education (e.g., the education level of the adult population); employment (e.g., the percentage of the lowest occupational categories in the area); and housing (e.g., the overcrowding in housing space). Moreover, demographic indicators in Roma settlements reveal that structural parameters related to age and household forms restrain mobility opportunities (e.g., imposed marriages at an early age, followed by childbirth in adolescence) and housing conditions (large households in small and precarious houses). Eventually, the extreme deprivation in settlements creates vicious circles, hindering the potential of young Roma for social mobility: illiterate parents or parents with elementary education lack the means to monitor and encourage their children's education trajectory; children's duty to help parents in their family survival strategies diminishes their own mobility prospects; the range of potential jobs in Roma settlements limited to menial, unskilled, and dead-end jobs also curtails any mobility prospects through employment.

### *5.1. Education*

The percentage of the cohort of 4–15 years olds registered in compulsory education among the Roma population was estimated at 51.8 in 2021, using a sample of 54,735 individuals in the Roma population [29], against 85.1 in 2011 for the same cohort in the general population [35]. In pre-school education (0–3 years old), 8.6 percent of Roma were attending in 2021 [29], versus 30.4 percent in the general population [43]. Moreover, the percentage of those who completed the upper secondary education among 20–24-year-olds was estimated at 16 percent for the Roma population [29] against 95 percent for the general population [3]. Furthermore, the percentage of young Roma, aged between 16 and 24, whose current main activity was neither in employment nor in education or training (NEET), was 58 percent in 2021, having increased from 48 percent in 2016, against 13 percent in the general population [3] (p. 45).

The huge gap in education trajectories and attainment between Roma and the general population in Greece is further specified by data on the two investigated settlements. The lowest education level (not completed primary school) scores very high in *Dendropotamos* (37.1 percent). This percentage is in stark contrast to both the surrounding municipal community of Menemeni, and the Regional Unit of Thessaloniki Table 3). The drop-out rate for 12–15-year-olds is also very high (28 percent), especially since this age cohort corresponds to lower secondary school, which is part of compulsory education. Moreover, the percentage of NEETs is more than half among the 15–22-year-olds, and both drop-out and NEET rates are incomparably higher than in the adjacent community and the regional unit (Table 3). A local children's caretaker and teacher explains the high percentage of Romani people who have not finished primary school in *Dendropotamos*: "*the fact that their language is unwritten, that they have been illiterate for centuries, that parents take their children to work as peddlers or marry them very young*" (DEN.INT.01) deprives them of the opportunity to go to school. Family monitoring and family conditions play a significant role in educational attainment. Apart from the impossibility of illiterate parents to supervise the course of their children in school, family conditions also play an important role in the increased illiteracy rates. According to a resident, born and raised in *Dendropotamos*, and a member of the center for the protection of Roma children, "*many Roma children whose parents were in prison do not get up in the morning to go to school*" (DEN.INT.03).

**Table 3.** Educational attainment and exclusion in the Roma settlements of *Dendropotamos* and *Kritiri* and their surrounding areas (2011). Source: EKKE [35], data processed by the authors.

| | No Primary Education (Over 18) | 12–15-Year-Old Not in Education | NEET [1] (15–22) |
|---|---|---|---|
| *Dendropotamos* | 37.5 | 28.0 | 56.4 |
| MC [2] of Menemeni | 11.5 | 8.7 | 27.2 |
| RU [3] of Thessaloniki | 5.3 | 1.6 | 13.8 |
| *Kritiri* | 93.3 | 91.3 | 81.1 |
| MC of Tyrnavos | 17.9 | 27.4 | 33.9 |
| RU of Larissa | 11.3 | 3.7 | 16.8 |

[1] NEET: Not in education, employment or training; [2] MC: Municipal community; [3] RU: Regional Unit.

In *Kritiri*, the percentage of those who have not completed primary school (93.3 percent) is more than double that in the *Dendropotamos*, five times higher than in the surrounding municipality, and eight times higher than in the regional unit. The same applies to school dropouts and NEETs, both being the norm in this settlement. The difference must be related to the type of settlement, with *Kritiri* being more precarious (type II versus type III for *Dendropotamos*), lacking all basic amenities, including schools. This means that children from *Kritiri* must attend distant schools in other neighborhoods of the municipal community of Tyrnavos. The local authorities have distributed Roma children among the school units of the area, "*which is good for addressing the discrimination they experience*" (KRI.INT.02), but their drop-out rate remains very high. The distribution of Roma children in different school units of the area increases the distance between home and school and, therefore, the difficulty to regularly attend school for children of a group with a very high drop-out rate. The increased drop-out rate eventually becomes a norm. A social worker in the community center of Tyrnavos stated that "*school dropout is a multifactorial phenomenon and the nomadic way of life of the Romani people and the fact that they marry at an early age are important factors that withdraw Roma children from school*" (KRI.INT.04). This widespread perception incriminates the culture and the way of life of the disadvantaged group as the cause of the outcome and, eventually, blames the victim.

Overall, the massive abandonment of education by young Roma at a very early stage makes it more difficult to get integrated to the labor market at a comparable rate with the rest of the population and, eventually, promote their social inclusion.

*5.2. Employment*

The Roma active population have very precarious jobs. Unemployment is extremely high (64 percent) [29], while the main occupational activities of the members of this group are part of routine occupations and often part of the informal labor market (54 percent) [29], corroborated by the fact that only 33 percent of respondents in a 2021 survey qualified their main activity as 'paid work' [3]. Routine jobs usually performed by Roma are the collection and resale of recyclable items, door-to-door sales, sales in open markets, and seasonal work in agriculture. These four routine jobs amount to about 82 percent of the Roma jobs in 2021 [29] (pp. 67–68). The situation is much worse for Roma women, since there is a huge gender gap in accessing employment [3].

Roma groups occupy a very disadvantaged position in the labor market, their members usually being close to the bottom of the occupational ladder. We measured the categories in which Roma have the higher percentages. In the large general occupational category (1-digit) of 'unskilled workers', Roma settlements have a comparable percentage with their surrounding areas (Table 4). On the contrary, they stand out in the small and undesirable three-digit categories of 'garbage collectors', 'street vendors', and 'vendors in flea markets' (Table 4). These categories also embody the occupational specialization and confinement of Roma groups at the national level. According to a non-Roma employee and experienced observer in *Dendropotamos*, "*The Romani people belong to the most subordinate occupational categories, such as street sellers or garbage collectors, a fact also linked to their low level of education*" (DEN.INT.05). A business owner in *Kritiri* also mentioned that "*Romani people tend to be street sellers as this activity can be combined with their nomadic way of life*" (KRI.INT.05), once more reproducing the belief that the fate of this group is, to some extent, a matter of choice.

**Table 4.** Occupational categories in the settlements of *Dendropotamos* and *Kritiri* and their surrounding areas (2011). Source: EKKE [35], data processed by the authors.

| | Unskilled Workers | Garbage Collectors | Street Vendors | Sales Assistants |
|---|---|---|---|---|
| *Dendropotamos* | 14.7 | 2.8 | 13.0 | 20.4 |
| MC [1] of Menemeni | 14.6 | 0.9 | 2.7 | 10.4 |
| RU [2] of Thessaloniki | 8.5 | 0.5 | 0.7 | 7.7 |
| *Kritiri* | 15.4 | 14.1 | 49.8 | 3.3 |
| MC of Tyrnavos | 14.4 | 1.3 | 3.6 | 5.3 |
| RU of Larissa | 8.6 | 0.5 | 0.7 | 5.7 |

[1] MC: Municipal community; [2] RU: Regional Unit.

Unemployment would be expected to be higher than the score registered in the census (Table 5). In Roma settlements, unemployment is usually persistent, long-term, and most likely less easy to detect through the census. According to a teacher in *Dendropotamos*, the reduced unemployment rates are related to the fact that "*Roma occupational activities are usually informal and not officially recorded*" (DEN.INT.01). The former President of the municipal council of Tyrnavos also stated that "*many Romani people work informally, without a work permit*" (KRI.INT.01). Unemployment in Roma increases when those looking for a job for the first time (i.e., those who never worked officially before) are also considered. The occupational activity of women is very low, compared to the regional level, especially in the rurban area of *Kritiri*. Among other things, this indicates the solid patriarchal hierarchy within Roma groups, the traditional and subordinate roles allocated to women, and the gender profile of the group's occupational activity.

**Table 5.** Unemployment and women's participation in the labor market in the Roma settlements of *Dendropotamos* and *Kritiri* and their surrounding areas (2011). Source: EKKE (2015) [35], data processed by the authors.

| | Unemployed | Looking for a Job for the First Time | Economically Active Women |
|---|---|---|---|
| *Dendropotamos* | 21.6 | 19.0 | 14.3 |
| MC [1] of Menemeni | 23.2 | 9.0 | 29.6 |
| RU [2] of Thessaloniki | 16.6 | 5.8 | 35.3 |
| *Kritiri* | 15.1 | 9.8 | 0.9 |
| MC of Tyrnavos | 9.0 | 8.0 | 25.5 |
| RU of Larissa | 11.1 | 6.5 | 30.3 |

[1] MC: Municipal community; [2] RU: Regional Unit.

### *5.3. Main Sources of Income*

A large percentage of the economically inactive population, including the large number of children, significantly reduce the percentage of those having employment as their main source of income. Public allowances are much more important in Roma settlements compared to the population in the surrounding areas, due to the much higher percentage of poverty and the allowances for families with three children or more. According to a local employee in Dendropotamos, the fact that Roma groups depend on allowances more than others "*makes it often difficult for them to join the labor market*" (DEN.INT.05). A local teacher adds that this may be the unintended result of "*paternalistic policies for the social integration of Roma, which ultimately failed, and led to the opposite effect*, i.e., *isolating the Romani people even more*" (DEN.INT.01). And a social worker in the community center of Tyrnavos stated that "*even though allowances financially help Romani people they cannot be the exclusive instrument for their social integration*" (KRI.INT.04). Moreover, large families and large numbers of children also increase the number of individuals whose income depends on others, parents, or other family members (Table 6).

**Table 6.** Main income sources in the settlements of *Dendropotamos* and *Kritiri* and their surrounding areas (2011). Source: EKKE [35], data processed by the authors.

| | Employment | Allowances | Depending on Others |
|---|---|---|---|
| *Dendropotamos* | 16.7 | 12.1 | 56.1 |
| MC [1] of Menemeni | 26.6 | 5.7 | 48.1 |
| RU [2] of Thessaloniki | 32.4 | 2.9 | 42.2 |
| *Kritiri* | 16.2 | 9.4 | 70.2 |
| MC of Tyrnavos | 31.8 | 2.1 | 43.7 |
| RU of Larissa | 31.9 | 1.8 | 40.0 |

[1] MC: Municipal community; [2] RU: Regional Unit

### *5.4. Age and Size of Households and Families*

The population of the two Roma settlements contains a much larger percentage of children and a much smaller percentage of elderly people than the general population (Table 7). This is confirmed by the more recent data on the total population of Roma people in Greece and the general population data from the census of 2021. According to the 2022 report of the General Secretariat of Social Solidarity and Fight Against Poverty [29] (p. 57–59), the Roma population comprises 34.3 percent of children (0–15) and 7.9 percent of elderly people (65+). The provisional data from the 2021 census show that the percentage of children and adolescents (0–19) in the general population is 18.6 percent and that of elderly people (70+) is 16.8 percent [44].

**Table 7.** Fertility and household size in the settlements of *Dendropotamos* and *Kritiri* and their surrounding areas (2011). Source: EKKE [35], data processed by the authors.

| | Age 0–14 | Age 65+ | More Than 3 Children Per Mother [3] | Household with More Than 5 Members | Average Household Size |
|---|---|---|---|---|---|
| *Dendropotamos* | 21.8 | 13.0 | 13.5 | 13.1 | 3.5 |
| MC [1] of Menemeni | 16.0 | 14.2 | 6.6 | 4.0 | 2.8 |
| RU [2] of Thessaloniki | 15.2 | 17.2 | 3.1 | 1.9 | 2.6 |
| *Kritiri* | 48.6 | 1.1 | 42.8 | 49.6 | 5.5 |
| MC of Tyrnavos | 19.9 | 17.9 | 7.7 | 8.0 | 3.2 |
| RU of Larissa | 15.7 | 20.1 | 4.6 | 4.1 | 2.8 |

[1] MC: Municipal community; [2] RU: Regional Unit; [3] women > 15 year old.

Table 7 also reveals two other issues related to the demographic structure: The first is that fertility is much higher in the Roma settlements compared to the surrounding regional units (four times higher in *Dendropotamos* and 10 times higher in *Kritiri*). The second is that these demographic features are also different between the two settlements. The rurban *Kritiri* is scoring significantly higher in children per mother and in household size. Furthermore, households in *Kritiri* are much larger (5.5) compared to *Dendropotamos* (3.5), while the average household size of Roma households in Greece is 4.2 [29], against 2.4 in the general population [35]. The large households in Roma settlements are related to gender inequality, which they reproduce. A member of the women's association in *Dendropotamos* affirmed the well-known fact that "it is quite a common phenomenon that most Roma women get married at a very young age" (DEN.INT.02). A member of the Centre for the Protection of Minors added that "this fact often leads Roma women to have many children at a young age and thus to reduce their possibilities and opportunities for further studies, education, employment, etc. compared to men" (DEN.INT.03). Moreover, a teacher in Tyrnavos mentioned that "only Roma boys come to school to acquire necessary knowledge that will help them later with their jobs; girls are restricted to the home, focusing on the care of the family" (KRI.INT.02).

The high percentage of children in the Roma population is linked to the higher fertility rate and early marriages that are 'very present' (88%) or 'moderately present' (9%) in Roma settlements [29] (p. 64). Interestingly, the percentage of marriages before 20 years old is only 0.3 percent in the general population [35]. On the other hand, the comparatively small share of the elderly should be related to the harsh living conditions that reduce life expectancy since Roma groups are not a recent addition to the Greek population. The life expectancy for the Roma population is almost 10 years shorter for both men and women (74 for Roma women against 83.7 in the general population, and 69.8 against 78.6, respectively, for men).

### *5.5. House Overcrowding and Amenities*

Housing conditions are extremely poor for Roma groups, compared to the general population. Overcrowding [2] was an issue in 2021 for 94 percent of Roma households, while it affects a much smaller share (29 percent) of households in the total population of Greece [45] (p. 54). Moreover, Roma groups persistently experience conditions of housing deprivation (accommodation that is too dark and humid; no shower/bathroom or no toilet inside the dwelling) at a very high percentage (68 percent) when compared to the general population (15 percent) [3].

Housing conditions are very different in the investigated Roma settlements and in their surrounding areas (Table 8). To elaborate, 20 $m^2$ per capita is the poverty line of housing surface in Greece (i.e., 60 percent of the median of the national surface per capita). Therefore, 10 $m^2$ per capita correspond to extreme conditions of overcrowding. One in five residents in *Dendropotamos* and two in three residents in *Kritiri* live in such conditions of overcrowding. Moreover, housing conditions are not the same within each settlement.

Some parts of the settlements are worse than others. A non-Roma businessman in the municipal community of Ampelokipi (near *Dendropotamos*) said "*the majority of the Romani people in Dendropotamos, and particularly those who live close to the stream at the southern part of the settlement, reside in shacks and in very bad conditions*" (DEN.INT.04). This is true for most residents of Kritiri, according to the former President of the municipal council: "*most of Romani people in Kritiri live in shacks that can barely accommodate their families*" (KRI.INT.01).

**Table 8.** Overcrowding and housing amenities in the settlements of *Dendropotamos* and *Kritiri* and their surrounding areas (2011). Source: EKKE [35], data processed by the authors.

| | Up to 10 m$^2$ Per Person | No Kitchen | No Plumbing | No Central Heating or No Heating |
|---|---|---|---|---|
| *Dendropotamos* | 18.9 | 0.1 | 1.9 | 50.9 |
| MC [1] of Menemeni | 5.5 | 0.0 | 0.4 | 26.2 |
| RU [2] of Thessaloniki | 1.5 | 0.1 | 0.1 | 18.8 |
| *Kritiri* | 68.9 | 10.2 | 15.8 | 95.6 |
| MC of Tyrnavos | 9.8 | 1.2 | 2.3 | 30.1 |
| RU of Larissa | 2.6 | 0.3 | 0.6 | 17.7 |

[1] MC: Municipal community; [2] RU: Regional Unit.

Heating issues are important for a significant part of the total Greek population, but they are much more significant for residents in Roma settlements (Table 8). More than half of the residents in *Dendropotamos* have insufficient heating (such as wood-burning stoves, braziers, etc.) or no heating at all, and the same applies to almost all the population of *Kritiri*. " *There have been many attempts by the Mayor to improve the quality of life of Romani people, especially regarding those who live in tents, the most degraded and excluded area of the Roma settlement, on the south side of Dendropotamos next to the stream, to relocate them to normal housing*" (DEN.INT.04). However, the stagnating outcome shows that although "*such efforts could improve the situation in the Roma settlement of Dendropotamos, they also need to be carried out with the help of the state in order to overcome this long-term socio-spatial exclusion of Romani people*", *stated the non-Roma man who works at the center for the protection of young Roma*" (DEN.INT.03). These extreme conditions of housing deprivation—especially in Kritiri, where a considerable number of residents have no kitchen or running water—are persistent. These conditions are also a perpetual danger in their everyday life. A Roma resident in *Kritiri* said "*it's true that most of the Roma families use rough heating systems because they can't afford anything else*" (KRI.INT.03); and a non-Roma social worker in the community center of Tyrnavos mentioned that "*immediate action must be taken to protect the Romani people from burning hazardous materials*" (KRI.INT.04).

## 6. Discussion and Conclusions

The evidence we provided on the extreme social exclusion and ghettoization of Roma groups in two settlements in Greece raises four broader issues for further discussion. The first is that the position of these groups at the very bottom of the social hierarchy, hardened by discrimination, stigmatization, and exclusion, is leading to a vicious circle that is constantly reproducing their subordinate social position and their spatial exclusion.

Previous research work on the social condition of Roma groups, as well as our own investigation of the two Roma settlements in northern and central Greece confirm the extreme conditions of social exclusion and the absolute segregation (ghettoization) experienced by these groups. Roma children are distanced from education much more than children in the general population. Employment opportunities for Roma are limited to the less desirable positions of manual work with no mobility prospects. Housing conditions in Roma settlements are far worse than for the general population, sometimes involving the lack of basic amenities (like running water), which accessible to almost all the other residents in Greece. Moreover, being obliged to live in a Roma ghetto, within a country

where social and ethnic segregation is rather limited, increases the effect of social and spatial exclusion. The spatial separation of deprived groups is certainly enabling their social 'othering' as inferior and stigmatized. These extreme conditions of social exclusion and segregation significantly reduce the mobility opportunities for young Roma and even considerably affect their life expectancy [3] (p. 48).

Moreover, the state does not seem concerned enough to apply the law for this group in the same way it does for the general population, particularly when imposed patriarchal rules and traditional parental guidance (e.g., marriages in early adolescence) are overlooked as tolerated cultural difference. For example, the absence of parental caution to ensure that children attend compulsory school is tolerated, or at least not penalized, in the same way as for the general population; the same applies to the transformation of pickup vans into two-story makeshift vehicles, putting family members accommodated on the second level, mainly women and children, in danger. State indifference is usually justified by cultural difference and by the choice to not enforce solutions that would be incompatible with the Roma ways of life, leading to blaming the victim and reinforce the ostracizing of the group. On the other hand, state indifference towards Roma practices are limited to activities having a negative impact on members of the Roma group. If there are consequences outside the group, tolerance and explanations involving cultural differences disappear.

The second issue that comes from the investigation of the social exclusion and segregation of Roma groups in Greece is related to their contradictory segregation pattern. At the broad neighborhood/local community level, Roma settlements become part of social/ethnic mix, while at a lower level, at the level of city blocks (micro-segregation), Roma settlements embody a case of complete segregation. How can we grasp this contradictory aspect of segregation?

The ghettoization of Roma groups in Greece does not completely follow the dominant pattern of the segregation of ethnic groups' in southern Europe. Arbaci (2019) [46] discusses the situation of recent ethnic migrants in southern European cities, a combination of a high level of deprivation with a relatively low level of spatial separation. Their deprivation does not lead to their segregation at the neighborhood level. However, their underprivileged social positions are usually combined with disadvantaged positions at the micro-space level (e.g., their concentration in the disadvantaged dwellings of apartment blocks or in small slums scattered in the urban tissue). Therefore, the presence of recent ethnic migrants in southern European cities gives the impression of reduced segregation at the neighborhood level due to the invisibility of micro-segregation.

The segregation pattern of Roma groups in major Greek cities is somehow different, representing an extreme form of Arbaci's pattern. The invisibility of Roma at the micro-scale is due to their small number and the out-of-the -way positions they are allocated in urban space. This invisibility at the micro-scale is contradicted by the striking visibility of their ghettoization when their settlements falls under the radar. The Roma condition can be summarized as social exclusion in spatial proximity: a mix with the non-Roma population at the neighborhood level and complete segregation at the micro-scale, supported by barriers that annihilate any potential beneficial impact of proximity. Considering the rationale of micro-segregation [7], Roma settlements are, at the same time, a formal type of social mix at the neighborhood level, as well as a form of extreme segregation at the level of the city block.

The ghettoization of Roma groups in small units in Greece is very different from the spatial form and the perception of the Black ghetto. The invisibility of Roma in Greece is related to the reduced share of the Roma population (about 2 percent), compared to the respective subaltern groups with much larger shares, of outcasts in India or the African Americans in the US, for example, where they form one of the poles of the racially hyper segregated city [27,47]. Roma groups in Greece are invisible because they are scattered and confined in localities at the margins. Their ghettoes are a constellation of small and unconnected dots (Figure 1) within, or close to, the most deprived and out-of-the-way parts of urban areas (Figure 2).

Further research is needed on how this segregation form is working for social reproduction, using comparisons with processes and outcomes in contexts hosting similar forms of spatial arrangements, like urban areas in India with cast-set micro-communities [48], spatially proximate but socially very unequal residential areas in Brazilian cities [49], areas of Naples where working-class enclaves operate within the wealthiest neighborhoods of the city [50], and micro-segregated spaces of racial mixes in metropolises of the US East-Coast at the end of the 19th century [51,52].

The third issue is related to how the severe problems of social and spatial exclusion of Roma groups can be related to the debates about policies of social mixing, and also whether such policies could replace ghettoes via a less discriminating spatial arrangement for the Roma population.

Policies to increase social mixing are usually implemented today by redistributing poverty in urban spaces and/or by attracting middle-class groups into areas of poverty in order to combat the assumed negative effects of spatially concentrated deprivation. The policies to increase social mixing are in the spirit of social engineering and usually:

- destroy the self-help social networks supporting the survival of marginalized groups; moving the households belonging to these networks in distant places removes their spatial proximity necessary for their operation,
- focus on the assumed –and not the real– effects of the inflow of middle-class groups in poor areas, which do not necessarily improve the life conditions and chances of former poor residents (often the process of this inflow leads to gentrification, promoting their displacement or their alienation from a place becoming less affordable and accessible [53,54]).
- neglect the new hierarchies created at the micro-scale following the increase of social mixing (either through the redistribution of poverty or through the attraction of middle-class groups) which remain unregulated, although they may negatively affect social reproduction.

In the plans to deal with the condition of Roma groups in Greece, there are no policies to redistribute poverty, and there are no debates about their potential limitations and negative effects. The ghettoization of Roma is not (yet) a policy issue of this kind. Also, the attraction of middle-class households in Roma settlements (i.e., gentrification) is something completely out of the policy radar, since these settlements occupy the most undesirable places. The complete absence of efforts to combat the ghettoization of Roma, even by considering the problematic policies for social mixing used in other contexts, is another facet of the complete exclusion of Roma groups from the policy management of mainstream society in Greece. The problems they experience and the policies to confront them are considered separately from those of the rest.

Roma groups experience discrimination and inequality at the same time. Their discrimination is not official and is not part of the rule of Law. It is implemented through stigmatization, through the dominant perception of their 'otherness' and inferiority, through their exclusion in the real estate market, through policies that consider their conditions as a problem of their group, through the distanced approach of civil servants, and through police violence that create an informal but effective apartheid. Under these circumstances, discrimination issues come first. Becoming part of a system (a community) precedes the issue of the position within it.

The fourth issue is related to the causal link between the persistent deprivation in Roma settlements and the extreme segregation/ghettoization of their residents. Is their ghettoization responsible for their social exclusion? Would their lives and prospects improve if they lived dispersedly within their cities?

At first sight, conditions in Roma settlements seem to be responsible for the reproduction of the subaltern position of their group members. This causality issue is connected to the neighborhood effect. It has been effortless to convince politicians and decision makers that segregation—understood as concentrated poverty and social disadvantage—is responsible for the negative effects of social reproduction [55]. Such an understanding of segregation enabled the promotion of social mixing in a period of neoliberal policies and state withdrawal that boosted gentrification processes, rather than improved the condition of vulnerable groups [56,57]. Critical research on the neighborhood effect and on policies of social mixing [58,59] has stressed that individual and family characteristics (like social origin, ethnic identity, gender, etc.) are more important for social outcomes than spatial environment. The latter may not be insignificant for social reproduction but should be considered in combination with the main causes producing socially inequal outcomes.

In this paper, we provide evidence about the extreme conditions of life in Roma settlements in Greece, while other reports assert that the Roma living dispersedly in non-Roma communities enjoy much better conditions than those in settlements. The evidence we provide supports the argument that the concentration of poverty is negative for life conditions and mobility prospects, and that policies to increase social mixing would be noticeably positive.

The question is whether the improved life conditions of Roma living dispersedly are due to the type of their residence or to the other differences the Roma living dispersedly have with those living in settlements. Apart from the many differences among and within Roma groups, usually unknown and invisible to outsiders, this question is similar to the interrogation of whether shop sellers living dispersedly in high status neighborhoods enjoy better quality of life compared to shop sellers living next to others with similar occupational positions. A positive answer raises the question as to whether this difference in the quality of life they experience is due to the profile of their residential area, or to other differences that mainly provoke different life conditions. Further research is, therefore, needed on differences within the Roma community, on the mobility trajectories of members of the group, and on the relation of these trajectories when members of this groups relocate to within or outside Roma settlements.

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## Appendix A

**Table A1.** List of interviewees.

| Code ID | Gender | Occupation/Position | Roma Group Member | Interview Date | Duration |
|---|---|---|---|---|---|
| DEN.INT.01 | Male | Teacher | No | 02/11/2020 | 28′ |
| DEN.INT.02 | Female | Roma Women's Association of Dendropotamos | Yes | 17/11/2020 | 35′ |
| DEN.INT.03 | Male | Center for the protection of minors Roma | No | 23/11/2020 | 17′ |
| DEN.INT.04 | Male | Business owner in Ampelokipi | No | 29/11/2020 | 14′ |
| DEN.INT.05 | Female | Employee in Dendropotamos | No | 30/11/2020 | 27′ |
| KRI.INT.01 | Male | Former President of the Municipal Council | No | 05/06/2021 | 64′ |
| KRI.INT.02 | Female | Teacher | No | 02/07/2021 | 24′ |
| KRI.INT.03 | Male | Roma Resident of Kritiri | Yes | 02/07/2021 | 51′ |
| KRI.INT.04 | Female | Social worker in the community center of Tyrnavos | No | 05/07/2021 | 52′ |
| KRI.INT.05 | Male | Business owner in Kritiri | No | 11/06/2023 | 16′ |

## Notes

[1] The word rurban (rural+urban) is used to describe land in the countryside on the edge of a town or city, on which new housing, businesses, etc. are being built (https://dictionary.cambridge.org/dictionary/english/rurban, accessed on 1 February 2024).

[2] Overcrowding is understood according to Eurostat's definition of overcrowding: a person is considered to live in an overcrowded household if the household does not have at its disposal a minimum number of rooms equal to one room for the household, one room per couple, one room per single person aged 18 or more, one room per pair of single people of the same gender aged between 12 and 17, one room per single person aged between 12 and 17 not included in the previous category, and one room per pair of children aged under 12 [3] (p. 54). Overcrowding in the two settlements is measured in a different way. It refers to the percentage of residents with available housing space below the housing surface poverty line, calculated in the same way with the income poverty line (i.e., those with housing surface per capita below 60 percent of the national median).

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