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Special Issue Reprint

Immigration, Ethnic Residential Segregation or (vs.) Socioeconomic Integration in Urban Areas

Edited by
Federico Benassi, Ricardo Iglesias-Pascual and Salvatore Strozza

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Guest Editors

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About the Editors

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Preface

Since the end of the 20th century, the organisation and management of economic markets have increasingly followed the principles of the neoliberal socio-economic model. This paradigm, often applied rigorously and uncritically, has led to profound and lasting transformations in the social and urban dynamics of contemporary cities. Among the most evident manifestations of this process are the growing financialisation of the housing market and the parallel deregulation of housing policies. These changes have not only redefined the economic value of urban space, but have also had direct and tangible effects on the quality of life for large segments of the population. Housing, once regarded as a fundamental right and essential good, has increasingly become the object of speculation and investment, with dramatic consequences for housing accessibility, particularly for the most vulnerable groups. Among those most exposed to the negative impacts of these dynamics are populations of foreign and migrant origin, especially those coming from non-Western countries. Their structurally weak position in both the labour and housing markets often confines them to peripheral and deprived neighbourhoods, where access to essential services, employment opportunities, and social networks is severely limited. This results in processes of residential segregation that are not only spatial but also deeply social and cultural, directly shaping the trajectories of integration and the possibility of building a meaningful sense of belonging in the host society. This Special Issue aims to analyse these dynamics in depth, exploring the nexus between economic policies, urban transformations, and social inequalities. Through a multidisciplinary approach that brings together political economy, urban sociology, and migration studies, this collection invites critical reflection on the consequences of a development model which, despite its apparent neutrality, reproduces and amplifies existing fractures within the social fabric.

Federico Benassi, Ricardo Iglesias-Pascual, and Salvatore Strozza

Guest Editors

Article

The Residential Segregation of the Middle Eastern and North African and South Asian Populations from the White Population in U.S. Metropolitan Areas, 2012–2016

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Abstract: We examine the residential segregation of the Middle Eastern and North African (MENA) population, South and East Asian people, and Black from white people in the U.S. Using data from the 2012–2016 American Community Survey (ACS) and the 2012–2016 Integrated Public Use Microdata Sample (IPUMS) at the metropolitan level, descriptive analyses of segregation reveal that Black–white segregation is significantly greater than the segregation of MENA and East Asian people from white people. South Asian–white segregation is higher than Black–white segregation, but the difference is not statistically significant. Multivariate analyses of average dissimilarity indices show that relative to Black–white segregation, MENA–white, South Asian–white, and East Asian–white segregation are not significantly different after controlling for relevant variables. The results for the isolation index also follow a similar pattern. While MENA and both Asian ancestry groups are significantly less isolated than Black people in the unadjusted results, the differences in average isolation indices between Black people and these groups disappear after controlling for relevant characteristics. The results suggest evidence that supports these hypotheses in terms of spatial assimilation.

Keywords: immigration; MENA population; South Asian population; residential segregation; spatial assimilation

1. Introduction

Research on residential segregation in the United States has focused on traditional racialized groups, such as the non-Hispanic Black (hereafter “Black”), Hispanic, and Asian people (Massey and Denton 1993; Kim and White 2010; Iceland et al. 2014). Studies in this tradition collectively indicate that Black people are the most segregated from non-Hispanic white people (hereafter “white”), and Hispanic and Asian people are moderately segregated from whites (Massey and Denton 1993).

The residential segregation of the populations identifying as Middle Eastern and North African (hereafter “MENA”)¹ and South Asian² has largely been ignored. The focus of Bozorgmehr et al. (1996) on Middle Eastern people (Iranian, Armenian, Israeli, and Arab people) and Holsinger (2009) on Arab residential segregation are partial exceptions. These studies are limited to examining the Arab MENA population or geographically by only focusing on New York, Los Angeles, Chicago, and Detroit. These studies are restricted in their use of older data from 2000 or earlier. Only a small amount of research explores the residential segregation of South Asian people, and it is limited to specific places and

relies on older data (Iceland et al. 2014). The existing research finds that these groups have moderate levels of segregation from white people, thereby necessitating more research on this topic (Holsinger 2009; Iceland et al. 2014).

Between 2000 and 2019, the MENA and South Asian populations within the U.S. doubled in size, from about 600,000 to 1.2 million and from 1,900,000 to 4,606,000, respectively, and are now fairly dispersed throughout the country (Harjanto and Batalova 2022; Pew Research Center 2011). Given this tremendous growth in these populations, we re-examine their segregation with more recent data and at a national level. We choose to focus particularly on MENA and South Asian people because of the housing discrimination they experience and the widespread stereotypes that exist about these two groups, both of which could affect their residential segregation from white people. Several studies have identified bias and discrimination in the housing market against Arab, Muslim (Carpusor and Loges 2006; Ahmed et al. 2010; Hogan and Berry 2011; Gaddis and Ghoshal 2015; Friedman et al. 2019), and Asian people (Turner and Ross 2003; Wong et al. 2011). South Asian people have been mistaken as MENA and/or Muslim because of their phenotypical similarities and common religious indicators (e.g., turban for Sikhs and hijab for Muslims), and as a result of this mistaken identity, they have been subjected to racial discrimination (Maira 2004; Love 2017; Lee and Kye 2016).

The purpose of this paper is to build upon the very few studies that have examined the residential segregation of the MENA and South Asian populations from white people in the United States and compare their segregation from white people to that of East Asian and Black people. Our analysis is guided by the following research two questions: (1) What is the level of segregation of the MENA population and South Asian people from white people compared to that of East Asian and Black people across metropolitan areas in the U.S., and how does segregation vary by metropolitan areas? (2) Does controlling for group differences in immigrant-related, socioeconomic, and demographic characteristics attenuate group differences in residential segregation of these minority groups from white people? Our metropolitan-level analyses rely on Summary File (SF) data from the 2012–2016 American Community Survey (ACS). We also utilize data from the 2012–2016 Integrated Public Use Microdata Series (IPUMS) to create several group-level predictors of segregation that are absent from the ACS data.

2. Theories on Residential Segregation

Sociologists have analyzed residential segregation by relying on two primary theoretical approaches: the spatial assimilation and place stratification models (Massey and Denton 1993; Charles 2003). Spatial assimilation refers to the process of residential attainment by groups to live near the majority members of the society (Massey 1985). The spatial assimilation model contends that groups' residential patterns are shaped by their degree of acculturation and socioeconomic advancement (Massey 1985). The residential isolation of immigrants is thought to be a temporary phenomenon; residential segregation from the mainstream population will gradually decline as groups attain increased cultural familiarity and socioeconomic status.

There is a large body of scholarship on the residential segregation of groups from white people that supports the general tenets of the spatial assimilation model—that advancement in socioeconomic status (SES) results in spatial assimilation (Timberlake and Iceland 2007; Fong and Wilkes 2003). As immigrants accumulate cultural, human, and economic capital, they achieve upward residential mobility by investing in higher-quality housing and neighborhoods with more resources—neighborhoods where middle-class, non-Hispanic white people often reside (Logan et al. 2002). Such transitions have been observed for European (Fong and Wilkes 2003), Asian (Iceland et al. 2014; Timberlake

and Iceland 2007), Arab (Holsinger 2009), and Latin American people (Iceland et al. 2014; Massey and Denton 1993).

Relying on spatial assimilation theory, we expect that when members of minority groups acculturate and advance their socioeconomic attainment, they will convert these gains into locations in whiter neighborhoods. It is expected that in descriptive analyses, the MENA population and South and East Asian people may be more segregated from the White population than Black population because greater shares of the former groups are immigrants; on the other hand, because these immigrant groups' educational attainment and income may be greater than that of Black people, the residential segregation from white people of the MENA population and South and East Asian people could be somewhat lower than Black–white segregation (Bozorgmehr et al. 1996; Schachter 2014). According to the spatial assimilation model, however, after controlling for variation in acculturation and socioeconomic characteristics across these groups, differences in segregation from white people should diminish or disappear among the MENA population and South and East Asian and Black populations.

Nevertheless, such patterns are not generalizable to every non-White group in the United States. The existence of racism and discrimination have been used as an apparatus by dominant groups, hindering the spatial assimilation of minority groups, thereby giving rise to a second theoretical perspective, the place stratification model (Charles 2003; Massey and Denton 1993). The place stratification model suggests that enduring prejudice and discrimination by powerful groups and structural factors that distribute housing opportunities unequally across race, ethnicity and nativity prevent minority access to residential proximity with white people, the majority group (Charles 2003; Massey and Denton 1993). Discrimination practices include realtors steering minority populations to specific neighborhoods where their race and ethnicity predominate and housing providers constraining home-seekers' access to housing on the basis of their race and ethnicity (Besbris 2020; Korver-Glenn 2021; Iceland and Nelson 2010; Massey and Denton 1993; Turner and Ross 2003).

The subjectivity in the perception of MENA and South Asian groups by others, particularly society's majority-group members, leads to negative interactional experiences, and these groups may face greater residential segregation than other groups (e.g., East Asian people), especially considering this longstanding and negative sociopolitical climate that configures them as inherently criminal and potential enemies of the state (e.g., President Trump's "Muslim ban") (Love 2017). Both Arab and South Asian people report being marginalized by policies that single them out as a group that is dangerous and potentially subversive and express concerns about their civil rights and safety (Cainkar and Maira 2005). The report published by the Council on American-Islamic Relations (CAIR) indicates a dramatic increase in civil rights and hate crime complaints, from 48% to 62% filed by Muslims from 2007 to 2016, respectively (CAIR 2009, 2017). Among Asian people, Asian Indian people are the most likely to report being a victim of a hate crime in the U.S. (Wong et al. 2011).

The MENA and South Asian populations have been subject to various forms of discrimination in the housing market. The National Fair Housing Alliance and other studies have documented bias, discrimination, harassment, and hate-motivated practices toward Muslim and Arab people (Carpusor and Loges 2006; Tehranian 2009; Ahmed et al. 2010; Hogan and Berry 2011; Wong et al. 2011; Gaddis and Ghoshal 2015; Garner and Selod 2015; Friedman et al. 2019). Black Muslims have experienced residential disadvantages, even after accounting for differences in socioeconomic status (Friedman et al. 2019). When selecting potential roommates, those with Arab-sounding names are only 57 percent as likely as those with white-sounding names to receive a response to a room-

mate request (Gaddis and Ghoshal 2015), and Arab names receive significantly fewer positive responses when attempting to rent in corporate and privately owned apartment complexes (Carpusor and Loges 2006). Similarly, Asian Indian people experienced the highest racial and immigrant-based discrimination in the United States compared to other Asian groups (e.g., Chinese, Filipino, Japanese, Korean, and Vietnamese people) in the workplace, employment, neighborhood and communities (Wong et al. 2011; Jeung and Lim 2012; Schachter 2014).

It is unclear how discrimination against the MENA and South Asian populations will translate into differences in their residential segregation from white people, especially as it compares to Black–white segregation. The place stratification model offers three possible scenarios: (a) the residential segregation of the MENA and South Asian populations from white people will be greater than Black segregation from white people even after taking into account acculturation, socioeconomic, and demographic characteristics; (b) taking into consideration the longstanding housing discrimination that Black people have faced in the United States, it is expected that the residential segregation of the MENA and South Asian population from white people will be similar to Black segregation from white people, controlling for relevant factors; or (c) given the history of residential segregation that has disadvantaged the Black population for decades relative to other non-Black groups, it is expected that the residential segregation from white people of the MENA and South Asian populations will be lower than Black people, controlling for other factors.

3. Data, Measures, and Methods

3.1. Data

We use two data sources for this research provided by the University of Minnesota: (1) the 2012–2016 American Community Survey (ACS) Summary File (via the National Historical Geographic Information System—NHGIS) and (2) the 2012–2016 Integrated Public Use Microdata Sample (IPUMS)—5% sample (IPUMS USA) (Ruggles et al. 2022). Data from the ACS are extracted at two levels of analysis—the census-tract level and the core-based statistical area (CBSA) level. We restrict our analysis to only metropolitan CBSAs because the accuracy of our calculation of segregation measures relies on larger areas that exceed the population size of micropolitan areas. ACS tract-level data are used to calculate the dependent variables—dissimilarity and isolation indices. The ACS CBSA-level data are used to construct some of the control variables for our analysis.

We use IPUMS data to calculate percentages and average characteristics at the CBSA level for each group—MENA, South Asian, East Asian, and Black—including English language proficiency, educational attainment, income, nativity status, housing tenure, residence in the suburbs, marital status, presence of children, and age. These variables are our focal independent variables and control variables used in our multivariate analyses (discussed in more detail below). The use of these data is critical because the aggregated 2012–2016 ACS data in the Summary File do not contain summary tables for these characteristics by our specific groups (e.g., educational attainment of the MENA population). The IPUMS data maintained by the University of Minnesota provides a CBSA code that we use to aggregate these characteristics for each group by each metropolitan area (Ruggles et al. 2022).

We limit the analytical sample to CBSAs with at least 4000³ members of each group; this yields a total sample of 192 metropolitan CBSAs from our 2012–2016 ACS data. We do not include metropolitan areas with less than 4000 for each group because, in such metropolitan areas, the calculation of the segregation indices is less accurate (Iceland et al. 2002). The units upon which our measures of residential segregation are constructed are

census tracts, which is consistent with the approach of previous research (Iceland et al. 2002; Massey and Denton 1993).

The ACS data are the best available for studying MENA individuals in the United States (Holsinger 2009). Despite there being no consensus on who comprises the MENA population among scholars or well-known research centers (e.g., Pew Research Center, United Nations, U.S. Census Bureau, and the World Bank), the literature converges on the fact that the MENA category is comprised of a multiethnic, multicultural, multilingual and multinational population—which usually includes Egyptians, Iraqis, Jordanians, Saudi Arabians, Lebanese, Moroccans, Palestinians, Syrians, Somalis, Sudanese, Armenians, Israelis, Cypriots, Iranians, Afghans, and Turks (Haddad 2009; Marvasti and McKinney 2004; Awad 2010; Bozorgmehr et al. 1996). Using the ancestry question⁴, we create the category of MENA from individuals who identified as Egyptian, Iraqi, Jordanian, Lebanese, Moroccan, Palestinian, Syrian, Turkish, Iranian, Afghan, Arab, and Other Arab⁵. That is, we include explicit responses to ancestry or origins from seven of these nationalities. Yemeni, Kuwaiti, and Saudi Arabian are not choices for the ancestry question. We suspect that people who identify as having ancestry or origins from those countries may identify as Arab or Other Arab, which are categories that we include in our definition of MENA⁶.

In accordance with the purpose of this study, we use the following inclusion and exclusion criteria in generating the MENA category: (1) self-identification, (2) common categorization by former scholars, and (3) Muslim or Arab country of origin (or both). We argue that it is important to consider self-categorization, as it conveys personal experiences in the wider society. For instance, although previous scholars and many research institutions include Armenian, Israeli and Cypriot people under the MENA moniker, the overwhelming majority of these people identify themselves as white⁷ rather than MENA (Mathews et al. 2017). Among MENA groups who come from Muslim countries, only Somalis, Sudanese, Afghans and Turks do not identify with the MENA category. The majority of the former two groups self-identified as Black, while the latter groups identified with some other race or as white (Mathews et al. 2017). Afghan and Turkish populations are included in this study because they have been categorized as MENA populations by previous scholars (Bozorgmehr et al. 1996; Bakalian and Bozorgmehr 2011; Marvasti and McKinney 2004) and come from predominantly Muslim countries (Pew Research Center 2015). That is, we added ancestry or origins from the countries Morocco, Palestine, Turkey, and Afghanistan to our definition of MENA countries because other research has also included these countries (Bozorgmehr et al. 1996; Marvasti and McKinney 2004; Bakalian and Bozorgmehr 2011), and these countries' populations are at least 98% Muslim (Pew Research Center 2015). One potential limitation of our approach is that we do not know if people who claim ancestry or origins from these countries are practicing Muslims; we only know that they identify with a country where the religion is largely Muslim.

We also created a South Asian category from respondents who reported their ancestry or origins as Asian Indian or Sri Lankan⁸. Although Bangladeshis and Pakistanis are part of the South Asian population, we exclude them from the South Asian category as they come from majority-Muslim countries (91 percent and 96 percent, respectively), and we do not want to conflate geographic region with religion in our MENA and South Asian categories. We compared the percentage of respondents identifying their ancestry or origins from India or Sri Lanka to those that identify their race as Indian or Sri Lankan in order to determine how well the ancestry answers correspond to the race-based answers, the latter of which are more commonly used; 1.12% of respondents answered those categories in the ancestry question, and 1.29% answered them for the race question, thereby revealing a fairly strong concordance between the responses to these questions. We create an East Asian category from individuals identifying as Chinese, Korean, Taiwanese, and Japanese. We found that

2.52% of respondents answered these categories in responding to the ancestry question, and 2.49% of respondents answered them in responding to the race question, revealing a high level of concordance in the responses to these questions. Finally, we create the white and Black groups using the race and ethnicity question on the ACS and counting those that identified as “non-Hispanic White” and “non-Hispanic Black,” respectively, in those categories. In order to keep the white and MENA categories distinct, we subtract the MENA tract count from the non-Hispanic White count⁹.

3.2. Measures

Dependent variables. To measure the residential segregation of the MENA, South and East Asian populations, and Black population from White populations, we use two commonly used segregation measures: the dissimilarity index and the isolation index (see Logan and Stults 2011; Massey and Denton 1988; Massey and Tannen 2015). The dissimilarity index is a measure of the evenness of two populations and ranges from 0 (complete integration) to 100 (complete segregation). Conceptually, it describes the percentage of any members of either of the two groups that would have to change their residence to achieve an even racial and ethnic distribution in the broader metropolitan area (Iceland 2009).

The isolation index is a measure of residential isolation, which refers to the level of potential interaction or contact between minority or majority group members and members of their own group. In Massey and Denton’s words, the isolation index will “capture the experience of segregation from the viewpoint of the average” minority or majority member (Massey and Denton 1993, p. 65). It also ranges from 0 (lowest level of isolation) to 100 (highest level of isolation). Unlike the dissimilarity index, the isolation measure is sensitive to the number of the group in the CBSA.

Both measures are important to include in any analysis of residential segregation because they gauge different dimensions of segregation—the evenness of the group relative to white people versus the isolation of the non-White group. Although MENA and South Asian people compose small shares of the population in any given metropolitan area, their isolation can still be relatively high. For example, Logan and Stults (2011) found that although Asian people compose over 6% of the population in the U.S., the average isolation index across metropolitan areas is 25%, which is notably high given how small their size is in the population. Given the importance of the use of the dissimilarity and isolation indices in previous research (Massey and Denton 1993; Iceland et al. 2002; Logan and Stults 2011), we employ these measures in this analysis.

Focal independent variables. Our analyses use two sets of focal independent variables. The first set is the dummy variables that allow us to compare the MENA–white, South Asian–white, and East Asian–white segregation scores to the Black–white segregation scores, controlling for other relevant factors. The second set of focal independent variables focuses on the acculturation characteristics and socioeconomic status of groups. We measure the acculturation characteristics of groups¹⁰ within each CBSA using: (1) the percentage of each group that reported speaking English only or very well and (2) the percentage that are born in the U.S. The socioeconomic characteristics within each CBSA are measured using the: (1) average household income (in 2016 USD) for each group; (2) the percent education level with BA or more; and (3) the percentage of each group that own their homes.

Control variables. For each CBSA, we also create the following control variables for each group: (1) the percentage living in suburban areas; (2) the percentage of households headed by a married couple; (3) the percentage with children; and (4) the average age. Metropolitan-area level characteristics are also associated with residential segregation

(Logan et al. 2004; Wilkes and Iceland 2004). To account for variation in these characteristics, we draw on data from the ACS SF file for each CBSA and include the following variables: (1) the log of the CBSA population size; (2) the number of each group in the CBSA; (3) the percentage employed in: (a) manufacturing and (b) the government; (4) the percentage of the population in the armed forces; (5) the percentage of the population age 3+ enrolled in college, graduate school, or professional school; (6) the percentage of the population living in housing built since 2000; (7) the percentage of non-white population; and (8) region—Northeast, Midwest, South or West with Northeast as reference category.

3.3. Methods

Analytic approach. To measure the degree to which residential segregation is explained by acculturation, SES, and other independent variables, we conducted multivariate analyses. We used OLS, and we adjusted the standard errors because there are multiple observations within each metropolitan area.

Formally—and generally—the multivariate OLS models can be written as shown in the equation below:

$$Y_{gj} = \beta_0 + \sum_{g=1}^3 \alpha_g (X_{gj}) + \sum_{k=1}^K \beta_k (S_{kgj}) + \sum_{l=1}^L \gamma_l (C_{lj}) + \varepsilon_{gj}$$

where Y_{gj} is the score on the dependent variable for group g in metropolitan area j , β_0 is the constant, representing the predicted value on the dependent variable for the omitted group (Black people) when all other variables in the model are scored 0, the α_g are the increments or decrements to the constant for the three included groups (MENA, South Asian, and East Asian), the β_k are average effects across groups of the K acculturation and SES measures (such as income, which varies by group), the γ_l are average effects across CBSAs of the L CBSA-level measures (such as region, which does not vary by group), and ε_{gj} is an error term, representing unexplained variation in the dependent variable¹¹. The primary coefficient of interest is the α_g , which indicates the extent to which MENA, South Asian, and East Asian segregation—compared to white people—is greater or less than the level of segregation experienced by Black people compared to white people.

Our analysis proceeded as follows. First, we presented weighted (by the total population size within CBSAs) mean indices of dissimilarity and isolation by ancestry and racial groups, and we conducted differences in means tests for those comparisons. Next, we report descriptive statistics for the focal independent and control variables by ancestry and racial groups. Then, we conducted our multivariate analyses for each of our two dependent variables—the index of dissimilarity and isolation index. Following the methods of previous research (Wilkes and Iceland 2004; Iceland and Wilkes 2006; Iceland and Nelson 2010; Friedman et al. 2022), each of the two models contained the three dummy variables (i.e., measuring MENA–white, South Asian–white, and East Asian–white, relative to our reference group Black–white) as well as the other focal independent and control variables. In each of these two models, the dummy variables indicate the nature of the differences in segregation scores between Black–white segregation and each of the other ancestry–white groups’ segregation, as well as whether those differences are statistically significant, controlling for other focal independent and control variables.

4. Results

Our descriptive results begin in Table 1. We report the mean index of dissimilarity scores and isolation index scores for our key ancestry and racial groups across CBSAs weighted by the size of the minority group. We begin by discussing the index of dissimilarity and the differences between the groups relative to the average Black–white score, which is shown by the significance in column 2. Column 1 shows that the average MENA–white

index of dissimilarity across CBSAs is 51.17, meaning that just over 51% of the MENA or white population would have to move for these groups to achieve an even residential distribution. This average score falls in the “moderate” range of segregation scores, although across CBSAs, there is a maximum value of 63.89, which falls into the “high” range (Massey and Denton 1988). Appendix A, Table A1 shows that several CBSAs have high MENA–white segregation scores, like Nashville-Davidson--Murfreesboro--Franklin, TN; Birmingham-Hoover, AL; New Orleans-Metairie, LA Milwaukee-Waukesha, WI and Indianapolis-Carmel-Anderson, IN. Three of the five CBSAs in the list of CBSAs with the highest dissimilarity scores lie outside of the five states where more than 50% of the MENA population lives (i.e., CA, NY, TX, NJ, MI—see Harjanto and Batalova 2022). Thus, our analysis shows that there is significant variation in the segregation between the MENA population and white people that previous research has not uncovered by solely being focused on specific geographic areas where the majority of the MENA population lives (Bozorgmehr et al. 1996; Holsinger 2009).

Table 1. Residential Segregation of the MENA, South Asian, East Asian, and Black Populations from Non-Hispanic Whites in CBSAs, 2012–2016.

Group	Index of Dissimilarity					Isolation Index				
	Mean	Sig. ^{a,b}	St. Dev.	Min.	Max.	Mean	Sig. ^{a,b}	St. Dev.	Min.	Max.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
MENA	51.2	**	6.0	40.3	63.9	6.3	***	7.1	1.9	28.8
South Asian	59.9		5.0	48.1	72.6	11.1	***	4.6	1.9	18.9
East Asian	51.9	**	6.1	40.9	65.0	15.3	***	8.5	2.0	24.7
Black	59.8		10.3	33.2	78.8	47.5		15.4	3.7	68.5
N						192				

^a *** $p < 0.001$; ** $p < 0.01$, indicating significance relative to Black-white segregation. ^b Shading of cells in columns 1, 6 indicates significant at $p < 0.001$, $p < 0.01$, or $p < 0.05$ from MENA-white segregation. Note: We use bivariate regressions to indicate whether differences in residential segregation are significant, relative to Black-white and MENA-white segregation, as indicated by footnotes ^a and ^b, respectively.

The MENA–white average value is significantly lower than the average Black–white index of dissimilarity of 59.77 (see column 2 of Table 1). The standard deviation of the Black–white dissimilarity scores is the highest among all the scores at a value of 10.29, and the maximum value is 78.80, consistent with other research (Massey and Tannen 2015), CBSAs with the highest Black–white dissimilarity scores include Milwaukee-Waukesha, WI; Detroit, MI; and Chicago, IL (see Appendix A, Table A1).¹²

The average South Asian–white index of dissimilarity across CBSAs is 59.92, which falls under the high threshold of segregation scores. Notably, the maximum value of the South Asian–white segregation is 72.56, which is in Birmingham-Hoover, AL (see Appendix A, Table A1). Other CBSAs with very high South Asian–white dissimilarity scores include San Antonio-New Braunfels, TX; Buffalo-Cheektowaga, NY; Kansas City, MO-KS; and St. Louis, MO-IL. The difference between the average South Asian index of dissimilarity score and the Black–white average score is not statistically significant (see column 2 of Table 1). Comparing the unweighted D-scores in Appendix A, Table A2, however, reveals that South Asian people are significantly more segregated from whites than Black people (see column 1). The average East Asian–white index of dissimilarity is 51.90, which falls into the moderate range of segregation scores and is significantly less than the mean Black–white index of dissimilarity. One of the highest dissimilarity scores for East Asian–white segregation is found in Pittsburgh, PA (see Appendix A, Table A1).

We also formally compare these average scores to the average MENA–white dissimilarity score (except for the difference with the Black–white score, which was already

compared). The statistical significance of this comparison is noted by a shading of the cell in column 1 of Table 1. This analysis shows that the average South Asian–white and Black–white index of dissimilarity is significantly higher than the average MENA–white score. The former finding is also present in the unweighted analysis (see Appendix A, Table A2).

Turning to the results for the isolation index scores in column 6, it is notable that the average isolation score for Black people is the highest at 47.48, indicating that, on average, Black people live in neighborhoods where 47.82 percent of the population is Black. As was the case for the index of dissimilarity, the standard deviation of the Black–white isolation score is the largest at 15.44, reaching a maximum value of 68.52, which is for Memphis, TN-MS-AR (according to Appendix A, Table A1). The average isolation index for the MENA population is 6.32, which is significantly lower than the average isolation index for Black people, as denoted in column 7. However, the maximum value is 28.84, which is found in Detroit-Warren-Dearborn, MI (see Appendix A, Table A1). The average isolation indices of South Asian and East Asian people are 11.15 and 15.28, respectively, which are both significantly lower than the average isolation score for Black people and significantly higher than the average isolation score of the MENA population, as denoted by the shading of these two cells (in column 6). The maximum values for the isolation indices reach 18.88 and 24.74, respectively, for South and East Asian people, and are located in San Jose-Sunnyvale-Santa Clara, CA and the New York-Newark-Jersey City, NY-NJ-PA, respectively (see Appendix A, Table A1).

The differences in residential segregation from white people between ancestry groups and Black people are likely related to variation in acculturation-related, socioeconomic, and demographic variables. Table 2 reports descriptive statistics on these variables plus metropolitan-level characteristics for the MENA population, South and East Asian people, and Black people. The results for the acculturation-related variables of English proficiency and nativity status suggest that the ancestry groups should be disadvantaged, relative to Black people, in terms of their segregation from white people. Still, the results for segregation in Table 1 do not reveal such disadvantages. For example, the percentage of the MENA population that speaks only English or English well is almost 70%, but for Black people, it is nearly 96%; however, segregation of the MENA population from white people is significantly lower than the segregation of Black people from white people. The English proficiency level for South and East Asian people is also less than that of Black people, but their segregation scores are similar to or significantly less, respectively, than that of Black people. A similar pattern of results is found for the percentages of the ancestry groups that are native-born; they are significantly lower than that for Black people.

The results for the socioeconomic characteristics, however, likely reveal why the segregation of ancestry groups from white people is lower as Black–white segregation. The average percentage with at least a BA degree of the MENA population and South and East Asian people is at least two times higher than that for Black people. Similarly, the average household income of the MENA and South and East Asian people is at least 1.6 times higher than that of Black people. The percentage of the ancestry groups that are homeowners is also significantly higher than that of Black people, while just over 54% of Black people own their homes, 64.37%, 65.64%, and 71.32% of MENA and South and East Asian people own their homes, respectively.

The results for some of the demographic characteristics indicate that these variables may also be important in predicting the differences in segregation between white people between the ancestry groups and Black people. With respect to the differences in the percentage of households with children present, larger shares of the MENA population (54%) and South (61%) and East Asian people (48%) report having children as compared to

Black people (40%). Thus, their generally lower segregation from white people, relative to that of Black people, could reflect their desires to locate in school districts of higher quality that tend to be in whiter communities (Reardon et al. 2015). Similarly, the percentages of ancestry groups that are married are more than 1.5 times higher than that of Black people, which could also be a demographic characteristic that reduces their segregation from white people. The results for the groups' average age and location in the suburbs, however, reveal no consistent pattern that might be associated with the differences in segregation observed in Table 1.

Table 2. Demographic, Socioeconomic, and Metropolitan Characteristics of the MENA, South Asian, East Asian, and Black Populations in CBSAs, 2012–2016.

	MENA	South Asian	East Asian	Black
Variables	(1)	(2)	(3)	(4)
<i>Spatial assimilation variables</i>				
% speaking English well or only	69.2	79.6	52.6	95.6
% native-born	26.3	7.6	20.2	83.4
Percent education with BA or more	51.8	76.8	57.2	22.3
Average household income (in \$000s)	11,155	15,714	12,248	6923
% homeowners	64.4	65.6	71.3	54.3
<i>Other demographics</i>				
% with children present	53.7	61.0	48.3	40.0
% married	69.9	82.2	70.5	37.8
Average age (in years)	48.0	44.6	49.5	51.0
% in suburbs	60.5	57.5	56.4	62.5
<i>Metropolitan area characteristics</i>				
Log of CBSA population (average)	15.4	15.5	15.6	15.3
Number of the group in CBSA (average)	105,367	222,041	405,780	1,209,927
Percent:				
Employed in:				
Manufacturing	9.1	8.9	8.5	8.6
Government	4.7	4.5	4.5	4.9
In armed forces	0.47	0.34	0.42	0.52
Aged 65 and over	13.4	13.0	13.2	13.2
With a college degree or more	7.7	7.8	7.9	7.6
In housing built since 2000	16.0	16.0	14.6	17.8
Non-white population	45.7	48.6	49.6	46.3
Midwest	0.21	0.16	0.09	0.21
South	0.31	0.32	0.21	0.52
West	0.23	0.24	0.38	0.08
Northeast	0.25	0.29	0.32	0.19
No. of CBSAs	48	48	48	48

For the most part, the variations in metropolitan characteristics between the ancestry groups and Black people reveal no clear-cut patterns that might relate to the differences in residential segregation observed in Table 1. For example, the average percentage employed in manufacturing across CBSAs is 9.12% among the MENA population, 8.91% among South Asian people, 8.48% among East Asian people, and 8.62% among Black people. Similar equivalent percentages are observed across these groups for the percentages employed in the government and in the armed forces and in other characteristics, including the percentages aged 65 and over, with a college degree or more, in housing built since 2000, and non-white population. Given that these are average percentages across CBSAs, it is not surprising that little variation exists between ancestry groups and Black people.

The low average values of isolation scores observed in Table 1 for the MENA population and South and East Asian people are not surprising in light of the results in Table 2 for the average number in each group in the CBSA. For the MENA population, the average number in the group across CBSAs is about 105,366, which is relatively small. While small numbers of the MENA population in each CBSA make it difficult for values of the isolation index to be very large, it is notable that the maximum value is 28.84, which is in the Detroit CBSA and is consistent with other research that has found that many MENA immigrants have located among their co-ethnics (Bakalian and Bozorgmehr 2013; Holsinger 2009; Lin 2009). The South and East Asian average population sizes across CBSAs are 222,040 and 405,779, respectively, which are also lower than for Black people (i.e., 1,209,927) and are consistent with the fact that the average isolation scores for South and East Asian people are 11.15 and 15.28, respectively.

Turning to the last set of results in Table 2 for regional location, there are somewhat different geographic patterns of location of the groups. The MENA population is more evenly distributed across the Midwest, South, West, and Northeast than the other groups. Among South and East Asian people, the lowest percentages—16% and 9%—live in the Midwest, respectively. South Asian people tend to be most likely to live in the South and Northeast, whereas greater shares of East Asian people are located in the West and Northeast. With respect to Black people, 52% live in the South, which is consistent with research that has revealed a return migration of Black people to the South (Falk et al. 2004).

We now turn to our multivariate analyses in Table 3 to assess the residential segregation of ancestry groups from white people as it compares to that of Black people from white people once we adjust for the differences in group- and metropolitan-level characteristics discussed in Table 2. As stated above, these analyses are weighted by the total population size in the metropolitan area consistent with the approach taken in previous research (e.g., Lichter et al. 2015).¹³

In discussing the results of these models, we first focus on our key differences in residential segregation between ancestry groups and white people relative to segregation between Black people and white people. In contrast to the descriptive or unadjusted results in Table 1, we find that MENA–white segregation and South Asian–white segregation, as measured by the index of dissimilarity, are higher than Black–white segregation as denoted by the positive coefficients, controlling for group- and metropolitan-level characteristics, but are not statistically significant. Interestingly, the segregation of South Asian people from white people is about 16 units higher than the segregation of Black people from white people; the magnitude of the difference between MENA–white and Black–white segregation is only 1.3 units. The coefficient for East Asian–white segregation is negative and small (−0.677) but is not significantly different from Black–white segregation, controlling for other factors.

Column 2 of Table 3 reports the results from our model of the variation in isolation indices. Unlike the descriptive or unadjusted results in Table 1, the isolation of indexes of the MENA population and South and East Asian people are higher—5.7, 23.7, and 15.6 units, respectively—than the isolation index of Black. However, after controlling for relevant factors, group- and metropolitan-level characteristics, the differences, relative to Black people, in the isolation indices of the MENA population and South and East Asian people are no longer significant, which is in contrast to the unadjusted results reported in Table 1 where MENA and South and East Asian people had significantly lower levels of isolation than Black people.

What is the association between residential segregation and the acculturation-related, socioeconomic, and demographic variables? Column 1 of Table 3 shows that few characteristics are significantly associated with variation in the index of dissimilarity. With respect to the acculturation-related and socioeconomic variables, the findings are consis-

tent with hypotheses derived under the spatial assimilation model. Controlling for other factors, the average household income of groups and percent native-born are negatively and significantly related to residential segregation from white people, as gauged by the dissimilarity index. The group percentages of speaking English well are negatively related to the dissimilarity index, but the coefficient is not statistically significant. Interestingly and in contrast to the spatial assimilation model, the results show that the percentage group with BA or more education is positively and significantly associated with the dissimilarity index for these groups. With respect to group-level demographic variables, the percentage of children present is positively and significantly related to residential segregation from white people. On the other hand, the percentage of married people is negatively and significantly related to dissimilarity scores.

Table 3. Coefficient and Standard Error Estimates from OLS Regression Models of Dissimilarity and Isolation Indexes by Group, with All Control Variables, 2012–2016.

Variables	Dissimilarity			Isolation		
	Coeff.	SE	Sig.	Coeff.	SE	Sig.
<i>Group (ref. Black-white)</i>						
MENA—white	1.32	9.51		5.65	11.92	
South Asian—white	15.92	10.38		23.72	13.88	
East Asian—white	−0.68	13.37		15.64	17.03	
<i>Spatial assimilation variables</i>						
% speaking English well or only	−0.19	0.15		−0.61	0.26	*
% native—born	−0.18	0.07	**	0.41	0.14	**
Percent education with BA or more	0.92	0.18	***	0.89	0.30	**
Average household income (in \$000s)	0.00	0.00	***	0.00	0.00	
% homeowners	0.23	0.18		0.80	0.33	*
<i>Other demographics</i>						
% with children present	0.92	0.29	**	3.17	0.43	***
% married	−1.62	0.30	***	−3.53	0.53	***
Average age (in years)	0.84	0.64		1.00	1.06	
% in suburbs	−0.02	0.05		0.07	0.10	
<i>Metropolitan area characteristics</i>						
Log of CBSA population	0.50	0.95		−2.14	1.78	
Percent:						
Employed in manufacturing	0.11	0.16		−0.25	0.36	
Employed in government	0.75	0.26	**	−0.20	0.50	
In armed forces	0.00	0.45		2.67	0.72	**
Aged 65 and over	−0.88	0.27	**	−0.33	0.65	
With a college degree or more	−2.64	0.83		−3.56	1.28	**
In housing built since 2000	−0.63	0.12	***	−0.53	0.22	*
Non—white population	−0.04	0.05		0.12	0.13	
<i>Region (ref. Northeast)</i>						
Midwest	0.23	1.77		−0.63	3.99	
South	−2.03	2.38		0.92	5.89	
West	−3.48	1.54	*	−12.03	3.77	**
Constant	99.19	43.09	*	26.99	65.30	
Adjusted R-squared	0.82			0.88		
No. of observations			192			

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

Column 2 of Table 3 shows the characteristics that are significantly associated with variation in the isolation index. Controlling for other factors, the group percentages speaking English well is negatively and significantly related to residential isolation, which is consistent with hypotheses derived under the spatial assimilation model. However, the native-born group percentages with a BA and more education that are homeowners

are all positively and significantly related to residential isolation, which is in contrast to the hypotheses derived under the spatial assimilation model that suggest that more native-born individuals and those of greater socioeconomic status would not necessarily be residentially isolated. On the other hand, these findings do reveal support for the finding that affluent households tend to isolate amongst themselves (Reardon and Bischoff 2011). Household income is the only socioeconomic variable that is not significantly associated with isolation, although it is positively related to isolation. Most of the demographic variables are significantly associated with variation in the isolation index. The percentage of the group with children and the average age are positively associated with isolation indices, and the percentage of the group that is married is negatively associated with isolation, controlling for other relevant factors.

How do the metropolitan-level characteristics relate to segregation? The lower half of Table 3 reports these results. The size of the population in the CBSA is positively related to the dissimilarity index, consistent with other segregation research (e.g., Wilkes and Iceland 2004; Iceland and Nelson 2010). The percentage of the population employed in government is significantly and positively related to segregation from white people, and the percentage of the population that is aged 65 and over is significantly and negatively related to dissimilarity scores, controlling for relevant factors. The percent of the population living in housing built since 2000 is negatively and significantly related to residential segregation from white people, which is consistent with previous research and suggests that areas with housing built after the passage of the Fair Housing Act have lower levels of residential segregation from white people (e.g., Wilkes and Iceland 2004; Iceland and Nelson 2010; Friedman et al. 2022).

The percent employed in the armed forces is significantly and positively related to residential isolation, and the percent of the population aged 65 and over is significantly and negatively related to residential isolation. As with the results for dissimilarity scores, the percentage of the population living in housing built since 2000 is negatively and significantly related to residential isolation. Similarly, the percentage of the population with a college degree or more is significantly and negatively related to isolation scores, controlling for relevant factors.

Metropolitan areas in the West have significantly lower values of the index of dissimilarity than those in the Northeast, controlling for other factors. This finding is also true for the isolation index, controlling for other factors. The adjusted R-squared for the dissimilarity index indicates that approximately 82% of the variation is explained by the independent variables in the model, suggesting that the model fits the data well and that the independent variables provide a strong explanation of the variation in the dissimilarity index. Similarly, the adjusted R-squared value for the isolation index is also very high (88%), indicating that the model provides a very strong fit in explaining the variation in isolation indexes across metropolitan areas based on the given predictors.

5. Discussion

The goals of this study were to examine the residential segregation of the MENA population and South and East Asian people from white people in the United States and to compare their segregation to that of Black people from white people. Little research has examined the residential segregation of the MENA and South Asian populations from white people. Our study builds upon the few studies that exist on this topic using much more recent data from the 2012–2016 Summary File of the ACS and the IPUMS.

The descriptive analyses of segregation as measured by the index of dissimilarity and the isolation index reveal that Black–white segregation, as gauged by both measures, is significantly greater than the other groups' segregation from white people. The one

exception is that there is no statistically significant difference between the average indices of dissimilarity of Black–white segregation and South Asian–white segregation. Taken together, these results could be indicative of support for either the tenets of the spatial assimilation or place stratification models. With respect to the spatial assimilation model, it is likely that the higher levels of Black–white segregation reflect Black people’s poorer socioeconomic status than that of the MENA population and South and East Asian people, consistent with hypotheses derived under this model. Indeed, the results in Table 2 revealed that Black people have much lower levels of income and access to homeownership than the ancestry groups, and Black people’s average years of education were also lower than that of the MENA population and South and East Asian people. In addition, Black people are much less likely than the ancestry groups to be married, which can also put them at an economic disadvantage if there are fewer earners in the household. According to the tenets of the spatial assimilation model, these disadvantages will likely make them more segregated from white people than their ancestry counterparts. The principles of place stratification, however, offer a different explanation. They suggest that higher levels of Black–white segregation, relative to the segregation of other groups from white people, is the result of Black exceptionalism, in that Black people have experienced a legacy of discrimination in the housing market that is above and beyond what other people of color have faced in American history (Logan and Stults 2011; Massey and Denton 1993; Massey and Tannen 2015; Wilkes and Iceland 2004).

The multivariate analyses in Table 3 provide a better way to adjudicate support for the tenets of these two different models because they include controls for socioeconomic, demographic, acculturation-related, and other relevant variables. Our results indicate support for hypotheses derived under the spatial assimilation model. The results regarding the index of dissimilarity reveal that once we account for control variables, the average level of segregation of MENA and South Asian people from white people is not significantly different than Black–white segregation. The results for the isolation index also show a similar pattern of findings. While MENA and both Asian ancestry groups are significantly less isolated than Black people in the unadjusted results (Table 1), after controlling for relevant characteristics, the differences in average isolation indices between Black people and these groups disappear. Thus, making these groups’ acculturation-related, socioeconomic, demographic, and other characteristics reduces the large gap in isolation indices between Black people and MENA and Asian ancestry groups and renders the differences non-significant.

The results for the control variables in the models also suggest support for the tenets of the spatial assimilation model. For example, the percentage of groups speaking English only or well, native-born, married, and the average household income was negatively related to segregation as measured by the dissimilarity index. Thus, consistent with hypotheses under the spatial assimilation model, acculturation and higher levels of socioeconomic status of groups were negatively related to residential segregation. Some results that did not conform with expectations under the model were the findings that the percentages of a group that is native-born, with a college education or more, and homeowners were positively associated with variation in the isolation index. As mentioned above, these alternative findings are consistent with research that shows that affluent households are increasingly isolating from one another (Reardon and Bischoff 2011).

The main contribution of our study is that it expands the existing literature by being the first to document levels of segregation of the MENA population and South Asian people in a much wider range of metropolitan areas, using recent data relative to Black–white segregation. Multivariate analyses that compare the segregation of non-white groups from white people have shown that Black people are significantly more segregated from white people than other non-white groups, controlling for other factors (Wilkes and Iceland 2004;

Iceland and Wilkes 2006; Iceland and Nelson 2010). However, research using more recent data has shown that there is no significant difference between Black people and Asian people in their residential segregation from white people after controlling for relevant group- and metropolitan-level characteristics (Rugh and Massey 2014).

Our findings appear to be consistent with this latter study. After controlling for relevant group- and metropolitan-level characteristics, as well as regional differences, we find no significant difference in segregation from whites between Black people and the MENA population and South and East Asian people. While not statistically significant, it is notable that the results in Table 3 show that South Asian residential segregation from white people in terms of the index of dissimilarity and isolation index is higher than Black–white people residential segregation.

Some scholars argue that immigrants with high levels of social capital—such as South Asian people—may prefer to settle in ethnic communities, defined as “ethnic neighborhoods that are selected as living environments by those who have wider options based on their market resources” (Logan et al. 2002, p. 300). Mainly, this approach—the ethnic community model—argues that immigrants form ethnic communities and live among co-ethnics even when living in affluent white neighborhoods is feasible for them to maintain their traditions, cultural practices and lifestyle (Portes and Jensen 1989; Lee and Kye 2016; Li 1998; Logan et al. 2002). Thus, segregation of immigrant groups, particularly those with high socioeconomic capital, could be attributable to in-group, residential preferences.

Several lines of inquiry would be useful for future research to pursue to expand the present analysis. It would be fruitful for future research to use individual-level data to examine the association between individual-level characteristics and locational attainment measured by the percentage of white and non-white in the neighborhood as well as the neighborhood poverty rate and median income, for example. With access to the confidential IPUMS data, the research could examine how acculturation-related, socioeconomic, and other characteristics predict access to neighborhoods inhabited by white people (the majority group) as well as with higher levels of socioeconomic status for specific MENA, South, and East Asian groups. This would be another way to test whether and how the tenets of the spatial assimilation model are supported, but using individual-level data would show how individual-level characteristics are associated with neighborhood characteristics. It would also examine the individual attainment of specific groups underlying the broad categories of MENA, South, and East Asian people. A benefit of focusing on individual-level data is that you would capture much more variation in the experiences of smaller groups like the MENA population. In aggregate analyses of residential segregation, if the metropolitan area is too small, it would not be included in the analysis.

Future research should also explore the mechanisms underlying the segregation of all the groups from white people. Uncovering why minority groups do not differ in their residential segregation from white people is important and can be examined more clearly at the individual level. The results would show whether individual-level socioeconomic and demographic characteristics are associated with location in neighborhoods of better quality. If they are not associated with residential attainment, it could point to the fact that other, more structural factors like housing discrimination could be affecting individuals' location in neighborhoods of varying quality.

A final direction for future research would be to focus more on variation in segregation of South Asian people who experienced higher levels of residential segregation from white people than Black people in both multivariate models. However, the findings were not statistically significant. Previous research shows that South Asian people have been mistaken as MENA and/or Muslim because of their phenotypical similarities and common religious indicators (e.g., turban for Sikhs and hijab for Muslims), and as a result of this

mistaken identity have been subjected to racial discrimination (Maira 2004, p. 219; Lee and Kye 2016; Love 2017). In fact, studies show that compared to Chinese, Filipino, Japanese, Koreans and Vietnamese, Asian Indian people experienced the highest racial and immigrant-based discrimination in the United States (Jeung and Lim 2012; Schachter 2014) in the workplace, employment, neighborhood and community level and have been viewed as “adversarial invaders and troublemakers” (Aptekar 2009, pp. 1512–29; Brettell 2011). These studies use older data, however. Thus, future research should conduct audits or correspondence tests to examine current discrimination and barriers faced by groups on the basis of race/ethnicity and/or religion in the housing market.

By 2030, non-Hispanic whites will constitute about 56% of the overall U.S. population but just under a majority of the population under 35 (i.e., 48%) (U.S. Census Bureau 2017). The Asian population in the U.S. is growing particularly rapidly. It is expected that by 2055, Asian people will surpass Hispanics in being the largest immigrant group in the U.S. (Pew Research Center 2021). Asian Indian people are the second largest subgroup in the overall Asian category and have grown in population by 142% between 2000 and 2019, which is much greater than the 88% growth rate of Chinese, the largest Asian subgroup (Pew Research Center 2021). Given the significant projected growth of South Asian people, it is imperative for future research to monitor their residential segregation relative to the segregation of other Asian and non-white groups, especially given that residence is inextricably linked to other dimensions of stratification and well-being in metropolitan America.

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Data Availability Statement: This study utilizes two publicly available datasets provided by the University of Minnesota: (1) the 2012–2016 American Community Survey (ACS) Summary File, accessed via the National Historical Geographic Information System (NHGIS) (<https://www.nhgis.org/>, 2 March 2025), and (2) the 2012–2016 Integrated Public Use Microdata Sample (IPUMS) 5% sample (IPUMS USA) (<https://usa.ipums.org/usa/>, 2 March 2025).

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Appendix A

Table A1. Metropolitan Areas with Highest and Lowest Residential Segregation of the MENA, South Asian, East Asian, and Black Populations, 2012–2016.

MENA			
Highest Dissimilarity		Highest Isolation	
Nashville-Davidson–Murfreesboro–Franklin, TN	63.9	Detroit-Warren-Dearborn, MI	28.8
Birmingham-Hoover, AL	62.8	Nashville-Davidson–Murfreesboro–Franklin, TN	6.61
New Orleans-Metairie, LA	62.7	Chicago-Naperville-Elgin, IL-IN-WI	5.95
Milwaukee-Waukesha, WI	62.2	San Diego-Chula Vista-Carlsbad, CA	5.90
Indianapolis-Carmel-Anderson, IN	62.1	Washington-Arlington-Alexandria, DC-VA-MD-WV	5.79
Lowest Dissimilarity		Lowest Isolation	
San Jose-Sunnyvale-Santa Clara, CA	40.3	Virginia Beach-Norfolk-Newport News, VA-NC	1.93
San Francisco-Oakland-Berkeley, CA	40.6	Oklahoma City, OK	2.08
Providence-Warwick, RI-MA	41.2	Kansas City, MO-KS	2.08
Boston-Cambridge-Newton, MA-NH	42.8	Hartford-East Hartford-Middletown, CT	2.08
Washington-Arlington-Alexandria, DC-VA-MD-WV	44.3	Minneapolis-St. Paul-Bloomington, MN-WI	2.09

Table A1. Cont.

SOUTH ASIAN			
Highest Dissimilarity		Highest Isolation	
Birmingham-Hoover, AL	72.6	San Jose-Sunnyvale-Santa Clara, CA	18.9
San Antonio-New Braunfels, TX	72.1	San Francisco-Oakland-Berkeley, CA	16.9
Buffalo-Cheektowaga, NY	71.4	New York-Newark-Jersey City, NY-NJ-PA	15.4
Kansas City, MO-KS	71.4	Raleigh-Cary, NC	14.0
St. Louis, MO-IL	71.4	Dallas-Fort Worth-Arlington, TX	14.0
Lowest Dissimilarity		Lowest Isolation	
Orlando-Kissimmee-Sanford, FL	48.1	Virginia Beach-Norfolk-Newport News, VA-NC	1.90
Washington-Arlington-Alexandria, DC-VA-MD-WV	51.0	Las Vegas-Henderson-Paradise, NV	2.19
San Jose-Sunnyvale-Santa Clara, CA	52.8	New Orleans-Metairie, LA	2.29
Boston-Cambridge-Newton, MA-NH	54.8	Miami-Fort Lauderdale-Pompano Beach, FL	2.61
Austin-Round Rock-Georgetown, TX	57.2	Salt Lake City, UT	2.65
EAST ASIAN			
Highest Dissimilarity		Highest Isolation	
Pittsburgh, PA	65.0	New York-Newark-Jersey City, NY-NJ-PA	24.7
Birmingham-Hoover, AL	62.2	San Francisco-Oakland-Berkeley, CA	24.1
Buffalo-Cheektowaga, NY	61.7	San Jose-Sunnyvale-Santa Clara, CA	20.5
Cleveland-Elyria, OH	59.9	Chicago-Naperville-Elgin, IL-IN-WI	13.0
St. Louis, MO-IL	59.7	Boston-Cambridge-Newton, MA-NH	12.4
Lowest Dissimilarity		Lowest Isolation	
Denver-Aurora-Lakewood, CO	40.9	San Antonio-New Braunfels, TX	2.02
San Jose-Sunnyvale-Santa Clara, CA	42.2	Tampa-St. Petersburg-Clearwater, FL	2.04
Seattle-Tacoma-Bellevue, WA	42.6	Milwaukee-Waukesha, WI	2.20
Portland-Vancouver-Hillsboro, OR-WA	42.6	Jacksonville, FL	2.21
Salt Lake City, UT	43.0	Birmingham-Hoover, AL	2.24
BLACK			
Highest Dissimilarity		Highest Isolation	
Milwaukee-Waukesha, WI	78.8	Memphis, TN-MS-AR	68.5
Detroit-Warren-Dearborn, MI	73.5	Detroit-Warren-Dearborn, MI	67.6
Chicago-Naperville-Elgin, IL-IN-WI	72.6	New Orleans-Metairie, LA	64.0
Cleveland-Elyria, OH	71.5	Milwaukee-Waukesha, WI	63.8
Newark-Jersey City, NY-NJ-PA	71.3	Chicago-Naperville-Elgin, IL-IN-WI	63.0
Lowest Dissimilarity		Lowest Isolation	
Las Vegas-Henderson-Paradise, NV	33.2	Salt Lake City, UT	3.72
Riverside-San Bernardino-Ontario, CA	37.4	San Jose-Sunnyvale-Santa Clara, CA	4.50
Raleigh-Cary, NC	39.7	Portland-Vancouver-Hillsboro, OR-WA	8.04
San Jose-Sunnyvale-Santa Clara, CA	39.8	Phoenix-Mesa-Chandler, AZ	10.2
Phoenix-Mesa-Chandler, AZ	40.2	Fresno, CA	10.7

Table A2. Residential Segregation of MENA, South Asian, East Asian, and Black Populations from non-Hispanic Whites in CBSAs, 2012–2016 (Unweighted).

Group	Index of Dissimilarity					Isolation Index				
	Mean	Sig. ^{a,b}	St. Dev.	Min.	Max.	Mean	Sig. ^{a,b}	St. Dev.	Min.	Max.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
MENA	53.0		6.0	40.3	63.9	3.9	***	3.9	1.9	28.8
South Asian	63.6	***	5.9	48.1	72.6	7.0	***	4.0	1.9	18.9
East Asian	52.0		5.9	40.9	65.0	6.3	***	5.2	2.0	24.7
Black	55.4		10.7	33.2	78.8	36.6		19.6	3.7	68.5
N						192				

^a *** $p < 0.001$, indicating significance relative to Black-white segregation. ^b Shading of cells in columns 1, 6 indicates significant at $p < 0.001$, $p < 0.01$, or $p < 0.05$ from MENA-white segregation. Note: We use bivariate regressions to indicate whether differences in residential segregation are significant, relative to Black-white and MENA-white segregation, as indicated by footnotes ^a and ^b, respectively.

Notes

- 1 For the purposes of this study, we include ancestries in the MENA category based on three criteria: self-identification, common categorization by scholars, and Muslim or Arab country of origin (or both). Accordingly, the MENA category in the current study refers to people of Egyptian, Iraqi, Jordanian, Lebanese, Moroccan, Palestinian, Syrian, Iranian, Afghani, and Turkish descent. We provide more details about the operationalization of the MENA group in the Data, Measures, and Methods section.
- 2 The South Asian category includes Indian and Sri Lankan people. For further discussion, see the data and method section in this study.
- 3 We also ran our analyses with 1000 as the population cutoff, and the results were not substantially different. We focused on results using the 4000-person threshold because a higher cutoff leads to more reliable and robust estimates (Napierala and Denton 2017). Upon request by the authors, the results of the 1000-population cutoff will be provided.
- 4 The ancestry question on the ACS questionnaire asked respondents, “What is this person’s ancestry or ethnic origin?” When we coded each category of MENA, South and East Asian, we used “ANCESTR1”, which provides the respondent’s self-reported ancestry or ethnic origin from IPUMS. We chose to create those categories using the first response to the ancestry question because we believe those “individuals are presumably the ones most likely to have a strong ethnic identity (and may experience more residential segregation)” (Iceland et al. 2014, p. 602).
- 5 The counts of ancestry groups from the NHGIS data do not indicate the number of respondents that do not report ancestry. Therefore, we are unable to do any specific analyses of variation in the percentage that does not report ancestry at the census tract or CBSA levels.
- 6 People identifying as Arab or Other Arab may not necessarily be Muslim, but given that there are no categories for Saudi Arabia, Kuwait, and Yemen, we include these generic Arab categories.
- 7 In the existing race question in U.S. Census Bureau surveys, there is no MENA category that allows individuals to be identified simultaneously as white and MENA. However, MENA populations can self-identify as “white” in the race question and write their ethnicity in the ancestry question. For the purpose of this study, we develop inclusion and exclusion criteria for groups by utilizing findings from the 2015 National Content Test conducted by the U.S. Census on whether to include a “MENA” category in the existing race question.
- 8 In terms of social and economic characteristics, both Sri Lankans and Asian Indian people show relatively similar trends. For instance, according to the Pew Research Center, Sri Lankans in the U.S. have a higher level of educational attainment compared to the overall American population. A significant majority (60%) of Sri Lankans have at least a bachelor’s degree, with 31% holding postgraduate degrees. Similarly, according to the Pew Research Center, Asian Indian people in the U.S. also have a higher level of educational attainment than the overall American population: a significant majority (75%) of Asian Indian people have at least a bachelor’s degree, with 43% holding postgraduate degrees. Additionally, Indian American households have a median income of USD 145,000, while the median annual household income for Sri Lankan Americans is USD 85,800. In terms of English language proficiency, approximately 79% of Sri Lankan Americans aged 5 and older are proficient in English, compared to about 82% of Indian Americans in the same age group. Considering the high socioeconomic attainments of both groups and the relatively small proportion of Sri Lankans within the South Asian category, we believe that the findings would not differ significantly if Indian or Sri Lankan people were examined separately.
- 9 There may be some overlap between the non-Hispanic white and MENA populations because they are derived from the race and ancestry questions on ACS, respectively. According to the 2015 National Content Test conducted by the U.S. Census (Mathews et al. 2017), the MENA population overwhelmingly identified themselves in the “white” racial category, with the sole exception of Afghans.
- 10 We aggregate the individual-level responses to the CBSA level so that we can get group-specific measures of characteristics to use as predictors of segregation. With respect to nonresponse, the rate was 13.4% in the individual-level data. Our decision to exclude those who did not report ancestry is consistent with the decisions of previous research (e.g., Gullickson 2016; Gullickson and Morning 2011).
- 11 These models are weighted by CBSA population size, and the standard errors are adjusted for the clustering of observations (one for each group) within CBSAs.
- 12 Appendix A, Table A2 shows the unweighted residential segregation scores. While the MENA D-score is similar to that presented in Table 1, the D-score for Black people is lower, and the MENA-Black D-score difference is insignificant in Appendix A, Table A2.
- 13 There is evidence of heteroskedasticity in our analysis. While the coefficients in our model remain unbiased, they lack efficiency under such conditions. Robust standard errors (e.g., Huber–White standard errors) can be employed to improve efficiency. These robust standard errors do not eliminate heteroskedasticity but ensure valid statistical inference even when heteroskedasticity is present.

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Article

Migration and Segregated Spaces: Analysis of Qualitative Sources Such as Wikipedia Using Artificial Intelligence

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Abstract: The scientific literature on residential segregation in large metropolitan areas highlights various explanatory factors, including economic, social, political, landscape, and cultural elements related to both migrant and local populations. This paper contrasts the impact of these factors individually, such as the immigrant rate and neighborhood segregation. To achieve this, a machine learning analysis was conducted on a sample of neighborhoods in the main Spanish metropolitan areas (Madrid and Barcelona), using a database created from a combination of official statistical sources and textual sources, such as Wikipedia. These texts were transformed into indexes using Natural Language Processing (NLP) and other artificial intelligence algorithms capable of interpreting images and converting them into indexes. The results indicate that the factors influencing immigrant concentration and segregation differ significantly, with crucial roles played by the urban landscape, population size, and geographic origin. While land prices showed a relationship with immigrant concentration, their effect on segregation was mediated by factors such as overcrowding, social support networks, and landscape degradation. The novel application of AI and big data, particularly through ChatGPT and Google Street View, has enhanced model predictability, contributing to the scientific literature on segregated spaces.

Keywords: urban segregation; urban landscape; Wikipedia; ChatGPT; machine learning; immigration

1. Introduction

Residential segregation is a complex phenomenon related to the social, economic, political, and cultural dynamics of a society. The influencing factors are heterogeneous, maintaining reciprocal relationships that complicate a detailed analysis. The individualism inherent in human beings and the fear of the unknown safeguard these spaces that seek homogeneity in the characteristics of the resident population (García-Hernández 2020). This phenomenon tends to manifest itself, especially in metropolitan areas, where the concentration of the immigrant population in certain neighborhoods often ends up generating spaces segregated from the rest of the city.

Several studies have examined spatial segregation, identifying how various factors contribute to segregation. In this regard, the income of residents, land prices, the concentration of immigrants from the same geographic origin, and the characteristics of the urban landscape are significant factors (Vaalavuo et al. 2017). Thus, it has been established that neighborhoods with a low average income tend to concentrate a higher proportion of immigrants, which in turn increases the likelihood of segregated enclaves (Van Ham et al. 2021). Similarly, the key importance of the urban landscape and negative narratives about certain neighborhoods has been identified, which can certainly accentuate the social exclusion of certain neighborhoods, creating a vicious cycle that hinders the social and residential mobility of immigrants (Sýkora and Bouzarovski 2012).

Despite the abundance of literature on residential segregation in Spanish cities, there are significant gaps regarding the relationship between the different factors that contribute to this phenomenon. Thus, little research has been conducted on the combined impact of variables such as income, land prices, urban landscape, and the geographic concentration of immigrants on segregation and how these factors interact differently according to the geographic origin of migrant populations. In this regard, Rodríguez-García (2022) and Lacayo (2016) point out that segregation does not manifest itself in the same way in all immigrant groups. However, the current literature does not provide sufficient detail on the differences between populations from Asia, Africa, and Latin America in Spanish cities.

This research gap poses a fundamental question: How do average income, the urban landscape and the concentration of immigrants from different geographic origins interact in the formation of segregated spaces in Spain's main metropolitan areas? The answer to this question will allow us not only to identify the most influential factors in the formation of segregated spaces but also to identify differences in the processes of urban segregation according to the geographic origin of immigrants.

On the other hand, there are abundant studies on the segregation of spaces (Matossian 2018), although statistical sources that estimate the segregation of urban spaces with little rigor are often resorted to due to limitations imposed by statistical legislation on the characteristics of the population and because the methodologies for obtaining data evolve at a slower pace than the current social dynamics. That is why it may be convenient to resort to other textual sources that adapt more quickly such as social networks or an encyclopedia such as Wikipedia.

Therefore, this paper seeks to advance the understanding of residential segregation processes in neighborhoods with high immigrant concentrations in Madrid and Barcelona, addressing gaps in the existing literature on the interplay between economic, spatial, and demographic factors in shaping segregated spaces. By employing a comparative analysis that uses both traditional demographic data and unconventional sources such as Wikipedia, this study offers a novel methodological approach. Wikipedia's dynamic and community-driven content provides a unique perspective on urban spaces, capturing narratives and representations that evolve more rapidly than traditional statistical sources.

These analyses, combined with indices measuring the geographic concentration of immigrant populations by origin (Asia, Africa, Latin America, and Europe), aim to uncover nuanced differences in segregation patterns across diverse migrant groups. By integrating quantitative measures with insights from publicly accessible knowledge bases, this study not only contributes to the academic debate on ethnic residential segregation but also highlights the importance of alternative data sources for understanding complex urban phenomena. Ultimately, this research aspires to equip policymakers and urban planners with actionable insights to foster more equitable and inclusive cities.

1.1. Main Factors Influencing Urban Segregation

Income levels have a direct impact on where immigrant populations settle in cities, as they create barriers to housing and access to certain neighborhoods. As a result, immigrants, typically with fewer resources, concentrate in areas with more affordable housing, which increases residential segregation (Jones 2011). Neighborhoods with lower incomes tend to be more densely populated, as people are forced to share smaller, more accessible spaces. In addition, the concentration of low-income immigrants in neighborhoods fosters the creation of segregated communities, where opportunities for social and residential mobility are limited. Furthermore, segregation creates disparities in access to public services, infrastructure, and job opportunities, thereby exacerbating economic and social inequalities in cities. As Musterd et al. (2016) point out, this dynamic reinforces patterns of urban inequality, which in turn weakens social cohesion and the integration of immigrants into the urban fabric.

1.1.1. Price of Land

Housing prices and land values are not only linked to accessibility to goods and services but also to socioeconomic and political dynamics that influence residential segregation. In this sense, Skifter Andersen et al. (2015) argue that segregation is not only caused by economic factors but that urban planning policies also represent an essential factor in the distribution of population in cities. The concentration of social housing in certain areas, instead of a more equitable distribution throughout the urban space, contributes to the creation of segregated low-income neighborhoods, which reinforces spatial segregation. In this way, the price of land, influenced by real estate speculation, limits the potential for developing affordable housing in central or better-served areas.

Trounstein (2020) argues that urban policies have historically fostered patterns of segregation that continue to this day, with zoning decisions that exclude certain social groups from more affluent neighborhoods. These decisions have had a disproportionate impact on immigrant and minority communities, who are not only affected by economic barriers but also by discriminatory practices that restrict their access to affordable rental housing in areas with higher real estate values and better infrastructure. As Cuenca (2023) points out, this spatial segregation is reinforced by the lack of inclusive policies that promote genuine social and economic integration in cities. Instead, the concentration of investments in areas of more profitable areas increases the value of land in these spaces, displacing the population with lower incomes to the urban periphery.

Thus, as Sampson (2012) indicates, immigrants' choice of residence is not so much a matter of preference but of constraints set by the real estate market and the discriminatory practices of the different groups involved in the supply of housing. Social networks, such as family and friends, play an important role in the concentration of this population in specific neighborhoods, reinforcing segregation. In addition, failed urban policies contribute to the fact that the neighborhoods where the immigrant population is concentrated are affected by the lack of investment in public services, which in turn contributes to prolonging socioeconomic and spatial inequalities (Ministerio de Vivienda y Agenda Urbana 2024).

1.1.2. Compatriot Networks and Immigrant Placement

Cultural, ethnic, and social identifications are primary factors in the residential segregation of the immigrant population, as they influence the preferences they may have in choosing their residence. Often, the immigrant population is confronted with the practices of some landlords who limit rental options in certain neighborhoods, resulting in concentration in neighborhoods with less strict requirements. Likewise, the immigrant population tends to consult relatives, friends, or compatriots about the most appropriate places to look for housing, resulting in concentration in certain city neighborhoods (Sampson 2012).

Likewise, urban planning often has a direct impact on the configuration of cities, as well as on segregation patterns. One example is the development of social or public housing in specific areas, as opposed to atomization in large cities, which can lead to greater inclusion of the population (Musterd and Ostendorf 1998).

1.1.3. The Urban Landscape

The urban landscape is an essential factor in shaping social dynamics within the city, as it represents existing inequalities and helps to perpetuate spatial segregation. In the most degraded neighborhoods, deterioration not only discourages investment and improvement of urban space but also contributes to reinforcing barriers between different social groups. According to Knorr (2017), the presence of visual elements such as dilapidated buildings, poorly maintained public spaces, dirty areas, and visible signs of neglect such as graffiti is a visible reminder of socioeconomic divisions, which in turn discourages non-residents from accessing these areas, thereby reinforcing segregation. Such devaluation of the urban landscape, which is often related to a lack of resources and public attention, contributes to these spaces being perceived as marginal areas, further limiting integration and improvement opportunities for their inhabitants (Knorr 2017).

Likewise, LaFleur (2021) argues that cultural appropriation of the urban landscape is a process by which immigrant or marginalized groups adapt and transform the environment to meet their needs and values. Through this resignification of space, inhabitants create forms of resistance against imposed marginalization, generating new uses for the spaces they inhabit. In this sense, Knorr (2017) highlights that, although both factors based on cultural appropriation and landscape degradation are different, both coincide in that the urban environment has significant power to reinforce or transform social divisions.

Similarly, Zukin (2010) and Harvey (2012) have pointed out that the relationship between the urban landscape and segregation is not only embodied in its physical deterioration but also in the distribution of a symbology and control of resources in the city. Inequality in access to quality spaces, both in terms of housing and public infrastructure, perpetuates the marginalization of certain groups. In this sense, urban exclusion is not only a physical issue, but also a cultural one, as spaces become representative of who has the right to the city and who does not (Zukin 2010).

Finally, as Roberto and Hwang (2015) point out, in cities there are also elements that influence residential segregation such as the existence or construction of natural barriers that can be, among others, rivers or mountains, as well as those related to transport road infrastructures. Barriers to accessibility significantly impact population distribution, often limiting access to essential resources and services.

1.1.4. Local Demographics and Immigration

Population size and density are important contributors to urban segregation, as more densely populated neighborhoods are associated with a higher proportion of immigrants, due to the need to access more affordable housing in limited areas. This higher density increases competition for space and contributes to reinforce residential segregation, as immigrants with lower incomes are forced to live in overcrowded neighborhoods. In this sense, Crowder et al. (2011) argue that an increase in the density of immigrants in a neighborhood favors the probability that residents move out, thus favoring segregation. In turn, Owens (2019) notes that income segregation is higher in areas where housing segregation is already significant, which favors urban disparities. However, although there has been considerable study on the impact of population density, there is a significant gap in studies analyzing the impact of population volume on the formation of segregated spaces.

1.1.5. Segregated Spaces

Methods for quantifying segregated spaces are varied. In Spain, the latent problem of inequality and vulnerability of the population involves 22 observatories whose analysis is carried out at different scales, from national to local (Giménez-Bertomeu 2020). However, the main data sources usually used to analyze these problems at the local level are the Population and Housing Census and the Atlas of Household Income Distribution of the National Institute of Statistics. The latter source has a level of detail that reaches census districts and sections. It also provides information on the average income per person and household and the Gini index, among other variables.

Another primary source in Spain is the Urban Vulnerability Observatory of the Ministry of Housing and Urban Agenda, which has different applications, including the Atlas of Urban Vulnerability and the Urban Analysis of Vulnerable Neighborhoods in Spain, which includes the Catalog of Vulnerable Neighborhoods and the Vulnerable Neighborhoods Catalog Viewer. It also includes several reports on urban vulnerability in some large Spanish cities, such as Madrid and Barcelona. In this context of data search and analysis, Wikipedia is presented as a valuable tool, since it receives almost 30 million daily visits in its Spanish version and more than 250 million in its English version (Pageviews 2024).

1.1.6. Immigrant Resilience and Adaptation

Some threads of the scholarly literature have also focused on how immigrants often demonstrate remarkable resilience and adaptability when facing the structural challenges

of residential segregation. Despite the isolating effects of these barriers, immigrants very often show resilience by reshaping the urban spaces they inhabit to recreate an environment consistent with their cultural, economic, and social needs. This process, often referred to as 'place-making', involves transforming neighborhoods into hubs of cultural and economic activity through the establishment of ethnic businesses, cultural centers, and informal support networks (Simone 2018).

Other scholars, such as Cordero-Guzmán (2005), have highlighted how immigrant communities resist marginalization by creating grassroots efforts, such as collective bargaining for housing rights or the formation of local advocacy groups, exemplifying their ability to resist exclusion and create pathways for inclusion. This resilience is particularly evident in neighborhoods like Raval in Barcelona or Lavapiés in Madrid, where immigrant populations have revitalized urban spaces despite systemic neglect (Zapata-Barrero 2024).

This resilience not only demonstrates their capacity to adapt but also highlights their role in challenging urban exclusion and fostering social cohesion. As Lefebvre (1991) and Zukin (2010) emphasize, the 'right to the city' is actively reclaimed by marginalized groups through their everyday practices and transformations of urban environments, countering the divisive impacts of segregation.

1.2. Wikipedia

Wikipedia is a free online encyclopedia that can be consulted and edited by anyone. Since its creation in 2001, there have been numerous scientific articles analyzing it, but most importantly, it has established itself as a very important tool in the access and dissemination of information across various fields of knowledge (Obregón and González 2018). It is widely used by users around the world, as well as by third-party services, such as search engines (Google, Bing . . .) and knowledge bases. It is perceived as a reliable source of information, although the reliability of its content is constantly debated, as anyone can edit it (Obregón-Sierra et al. 2023). However, the trust that users and third-party services place in Wikipedia seems to be justified by its quality and reliability (Singh et al. 2021).

With more than six million articles in its English version and millions of articles in other languages, Wikipedia covers a wide range of topics, including demographic, geographic, and urban aspects (List of Wikipedias 2024). For studies of residential segregation, Wikipedia provides an invaluable resource by offering data on the history, development, and current characteristics of neighborhoods and cities around the world. These articles are often continually updated, reflecting recent changes in the demographic and urban composition of these places (Deltell and Claes 2021).

Wikipedia's collaborative structure allows users worldwide to edit geographic articles, incorporating local perspectives that enrich the analysis of factors influencing residential segregation. Although it is not a primary source per se, Wikipedia acts as a repository of references and data from official sources, such as censuses or government reports, as well as information from the media, making it a complementary platform for academic research (Obregón and González 2021).

One of the key points that favors its use in studies of this type is the availability of articles in multiple languages. Wikipedia exists in 332 languages (List of Wikipedias 2024). Although with large differences between versions, this high number allows comparison of the representation of the same area in different languages, which may reveal differences in perception and emphasis on factors such as immigration or urban vulnerability.

Factors such as the number of editors who contributed to an article or discussion pages are important throughout the life cycle of an article (Zhang et al. 2018), but the existence of articles for each neighborhood allows us to analyze the content of these to identify demographic and geographic patterns. It is important to review the categorization of neighborhoods or districts in each Wikipedia article, as it allows us to track aspects related to classification with respect to immigration, urban development, and infrastructure (Aghaebrahimian et al. 2022). For their part, the links between articles provide insight into

the interconnectedness between different areas, helping to better contextualize the drivers of segregation.

However, we consider that what is most important is the content of each article. Although users use references to verify information, Wikipedia reflects not only factual data but also public perceptions and debates on various issues. The selection of certain biased sources can lead to biased content (Zubimendi et al. 2024).

If these perceptions are embodied in Wikipedia articles, which will be read by millions of people, they can generate opinions and biases about specific individuals or places. Performing a content analysis of Wikipedia articles requires careful review, as reading them may not always be neutral and often involves processing a large amount of information about those places.

1.3. Artificial Intelligence

Artificial intelligence (AI) has revolutionized the traditional way of working, as well as the analysis and understanding of complex phenomena. Since the launch of ChatGPT in November 2022, several areas have focused their research on this artificial intelligence chatbot application developed by OpenAI. These include customer care, health care, education, finance, and communication technology (Singh and Singh 2023).

In the short time since its appearance, there are already several articles that offer a literature review on ChatGPT, mainly referring to health and education (Aydın and Karaarslan 2022; Li et al. 2024; Montenegro-Rueda et al. 2023), but also about its applications and its potential impact in different fields (Gabashvili 2023).

In the latter, for example, generative AI is used to obtain cognitive collaboration, leveraging its potential to learn “with” the technology rather than “from” it (Fuentes 2024). In this field, a great influence of the use of ChatGPT on the quality of the submitted papers has been observed (Baldrich and Domínguez-Oller 2024). In health care, benefits are also noted, but the need for accurate and current data is revealed as one of the main obstacles to adopting ChatGPT (Javaid et al. 2023).

In other areas such as geography, ChatGPT is also used for various studies. For example, it provides invaluable assistance in creating large-scale maps and understanding geographic space (Tao and Xu 2023), serves as a cartographic assistant, considerably enriching maps (Juhász et al. 2023) or to study the dynamics of coastal water quality (Aziz et al. 2024), though overall, research in this area remains limited.

In a context where population distribution patterns and urban dynamics are constantly changing, the ability of AI to process large volumes of data quickly and accurately provides a significant advantage for researchers and urban planners (Bermúdez-Quimis 2024). AI not only helps identify correlations between socioeconomic, demographic, and geographic factors but also detects hidden trends, makes predictions, and analyzes data with a level of accuracy that surpasses traditional methods (Tejedor 2024).

In addition, AI facilitates information analysis by processing multiple sources, such as Excel files containing national censuses, PDF documents, and web pages (OpenAI 2024). This ability to understand datasets and combine structured and unstructured data, along with its ability to analyze information in real time, allows researchers to obtain a more holistic and up-to-date view.

Another key aspect is that AI has significantly improved digital content analysis techniques, idea generation, and innovation (Livberber 2023). Its advanced algorithms can efficiently analyze large volumes of texts and identify discourse patterns, highlighting how narratives in those texts are structured. For this reason, the aim of this paper is to analyze the factors that favor the formation of segregated spaces due to the concentration of immigrants in certain territories of a city, analyzing Wikipedia content using ChatGPT.

2. Materials and Methods

The bibliographic analysis presented earlier identified the factors that favor the concentration of the migrant population and contribute to segregation processes. This identifi-

cation allowed us to propose the following causal relationship in the form of an equation: Segregated spaces = Income + Price of land + Concentration of residents of the same geographical origin + Urban landscape + Neighborhood demographics.

2.1. Dependent Variables

Segregated spaces have been approximated using two groups of variables: the percentage of the immigrant population in the neighborhood and two indexes derived from processing information contained in a large knowledge base. The first factor assesses only the concentration of immigrants, not the potential marginality associated with it. In contrast, the indexes have been developed to evaluate neighborhood segregation by immigration from two different perspectives, which will be explained below.

Both indexes were obtained from a set of parameters sourced from Wikipedia. Specifically, the degree of segregation in the sample neighborhoods has been analyzed through the interpretation of the information by a Large Language Model, specifically ChatGPT. Executing the following prompt on the information from each Wikipedia article, for each neighborhood and language, allowed us to obtain a series of parameters regarding the degree of segregation in each neighborhood.

The prompt-questionnaire includes 12 items, most of which are parameters that help infer the degree of marginality in the neighborhood. These parameters were designed based on the analyses of Koopmans and Schaeffer (2016), McCann and Boateng (2020), Laurence and Bentley (2016), and Dinesen and Sønderskov (2015). After designing the prompt, it was applied to the texts collected from Wikipedia, and the indicators corresponding to each question were obtained. Additionally, an overall assessment of neighborhood segregation was requested from the text. Finally, it should be specified that all the information requested from Wikipedia was obtained in 2024.

Specifically, the prompt applied to each neighborhood would be as follows:

Variables and evaluation items

1. Economic inequality: Does the article disproportionately emphasize economic difficulties? Likert scale: 1 (Very negative or absent)–5 (Very positive or present).
2. Criminality: Does the article excessively highlight crime issues? Does the article link crime to the foreign population and immigration? Likert scale: 1 (Very negative or absent)–5 (Very positive or present).
3. Cultural representation: Does the article omit cultural diversity and the positive contributions of immigrant communities? Likert scale: 1 (Very negative or absent)–5 (Very positive or present).
4. Negative language: Does the article use language that perpetuates negative stereotypes about immigrants and minorities? Does the article highlight the presence of certain immigrant nationalities? Likert scale: 1 (Very negative or absent)–5 (Very positive or present).
5. Images and examples: Does the article use images that only show negative aspects, such as deteriorated areas or people in precarious situations? Likert scale: 1 (Very negative or absent)–5 (Very positive or present).
6. Incomplete history: Does the article fail to provide adequate historical context on how certain neighborhoods were formed and the policies that led to their current situation? Likert scale: 1 (Very negative or absent)–5 (Very positive or present).
7. Public policies: Does the article ignore public policies that have affected the community? Likert scale: 1 (Very negative or absent)–5 (Very positive or present).
8. Local successes: Does the article ignore success stories and improvements in the neighborhood, such as new businesses, infrastructure improvements, and reduced crime? Does the article highlight social problems such as isolation, persecution, and discrimination? Likert scale: 1 (Very negative or absent)–5 (Very positive or present).
9. Presenting a balanced view: Does the article present both the positive and negative aspects of the neighborhood, providing a balanced perspective? Likert scale: 1 (Very negative or absent)–5 (Very positive or present).

10. Use of diverse sources: Does the article use diverse sources and compare information to avoid bias and provide a more complete and objective view? Does the article make unverified negative claims? Likert scale: 1 (Very negative or absent)–5 (Very positive or present).
11. Updated statistics: Does the article use updated statistics and provide links to reliable sources so that readers can verify and explore the information further? Likert scale: 1 (Very negative or absent)–5 (Very positive or present).
12. Highlighting positive contributions: Does the article highlight the positive contributions of immigrant communities and the initiatives that are improving the neighborhood? Likert scale: 1 (Very negative or absent)–5 (Very positive or present).
13. Balanced images and examples: Does the article use images and examples that reflect both the challenges and the achievements and positive aspects of the neighborhood? Likert scale: 1 (Very negative or absent)–5 (Very positive or present).
14. Community involvement: Does the article encourage the participation of local residents, including immigrant communities, in editing and updating the content? Likert scale: 1 (Very negative or absent)–5 (Very positive or present).
15. Overall assessment: Evaluate the overall contribution of the Wikipedia article to spatial segregation, where 1 is minimal contribution and 5 is great contribution. Likert scale: 1 (Minimal contribution)–5 (Great contribution).

Only include numerical ratings.

This information was obtained for a sample of 74 neighborhoods in two metropolitan areas, Barcelona and Madrid. It should be noted that this database represents 80% of the neighborhoods. The data were gathered from neighborhoods where the percentage of the foreign population exceeds 25% of the total, focusing only on Spain's main metropolitan areas, specifically Madrid and Barcelona.

Moreover, Wikipedia information on each neighborhood was consulted in four languages: Spanish, English, French, and Catalan. Finally, all the information from each language was aggregated at the neighborhood level using an average.

A factor analysis of the obtained values was performed, and the interpretation of each factor was used as a dependent variable.

Thus, to conclude, three dependent variables were created in this research:

1. Factor Analysis Variable: This variable was obtained from a specific factor analysis, capturing spatial segregation related to immigration, based on data obtained by ChatGPT from Wikipedia. (Referred to later as "Factor Analysis Variable").
2. Foreigners Proportion: The percentage of foreigners relative to the total number of neighborhoods. (Referred to later as "Foreigners Proportion").
3. Index for Spatial Segregation: An index related to spatial segregation due to immigration, obtained by ChatGPT from Wikipedia and available in question 15 of the prompt. (Referred to later as "Index for Spatial Segregation").

2.2. Independent Variables

The independent variables of the model have been grouped into four categories: those that value the demographic size of the neighborhood, those that value the income of the neighborhood, those that value the formation of clusters of immigrants by geographic origin, those that analyze the price of land and those that value the urban landscape. Some variables have been obtained directly from different sources, while another group of variables are indexes, which will be explained below.

First, the index of geographic concentration of immigrants by geographic origin should be highlighted. The calculation of this index was based on the application of the Local Index of Spatial Autocorrelation (LISA) by Anselin (2013), as it is one of the most widely used methods for identifying the geographic concentration of variables. This algorithm detects local spatial patterns, providing an accurate measure of spatial autocorrelation in specific areas. Specifically, four analyses were performed—one for each of the four geographic origins: Asia, Africa, America, and Europe, excluding Spain. Since the National Institute

of Statistics does not provide neighborhood-level information on this, it was necessary to obtain such data at the census section level, which offers a notably smaller geographic unit, with each neighborhood containing between 6 and 7 census sections on average. After applying the analysis to the set of census sections, immigrant hotspots were identified for each geographic origin, as shown in Figures 1 and 2.

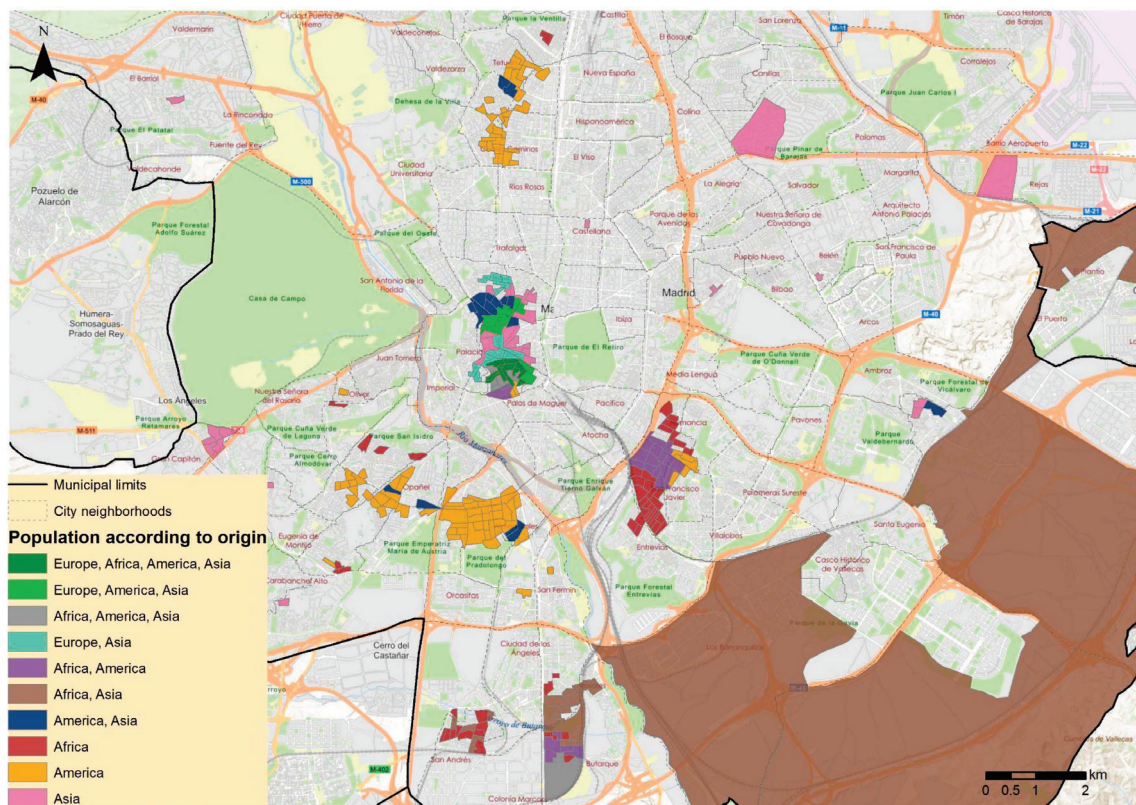


Figure 1. Concentration of immigrants in Madrid. Source: author.

Next, only those census sections that met the following criteria were selected: significant at the 95% confidence level, a positive High–High correlation, and at least 25% of the population being immigrants. Finally, the census sections identified for each geographic origin are presented below.

Once the LISA value for each census section was identified, the values for all the census sections in each neighborhood were averaged. Then, the percentage of these averaged values relative to the total sum was calculated. This proportion constituted the clustering indicator for each neighborhood and each geographic origin: Europe (Europe_Percentage), Latin America (Latino_Percentage), Africa (Africa_Percentage), and Asia (Asia_Percentage).

Another index, called Max_Clustering_Index, identifies the highest percentage of concentration for any continental ethnic group within a given neighborhood.

The final index (Urban_Landscape_Index) involves an assessment of the urban landscape using AI. Specifically, for each neighborhood, an image of a random street was selected from Google Street View. In neighborhoods with census sections that indicated a high concentration of a particular ethnic group, the street image was selected from those areas. The image was then downloaded and attached to ChatGPT-4.0, along with the following prompt: “Rate the urban landscape of the attached image using a Likert scale.”

These variables were then entered along with the rest into a database with the following characteristics (see Table 1):

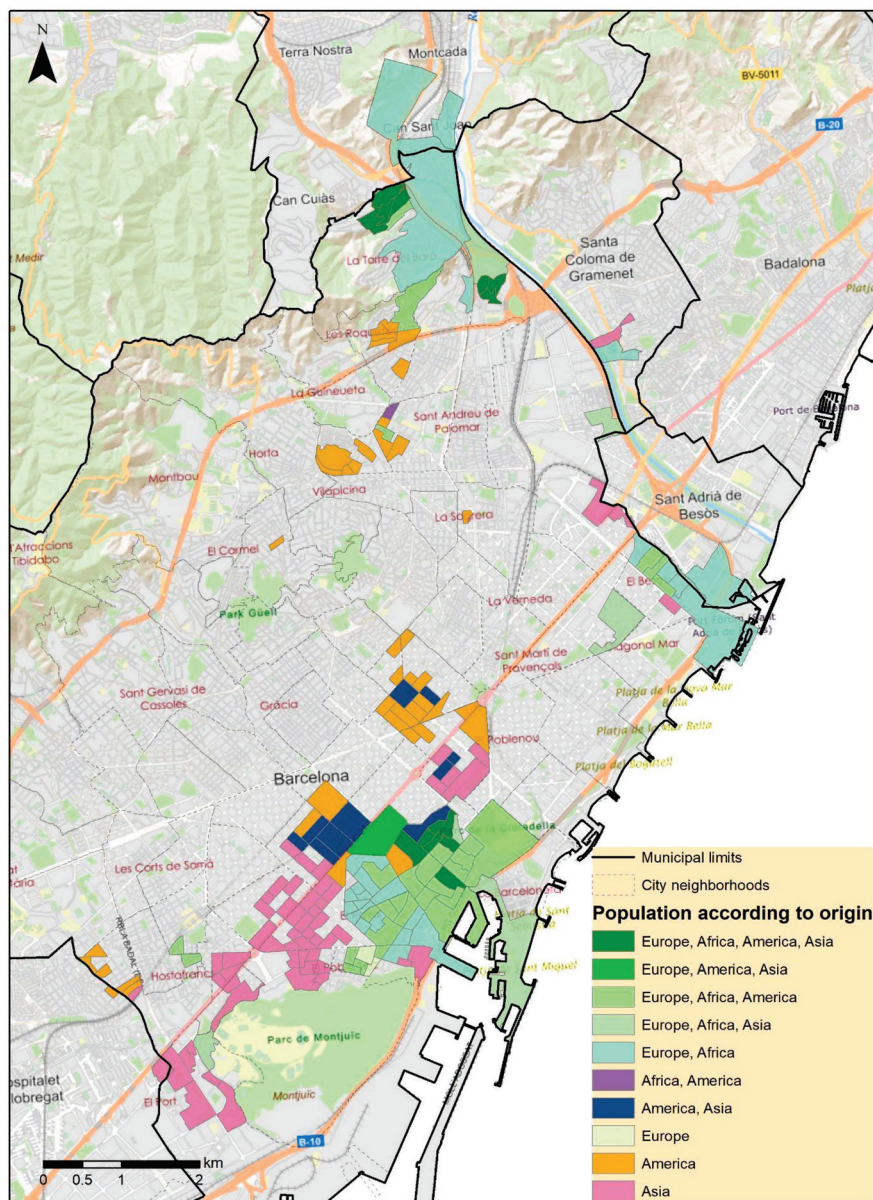


Figure 2. Concentration of immigrants in Barcelona. Source: author.

Finally, a regression analysis was carried out using four machine learning algorithms: Lasso, ridge regression, gradient boosting, and random forest. Algorithm selection was performed by comparing the mean square error (MSE) and the coefficient of determination (r^2) of the resulting models for each algorithm. The algorithm that showed the best performance in both parameters was selected for use in the research.

These four models are relevant because they are particularly suitable for this type of analysis. Lasso and ridge regression are regularized linear regression models, useful when the goal is to simplify the model by eliminating or reducing the weight of less relevant variables (Hastie et al. 2015; Zou and Hastie 2005). On the other hand, gradient boosting analyzes complex nonlinear interactions between variables and improves predictive performance by sequentially combining several weak models, such as decision trees (Friedman 2001; Chen and Guestrin 2016). Random forest, in contrast, is robust in avoiding overfitting, as it generates multiple decision trees randomly and averages their predictions, giving it high generalization capability (Breiman 2001). These characteristics make these algorithms particularly effective for analyzing data with multiple complex relationships and interaction structures between variables, as in the present study.

Table 1. Variables collected in the database. Source: own elaboration.

Variable	Description	Measurement	Source	Category
Name	Name of the neighborhood or district.	Name of the geographical entity	National Statistics Office	-
Africa_Clustering_Index	Clustering index for African geographic origin in the district.	Anselin LISA algorithm (value)	(Instituto Nacional de Estadística 2024b)	Index
Asia_Clustering_Index	Clustering index for Asian geographic origin in the district.	Anselin LISA algorithm (value)	(Instituto Nacional de Estadística 2024b)	Index
Europe_Clustering_Index	Clustering index for European geographic origin in the district.	Anselin LISA algorithm (value)	(Instituto Nacional de Estadística 2024b)	Index
Latino_Clustering_Index	Clustering index for Latin American geographic origin in the district.	Anselin LISA algorithm (value)	(Instituto Nacional de Estadística 2024b)	Index
Africa_Percentage	Proportion of African population in the district out of the total population.	Percentage	(Instituto Nacional de Estadística 2024b)	Index
Asia_Percentage	Proportion of Asian population in the district out of the total population.	Percentage	(Instituto Nacional de Estadística 2024b)	Index
Europe_Percentage	Proportion of European population in the district out of the total population.	Percentage	(Instituto Nacional de Estadística 2024b)	Index
Latino_Percentage	Proportion of American population in the district out of the total population.	Percentage	(Instituto Nacional de Estadística 2024b)	Index
Max_Clustering_Index	Maximum clustering index.	Maximum value of the clustering index	Index	Index
Resident_Population	Total number of people residing in the district.	Number of persons	Instituto Nacional de Estadística (2024a)	Demographic size
Net_Annual_Income_Per_Capita	Average annual net income per inhabitant of the district.	Euros	Instituto Nacional de Estadística (2024a)	Renta
House_Price_Index	Average price of houses in the district.	Euros per square meter	Idealista (2024)	Land price
City_Average_Index	Average of city averages for different variables.	Numerical value	Idealista (2024)	Land price
Relative_House_Price_Index	Relative price of homes in the district compared to other areas of the city.	Numerical value	Idealista (2024)	Land price
Urban_Landscape_Index	Index of the district's urban landscape.	Numerical value	Google Street View (2024)	Index

To interpret the results of this model, we used SHAP (Shapley Additive Explanations), a technique based on game theory that decomposes the prediction of each observation and reveals the contribution of each variable. SHAP not only provides interpretability in terms of which variables are most important but also shows how each explanatory variable influences the dependent variable positively or negatively (Lundberg and Lee 2017). This is particularly useful for our analysis, as it allows us to visualize clearly whether factors such as income or streetscape are increasing or decreasing the likelihood of segregated spaces forming. SHAP offers an accurate and understandable representation of the causal

relationships between the independent variables and the observed outcomes, helping to generate more robust conclusions (Molnar 2020).

3. Results

Once the database has been completed and the analyses explained in the Section 2 have been applied, the results of the analysis are explained.

3.1. Correlation Analysis

Thus, initially, an analysis of correlations between the dependent and independent variables considered was conducted (see Figure 3). Thus, it was found that in general, the correlation of the variables in the model is low, with some groups of variables standing out in particular. Specifically, there is a significant expected correlation between the average sales price of the neighborhoods and that of the city. Likewise, significant expected correlations are identified between the urban landscape and the average rent of buildings or the average price of housing. Finally, the concentration of immigrants in a neighborhood is particularly correlated with the concentration of populations from Asia and Africa.

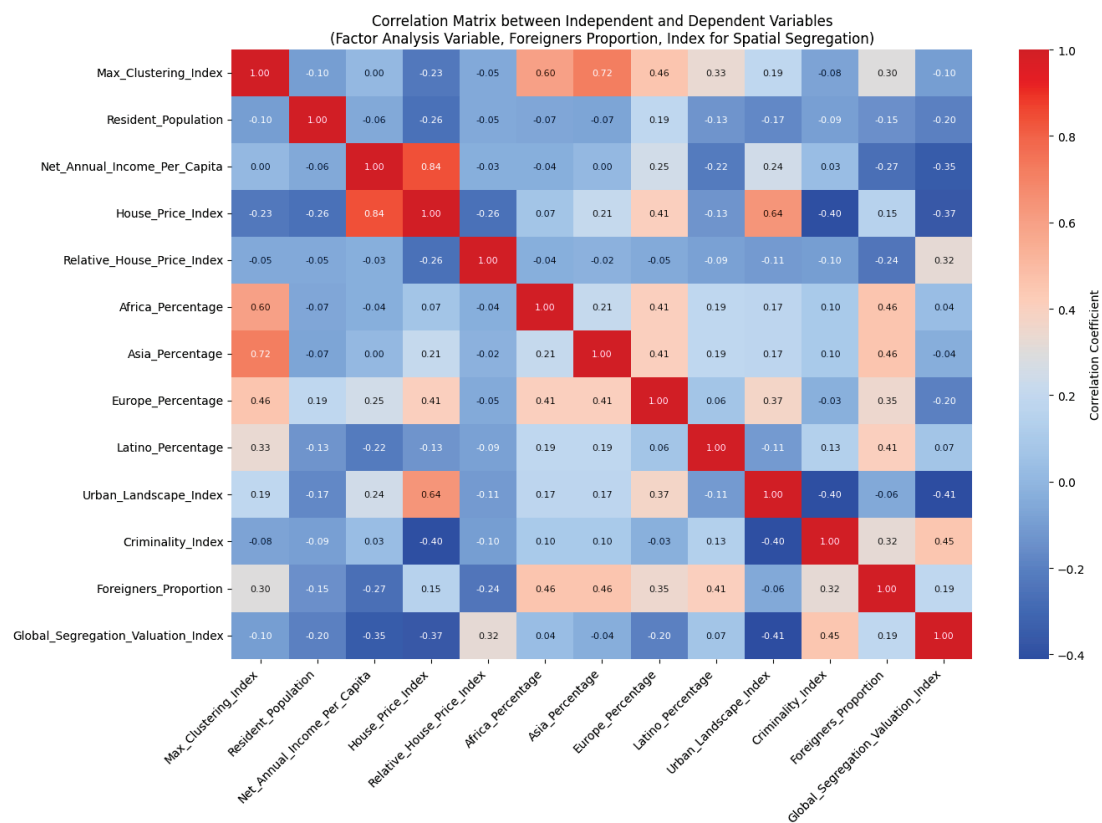


Figure 3. Table of correlations between the variables of the model. Source: author.

3.2. Factor Analysis Results

The results of the factor analysis (FA) showed that Factor 3 is strongly influenced by variables related to negative social and economic narrative (0.828), economic inequality (0.784), criminality (0.628), and community participation (0.409). This indicates that this factor is influenced by negative perceptions or discourses about the neighborhood. It is also noteworthy that most of the articles mention the structural inequality of the neighborhood. A large number of these neighborhoods cite insecurity due to high crime. Finally, the low involvement of residents suggests that the neighborhood is neglected, leading to poorer preservation. “Factor Analysis Variable,” will be obtained from factor 3 and can be defined as a “Factor of negative social perception and structural inequality of a neighborhood” (see Table 2).

Table 2. Values returned by ChatGPT for Factor Analysis Variable (Factor 3).

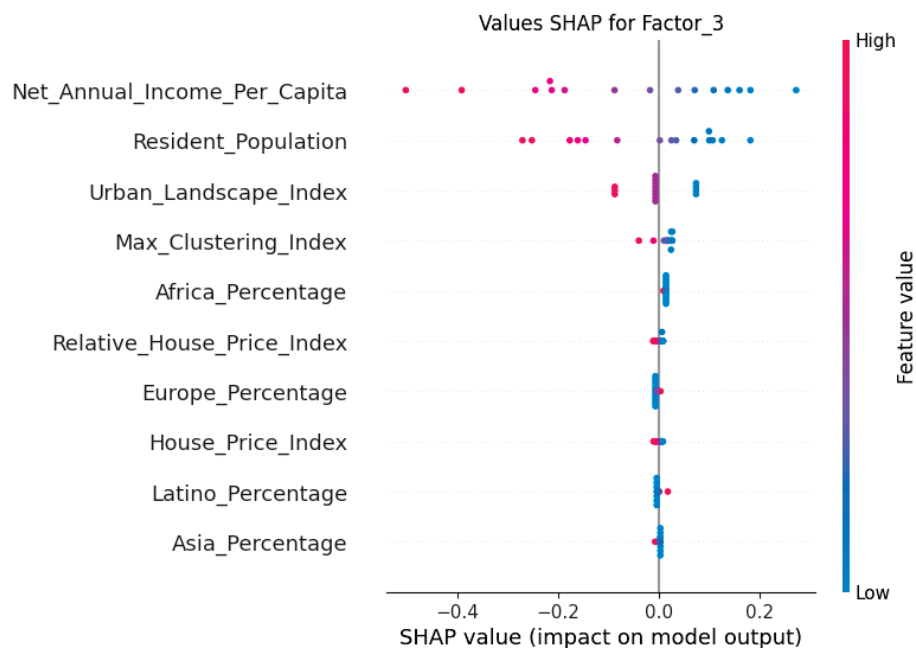
Factor 3	Valor
Negative_Narrative_Index	0.828017
Economic_Inequality_Index	0.783713
Criminality_Index	0.628341
Community_Involvement_Index	0.409855
Images_Examples_Index	0.315339
Cultural_Representation_Index	0.256997
Incomplete_History_Index	0.204445
Balanced_Images_Index	0.190039
Diverse_Sources_Index	0.143111
Balanced_View_Index	0.104003
Public_Policies_Index	0.068489
Positive_Contributions_Index	−0.083090
Local_Success_Index	−0.118917
Updated_Statistics_Index	−0.195487

3.3. Regression Results Using the Factor Analysis Variable as Target Variable

On the other hand, the model run showed that ridge regression was the most efficient for the variable from the FA (factor of negative social perception and structural inequality of a neighborhood) and for the variable Foreigners Proportion, while random forest was the most outstanding for the index generated by ChatGPT from the information of the neighborhoods in Wikipedia.

Specifically, of the total tests performed, the most outstanding models for each of the three dependent variables were the following:

Results with ridge regression for the dependent variable (FA) Factor 3 (negative social perception factor and structural inequality of a neighborhood) are presented in Figure 4 and include the following parameters.

**Figure 4.** SHAP values for the dependent variable “Factor Analysis Variable (Factor 3)”. Source: author.

R2: 0.2497
MSE: 1.2135
RMSE: 1.1016
MAE: 0.8894

Interpretation of the model by SHAP representation on the most prominent variables, i.e., those located from the top down.

- Net_Average_Income: High values in red have a negative impact on Factor 3, while low values in blue amplify it. From this, it can be inferred that the higher the income of the residents, the lower the contribution to Factor 3, indicating a negative relationship.
- Resident_Population shows a negative trend similar to that of average income, although its importance is less, as fewer observations are located at the extremes of the graph.
- The next variable in importance would be Urban_Landscape_Index. This parameter presents a lower importance and presents a negative relationship in relation to Factor Analysis Variable. It is found that the factor's negative social perception and structural inequality of a neighborhood increase as the landscape deteriorates.
- Max_Clustering_Index, which represents the concentration of immigrant populations in a neighborhood, also has a negative relationship, i.e., the higher the concentration, the higher the values of Factor 3.

The remaining variables have limited importance in the model.

Results with ridge regression for the dependent variable proportion of Foreigners Proportion are presented in Figure 5 and include the following parameters.

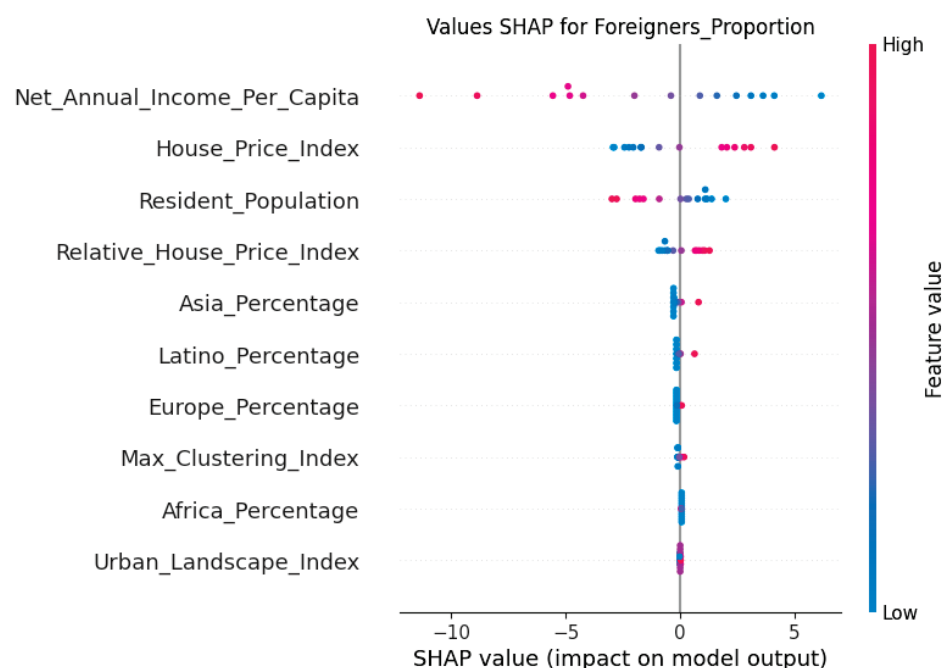


Figure 5. SHAP values for the dependent variable Foreigners Proportion. Source: author.

R2: 0.3282
MSE: 18.4581
RMSE: 4.2962
MAE: 3.7219

The following model exclusively values the accumulation of immigrants, regardless of whether they have become segregated spaces or not. The dependent variable is Foreigners Proportion. Thus, the interpretation of the most relevant variables according to the SHAP values, would be the following:

- **Average_Neta_Income:** As in the previous variable, the average income tends to be negative with respect to the immigration rate, so the lower the income, the higher the number of foreigners in the neighborhood, as expected, and conversely the higher the values the lower the immigration rate.
- **House_Price_Index:** This parameter has a positive relationship indicating that the higher the price of land the higher the proportion of foreigners residing in an area.
- **Resident_Population:** The volume of population has a negative and expected impact with respect to the volume of population. Thus, the immigrant population tends to be concentrated in sparsely populated neighborhoods.
- **Percentage_Asian and Percentage_Latino:** These variables have a moderate influence, with the percentage of Asians positively impacting the proportion of foreigners.

Random forest results for the dependent variable of ChatGPT with Wikipedia “Index for Spatial Segregation” are presented in Figure 6 and include the following parameters:

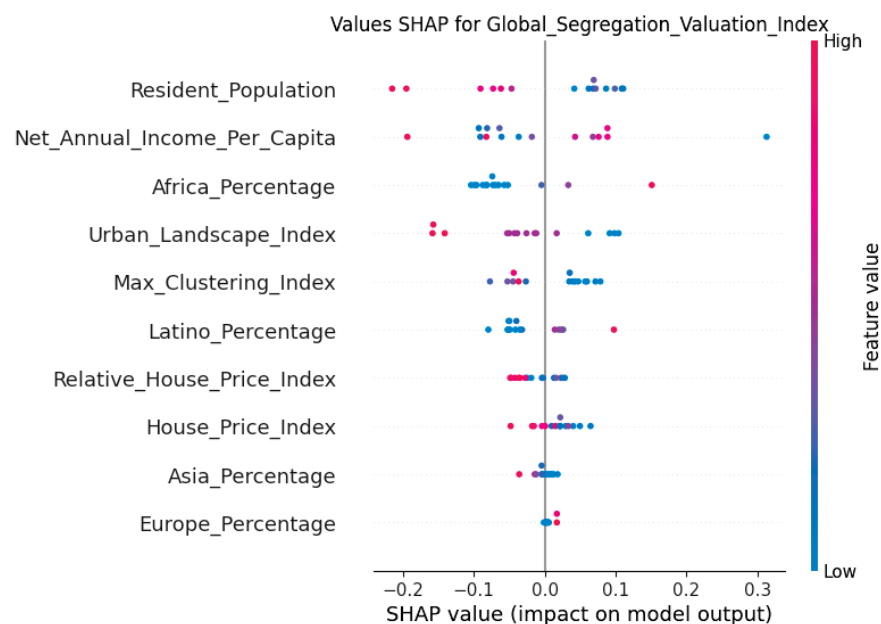


Figure 6. SHAP values for Index for Spatial Segregation. Source: author.

R2: 0.4096
MSE: 0.2404
RMSE: 0.4903
MAE: 0.3643

Finally, we will proceed to analyze the spatial segregation parameter, which does consider the impact of the immigrant population on spatial segregation. Next, the most relevant variables will be interpreted according to the SHAP values, as with the previous models:

- **Resident_Population:** As in the previous model, a clear negative relationship between population volume and spatial segregation is seen. So, areas with less population tend to be more segregated compared to the rest of the city. It is also worth noting that since the variable is located at the top of the model, it is the most relevant parameter in the model.
- **Average_Neta_Income:** The average income variable, unlike the first model, presents a nonlinear relationship, where extremely high-income values tend to discourage neighborhood segregation and extremely low values tend to encourage it, but there is also an intermediate situation in which moderately high-income values can favor segregation and moderately low values discourage it.

- **Urban_Landscape_Index:** This parameter, like the previous ones, presents a negative relationship with respect to social segregation, where poorer landscape quality is associated with greater neighborhood segregation.
- **Max_Clustering_Index** also shows a nonlinear relationship, where a strong concentration of foreigners from the same geographical origin does not necessarily lead to spatial segregation in the neighborhood.
- **Africa_Percentage** and **Latino_Percentage:** Both parameters present a clear positive relationship with respect to the segregation of spaces, being especially prominent in the case of African populations.

Finally, the average price of housing and its relative price with respect to the city's total is also negative, although it is one of the parameters with the least influence on the model.

In comparing the models, it is worth noting that they exhibit acceptable evaluation parameters (MSE, RMSE, and MAE), though the explanation of variability is somewhat limited. In this regard, it is worth mentioning that the model with the highest predictive capacity is the one that includes the general assessment of the neighborhoods based on ChatGPT as the dependent variable.

4. Discussion and Conclusions

The analysis of the model results allows us to draw several conclusions about the comparison between these approaches. The comparative analysis of the two types of variables shows that the variable generated by ChatGPT's textual interpretation has contributed to building a more predictive model than those using variables processed through factor analysis or those that explain neighborhood segregation by simply grouping immigrants.

Average income is a relevant variable in all the models. In general, it has a negative relationship with both the proportion of immigrants and segregation, although this relationship is not linear in the ChatGPT general valuation model. This finding confirms conclusions from previous studies that the proportion of immigrants and segregation are higher in lower-income neighborhoods (Jiménez et al. 2020).

Resident population is also a significant variable in all three models, although it is more influential in the models that assess segregation than in those analyzing the percentage of immigrants in neighborhoods. This difference can be explained by the fact that neighborhoods with smaller populations are more easily segregated and transformed than those with larger populations. In larger neighborhoods, a significant proportion of the population must be segregated to effect a noticeable change, while in smaller neighborhoods, transformation is simpler. This is a novel finding compared to the existing literature. Although it aligns with the results of Bellman et al. (2018) and Logan et al. (2023), which do not establish a direct relationship between total neighborhood population and segregation.

The urban landscape has a significant impact on the Index of Segregated Spaces variable, which is consistent with the findings of Vargas (2020). However, this situation is nuanced, as the concentration of foreigners has a low correlation with the landscape valuation parameter, as shown in Figure 3. This impact likely results from a long-term interaction between immigrant concentration and landscape degradation.

Neighborhoods with more degraded or poorly maintained urban landscapes tend to become less attractive to the broader population, ultimately leading to a reduction in property prices and, consequently, greater availability of affordable housing for low-income residents, including immigrants. As a result, degradation fosters long-term segregation.

On the other hand, the lack of impact of the landscape valuation variable on the dependent variable proportion of foreigners may seem contradictory, but it can be explained. In many cases, neighborhoods with a high percentage of foreign residents host long-term international students, workers, and tourists alongside other immigrants. These populations often reside in areas with high landscape quality. Therefore, it is logical that the model does not find this parameter significant for the proportion of foreigners, although it is significant for the Spatial Segregation Index.

Furthermore, it should be noted that two tools related to big data and AI have been essential in reaching this conclusion. The use of Google Street View alongside AI analysis has allowed us to assess the importance of this variable. Obtaining these data through conventional methods would have been time-consuming and costly, making it impractical.

Additionally, this research highlights the impact of landscape degradation on the segregation of spaces, which contrasts with the cultural appropriation of the landscape discussed by LaFleur (2021) and Knorr (2017). It would have been interesting to introduce an assessment of the impact of other elements of the urban landscape, such as accessibility to products and services specific to immigrant cultures. This aligns with the findings of den den Butter et al. (2004) regarding the closed economies of ethnic groups within neighborhoods. In relation to this, while Roberto and Hwang's (2015) contributions on the barrier effect was not considered in the model, many neighborhoods with a high concentration of immigrants are not physically separated, as seen in the maps in Figures 1 and 2, and therefore, this variable was not included in the model.

This research has also confirmed the relative importance of local networks of compatriot immigrants, although the result is not homogeneous across all the models. The conclusion drawn is that the concentration of the population of African origin tends to create more spatial segregation than immigrants from other areas such as America or Asia. In fact, as can be seen in Figures 1 and 2, the degree of spatial concentration is lower for immigrants from the Americas and Asia, while it is higher for immigrants from the African continent. Language difficulties may be a factor that contributes to African immigrants being more affected by social and economic barriers, which limits their opportunities for residential mobility and access to more diverse areas (Espaliú 2022). All of this can lead to a concentration of the population of African origin in neighborhoods where compatriots predominate, forming segregated enclaves. These results are consistent with those obtained by Pan Ké Shon (2010) and Tesfai and Thomas (2020); however, they also represent a contribution to the literature in that, to our knowledge, the impact of the concentration of immigrants of various ethnic groups had not been compared on a large scale as in this study.

Finally, it should be noted that the price of land has not shown a significant relationship with the indexes that focus specifically on segregation, but it has shown a significant and positive relationship with the dependent variable Foreigners Proportion, which measures the raw percentage of immigrants in the city. This conclusion contradicts the findings of authors such as Skifter Andersen et al. (2015) and Trounstone (2020).

A plausible explanation may lie in the fact that the Foreigners Proportion variable includes long-term tourists, foreign long-term high-skilled workers, and international students who are less sensitive to housing prices, as they tend to live in expensive central areas with high-quality landscapes due to their higher incomes. On the other hand, the presence of immigrants, presumably from lower-income backgrounds, in high-price housing areas may be explained by other factors that make them less sensitive to land prices, despite having significantly lower incomes. Specifically, factors such as social support networks of compatriots in certain neighborhoods, illegal occupation of vacant housing, or overcrowding may mitigate the impact of land prices on residential choices. Additionally, the degradation of the urban landscape can significantly reduce the price of specific buildings. It should also be noted that the sale price of housing is an average applied to the entire neighborhood, not to individual buildings, which may have significantly lower prices due to their condition. In fact, the correlation between the urban landscape and land price is the strongest in the correlation table shown in Figure 3, so severe landscape degradation should have a very negative impact on land prices.

Therefore, land price does not always act as a direct predictor of segregation, as it may be mediated by other factors such as the urban landscape, spatial concentration of compatriots, overcrowding, and squatting. Thus, this analysis contributes to the literature by qualifying the direct relationship between land price and segregation, showing that

other social factors—such as compatriot networks, squatting, and the degradation of the urban landscape—may mediate this relationship.

Finally, the use of Wikipedia as a data source for identifying segregated spaces is a valuable tool for practitioners and academics in the field of spatial segregation management and analysis. It not only helps to identify segregated areas but also the causal factors behind them, which can aid in mitigating segregation. In this regard, it is important to note that both the areas and the factors contributing to segregation can evolve over time. Knowledge sources such as Wikipedia, which evolve relatively quickly, can thus be valuable for managing these spaces. Moreover, Wikipedia appears more reliable than other sources, such as the INE, for identifying segregated neighborhoods, since neighborhood segregation is not always accurately captured by generic data on immigrants, as observed during model testing. In any case, the analysis of Wikipedia information would not have been possible without the help of AI Natural Language Processing (NLP) technology, which facilitates text comprehension. In this regard, a generative AI like ChatGPT can interpret and execute NLP-processed commands. Without these technologies, this work would have been enormous and unfeasible. Therefore, the technological capabilities of AI can be of great use in analyzing segregated spaces using various textual sources.

Among the main limitations of this research, two should be highlighted. First, the sample size is not particularly large due to the lack of data from all neighborhoods in Madrid and Barcelona from Wikipedia. Additionally, the inclusion of some neighborhoods in Spain that slightly exceed the 25% threshold would have provided observations from other Spanish cities, which might have altered the models. Nevertheless, the current database accounts for 80% of all neighborhoods in Spain that meet this condition, as previously mentioned.

Although the models' predictability is reasonable, there is significant room for improvement in explaining data variability. Introducing additional factors could enhance predictability.

Another limitation is that while the information consulted from Wikipedia was obtained in 2024, the information requested and used for analysis is constrained by the last update, which may not reflect the current date or have been updated at all.

As future lines of research, an analysis of the references used by Wikipedia could be undertaken to check their consistency with the statements made in the articles, identifying possible positive or negative biases. This could be a limitation in the current study's database and could serve as a case study on the reliability of Wikipedia as a knowledge base.

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Article

Race/Ethnicity and Homeownership in an Emerging Immigrant Gateway of the US Southeast: A Neighborhood Scale Analysis

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Abstract: Owning a home has become a distant, often unattainable dream for many Americans since the 2007–2009 recession. The shortage of homes has decreased affordability, forcing 43 million U.S. households to become renters rather than owners. Racially targeted policies and widespread discrimination, coupled with neoliberal urban renewal policies, have forced communities of color, especially immigrants and the foreign-born, at the greatest disadvantage in homeownership. This paper examines tract-scale disparities in homeownership across major racial/ethnic groups. Using the U.S. Census Office of Management and Budget's (OMB) 2019 definition of the 13-county-metropolitan statistical area (MSA) of Nashville, Tennessee, as the study area, I use five-year American Community Survey (ACS) (2015–2019) data estimates to examine the spatial disparity in homeownership and its predictors. Nashville MSA is one of the fastest-growing southern gateways, and it is also the largest, most diverse, and most intermixed metropolis in Tennessee. It contains higher than the state's overall share of foreign-born, and during 2019–2040, its share of immigrants is projected to grow by 40.7%, making it the best-suited laboratory for race/immigrant-focused research on housing. This analysis finds significant differences in race-based mean per-capita income, with Whites (\$32,522) and Asians (\$32,556) at the top, whereas Blacks (\$25,062) and Hispanics (\$20,091) are at the lowest. The ratio of race-based per-capita-income-versus-median housing values is the highest for Whites (15.19) and Asians (15.07) and the lowest for Blacks (11.49) and Hispanics (9.27), putting these two groups as the most disadvantaged regarding their affordability. Regression models suggest lower White homeownership in higher diversity tracts among foreign-born-not-citizens (FBNCs), whereas Black and Hispanic homeownerships are higher in tracts with higher diversity among FBNCs. Interestingly, Asian homeownership is high in tracts with high-income Black tracts, pointing toward the increasing significance of class.

Keywords: homeownership; diversity; Hispanics; Nashville MSA; foreign-born

1. A Brief Overview of Race/Ethnicity and Homeownership Disparity

1.1. Homeownership and the American Dream

Owning a home has become a distant dream for most Americans, especially since the recession of 2007–2009, followed by COVID-19-induced skyrocketed housing prices. Home prices had also started skyrocketing due to banking and finance-related policy changes that affected the housing market, making it more difficult for people of color. These policies attributed to the restricted allocation of new housing permits, reducing the overall supply of housing stock in the market. While the recession added to the problem of declining homeownership among minorities and socio-economically disadvantaged communities, homeownership has remained a challenging issue for several decades in the United States due to its racially targeted policies and widespread discrimination (Fields and Raymond 2021). Further, the neoliberal policies of gentrification-focused urban renewals have cumulatively forced communities of color from ownership into rentership (Chaney et al. 2018; Fields and Raymond 2021; Hightower and Fraser 2020; Thurber et al. 2021). The relatively lower supply of housing in the market at affordable prices made it very tough for

almost everyone, but its impacts were felt unprecedentedly by the disadvantaged groups all over the country, with its severity falling disproportionately on the immigrants coming into the emerging immigrant gateways of the South, and Nashville is one of them (Chaney et al. 2018; Currier et al. 2018; Fields and Raymond 2021; Hightower and Fraser 2020; Thurber et al. 2021).

Homeownership in the USA remains a manifestation of a set of socio-economic, demographic/lifecycle, and cultural factors, including race/ethnicity, nationality, and immigration status. These processes eventually put people of color, especially immigrants and the foreign-born, many of whom made the US southern metropolises their new homes, at the greatest disadvantage in terms of both ownership and rentership in contemporary housing markets (Chaney et al. 2018; Currier et al. 2018; Hightower and Fraser 2020; Thurber et al. 2021). The rapidly rising share of immigrants, many of whom are still not citizens, are also deprived of many government programs and policies that would allow them to seek the benefits of the banking/financial institutions. All of these have exacerbated the issue of homeownership and wealth disparity across the communities of color, and those who are still not citizens often suffer from double penalties as they are discriminated against due to their pending legal status and non-White identities.

1.2. Determinants of Homeownership

Research on homeownership and wealth inequality has identified major categories of determinants: (i) Macro-level (structural) factors that comprise housing, stock market, assets, tax policies, racism, and (ii) Micro-level factors such as age, family structure, education, income, and inheritances (Freeman and Hamilton 2004; Keister and Moller 2000). Segregation tax—the indirect taxes relegated to minority-segregated clusters that attribute toward lower returns on homeownership investments by minorities (Faber and Ellen 2016; Flippen 2004; Shapiro 2006)—eventually puts minorities at a double disadvantage. It is also true that neighborhood demographics correlate with home values, although race and class both matter (Crowder 2001; Emerson et al. 2001; Galster 2008, 2019; Galster et al. 2018; Krysan and Farley 2001; Krysan et al. 2009; South and Crowder 1998). In this body of work, however, meso-level factors such as neighborhood characteristics and their relationship with wealth accumulation are missing in the literature (Keister and Moller 2000; Killewald et al. 2017). Also, while race and class are related to home values, class especially remains salient (Anacker 2010; Coate and Schweseter 2011; Flippen 2004).

Conventional scholarship has also discussed how racist policies have created and continue to create inequities in the built environment, producing racially and ethnically segregated communities, poor housing conditions, unwalkable neighborhoods, and general disadvantage (Hall et al. 2015; Rugh et al. 2015; Rugh and Massey 2010; Yang et al. 2023). Racial/ethnic, and economic segregation, disinvestment, and discrimination created by redlining policies, etc., remain in several cities even today, albeit in a different style, and these policies have added to present-day disparities through health outcomes such as preterm births, asthma, mortality, sleep quality, heart and lung issues, etc. (Galster and Santiago 2017; Yang et al. 2023).

1.3. Racial/Ethnic Disparity in Homeownership

Even though homeownership has long been symbolic of the American dream, for many non-Whites, it has been a dream deferred. Relatively lower incomes, the absence of family assets and wealth, and fewer financial resources, especially among Blacks and Hispanics, along with institutional and structural discriminatory practices, have kept them from attaining their American dream. Whether or not discrimination continues to be an important determinant of homeownership in 21st-century American cities has remained a topic of academic debate, and such practices have continued to impact minorities in numerous other ways (Sharma and Brown 2012; Sharma 2016a, 2016b; Yinger 1995).

Homes are a key source of wealth creation, and home values are closely related to neighborhood characteristics (Galster 2008; Sharma 2018). Neighborhoods also affect educational attainment, employment, labor, job types, income, and several other factors, and these contribute toward wealth accumulation gaps across various races/ethnicities (Levy 2022; Sharma 2018). In the US, homeownership contributes toward one-third of total household wealth and 40% of capital stock (Albouy and Zabek 2016). Research also suggests that homes in predominately Black neighborhoods across the US are valued at \$48,000 lower than predominately White neighborhoods, and this contributes toward a cumulative loss in equity of approximately \$156 billion. Also, Black adults, regardless of homeownership, are doubly disadvantaged in neighborhood–wealth relationships (Albouy and Zabek 2016). The latest report suggests that by 2020, the Black homeownership rate was 46.4% compared to 75.8% for White families and the US Census reports also indicated that in 1950, the Black homeownership rate was 34.5% compared to 55% for the overall population (Zhao 2024). As of the second quarter of 2024 reporting, the overall homeownership rate in the USA stood at 65.6%; these rates for Whites, Blacks, Hispanics, Asians, and All-others were at 74.4%, 45.3%, 48.5%, 62.8%, and 58.3%, respectively, pointing toward the long-held hierarchy with Whites at the top, and Hispanics and Blacks at the bottom (HTTP1 n.d., at <https://fred.stlouisfed.org/release/tables?eid=784188&rid=296>).

1.4. Structural Racism, Homeownership and Health Manifestations

Freeman and Hamilton (2004) suggested that even before the Civil Rights era, minorities, especially Blacks, were routinely discriminated against in almost all aspects of life, including buying and owning homes, and these occurred through routine practices by the real estate and financial institutions (steering, blockbusting, redlining, etc.). Structural and institutional racism has remained embedded in the past and present operations of the US housing market, and this has also contributed toward the largest share of racial health inequities among minorities (Lynch and Meier 2020). Structural racism, though a product of history, has adapted to these new contexts over time to recreate the conditions that give rise to poor health for racially minoritized populations (Williams et al. 2021). Structural racism permeates through the systems of education, housing, employment, healthcare, and criminal justice, impacting resource distribution and access to opportunity, which eventually reinforces unequal social, economic, and environmental conditions and, hence, poor health. Communities of color face a disproportionate burden of environmental hazards and reduced access to quality food, transportation, healthcare, educational and employment opportunities, as well as recreation and preventative health services (Lynch and Meier 2020).

1.5. Immigrants' Experiences with Homeownership

Numerous immigration scholars have addressed the growth of immigrant gateways and the reasons for the attractiveness of such emerging and established immigrant cities (McDaniel et al. 2019a; McDaniel 2021; Singer et al. 2008). Immigration scholars thus far have discussed immigrants' experiences with regard to social, economic, political, and institutional assimilation processes and the roles of policies and support measures taken by the state and federal programs that have made specific cities more receptive toward immigrants (for example Nashville in Tennessee has become an attractive destination for immigrants, largely driven by numerous policy changes) (see McDaniel et al. 2019b; McDaniel 2021). Yet, there are enormous discrepancies in immigrants' experiences and pathways toward acceptance and integration with regard to immigrants' housing experiences. There also exists significant disparities in housing experiences between documented and undocumented Hispanic immigrants compared to US-born Hispanics, Whites, and Blacks (Allen 2022; McConnell and Akresh 2010). In Los Angeles, for example, immigrants' legal status was a better predictor of housing affordability among low-income households rather than their race or nativity (McConnell 2013; McConnell and Akresh 2010).

Nashville, the largest metropolis in Tennessee, is also known as a Nuevo southern metropolis due to its attractiveness toward diverse immigrant groups originating from Asian, African, Latin American, and Caribbean countries (Chaney 2015, 2022; Chaney et al. 2018; Chaney and Clark 2020; McDaniel 2021; Sharma 2016a, 2016b). Nashville—often referred to as a Hispanic hypergrowth metro area (Suro and Singer 2002), a pre-emerging immigrant gateway (Singer 2004), a 21st-century gateway (Singer et al. 2008), and a minor-emerging gateway (Singer 2015)—remains one such attractive destination for many groups, including Hispanic populations. Such unprecedented growth in a diverse population, however, has also raised numerous social and economic problems for immigrants, and housing is one such issue that affects all.

While a significant body of housing scholarship has focused on the largest cities and metropolises of the USA (e.g., McConnell 2013; McConnell and Akresh 2010), not much is known about housing-related issues in the emerging gateways of the South. Nashville, Tennessee, is a mid-sized emerging immigrant gateway that has attracted a significant share of immigrants and has seen a steep rise in its housing prices, but not much is known about its impacts on immigrant communities. Among those who have addressed housing research, they have consistently shown that minorities, especially Blacks, have suffered from lower levels of homeownership in major American metropolises, once again ignoring these effects in mid- and small-sized metropolises, especially those that have attracted significant diversity and immigrants over last two decades. Thus, the impacts of housing market issues on immigrant communities, especially in mid- and small-sized metropolises of the South that have a relatively higher share of immigrants and the foreign-born is still unknown. Based on the scholarship thus far, it is fair to expect that immigrants who have not yet become citizens are likely disadvantaged due to their restricted access to banking/financial and legal resources (see Chaney et al. 2018), making it more difficult to own homes; and this paper specifically explores these differences among various racial/ethnic groups along with those in FBNC category while focusing on the census tracts of Nashville metropolis. In doing so, this research also examines how the determinants of homeownership vary across major population groups and the FBNCs since the emerging gateway of Nashville has a significant share of its population who are immigrants (McDaniel et al. 2019a; McDaniel 2021). This intra-urban inspection of determinants will provide pathways for creating pro-immigrant-based policy measures that can help create an inclusive and equitable society.

2. Research Design

2.1. Study Area

Based on my ongoing research on the rent burden faced by immigrants and racial/ethnic minorities in the Nashville metropolis (Sharma and Samarin 2024), this research attempts to expand our understanding of homeownership disparities faced by racial/ethnic groups and immigrants in the neighborhoods, defined by census tracts in the fastest growing immigrant hub of Nashville in Tennessee. This metropolis has attracted a significant share of immigrants from all over the world, including the regions that were not the conventional senders. These include African, Latin American, and Asian countries, all of which have attributed to the fast-increased multi-group diversity of Nashville (Chaney et al. 2018).¹ The dynamism in this fastest emerging music capital of the country has also attracted several economic sectors, making Nashville one of the most expensive cities in the US, especially regarding its housing costs (Samarin and Sharma 2022). Due to its unaffordability in terms of housing prices and the legal and financial difficulties faced by immigrants, especially those not yet citizens, this paper explores homeownership disparities among racial/ethnic groups while also focusing on the FBNCs in the census tracts of the Nashville metropolis.

2.2. Data Sources

Based on the OMB's 2019 definition, the Nashville MSA comprised 13 counties, namely Davidson, Sumner, Wilson, Cheatham, Dickson, Robertson, Rutherford, Williamson, Cannon, Macon, Smith, Trousdale, and Maury. I used tract-scale data from the National Historic Geographic Information Science (NHGIS)'s five-year estimates (2014–2019) to extract the demographic, socio-economic, and other relevant housing data (Manson et al. 2022).² In Nashville, out of a total of 372 census tracts in these 13 counties, only 365 valid tracts with population were included in this analysis, and the remaining tracts with zero population were removed.

2.3. Methodological Steps

Computation of Six Types of Dependent (Y) Variables

Given the focus of this analysis, I computed six types of dependent variables that are later used in regression analyses to examine race-based homeownership disparities. These Y-variables are listed below:

- Y1: Share of White Homeowners/Total Occupied Households;
- Y2: Share of Black Homeowners/Total Occupied Households;
- Y3: Share of Asians-with-Hawaiian and Pacific Islander Homeowners/Total Occupied Households
- Y4: Share of Hispanic Homeowners/Total Occupied Households;
- Y5: Share of non-Asian Minorities Homeowners/Total Occupied Households;
- Y6: Share of Black and Hispanic-Combined Homeowners/Total Occupied Households

2.4. Identification of Explanatory (X) Variables

The Multi-Group Diversity Scores (DS) were calculated for all valid 365 census tracts of Nashville, using five major racial/ethnic groups (non-Hispanic Whites, non-Hispanic Blacks, non-Hispanic Asians including Hawaiian/Pacific Islanders, non-Hispanic American Indians along with All-Other groups, and Hispanics) for total tract population, using the following specification adopted from Theil and Finizza (1971):

$$DS = \sum_{r=1}^n (Pr) \ln(1/Pr) \quad (1)$$

where P_r refers to a particular racial/ethnic group's proportion of the total population for a tract. All logarithmic calculations use a natural log (when the proportion of a particular group in a tract (P_r) is 0, then the log is set to 0; I prefer this procedure here, as the absence of a group(s) should result in a 0). The higher the value of DS, the more diverse an area is, and vice versa.

Likewise, using the same principles of computations, multi-group diversity scores were also computed for the foreign-born-not-citizens share of these five population groups (DS-FBNC) for each tract. These two types of DS-Overall and DS-FBNC are later used in correlations, cartographic mapping, and regression analyses. Having both types of DS helps us understand if being foreign-born and not having citizenship—our proxy for the immigrant population—might put immigrants at a greater disadvantage in terms of homeownership compared to others.

Thereafter, the income ratio variables were calculated for major population groups, including minorities, and other similar share variables were calculated. Major ones include educational attainment categories for major racial/ethnic groups, shares of homes in ownership and rentership categories for major races, shares of homes built in different year categories, shares of Foreign-born by their years of entry, and likewise. I also calculate the location quotients (LQs) for five major occupational categories for use as explanatory variables in regression models. To compute the LQ-values for five major occupations, I follow Moineddin et al. (2003)'s specifications:

$$LQ_i = (ei/e)/(Ei/E) \quad (2)$$

where ei is the employment in occupation i in the local tract; e is the total employment in the tract; Ei is the employment in occupation i at the metropolitan level, and E is the total employment at the entire Nashville metropolitan level (by adding total employment in all five major occupational categories taken together). These values of LQs provide an interesting overview of the under/over-representation of occupation types in specific tracts of Nashville.

Thereafter, I conducted various data exploratory analyses to gather a feel for the data and determine what variables would best serve as the explanatory variables. In this process, I also create various types of ratios and share variables, as they make better sense as explanatory variables for use in the regression models. Some basic descriptive analyses and bivariate correlation analyses were conducted using these variables so that the aspects of multi-collinearity could be examined and the best explanatory variables could be identified for use in the regression models. While I do not intend to discuss all these exploratory analyses at length, some basic understanding of the demographic composition and other major determinants is discussed below in the analysis and findings.

3. Analysis and Findings

3.1. Demographic Composition of Nashville Metropolis, 2019

Nashville has remained an important emerging immigrant gateway of the South due to its attractiveness as an economic hub. As noted in Table 1, Nashville's is higher than the entire state's share of the Hispanic population (7.30 percent versus 5.43 percent) but far lower than the nation's share of 18.83 percent. However, Nashville contains 37.52 percent of Tennessee's Hispanics—2.04 percent of the entire state's population—making it an especially noted metropolitan area in terms of minority representation.

Table 1. Racial/ethnic composition: USA, Tennessee, and Nashville, 2019.

	USA	Tennessee	Nashville MSA	Percent-By-State's- R/E-By-Total- Population
	Total (Percent)	Total (Percent)	Total (Percent)	
Population (Total), 2019	328,016,242 (100)	6,709,356 (100)	1,871,903 (100)	27.89 (27.90)
Non-Hispanic—Total	266,260,953 (81.17)	6,345,182 (94.57)	1,735,263 (92.7)	27.35 (25.86)
Non-Hispanic—Whites	197,132,096 (60.10)	4,951,558 (73.8)	1,348,843 (72.06)	27.24 (20.10)
Non-Hispanic—Blacks	39,980,733 (12.19)	1,114,068 (16.61)	283,476 (15.14)	25.45 (4.23)
Non-Hispanic—American—Indians	2,160,496 (0.66)	15,553 (0.23)	4018 (0.22)	25.83 (0.06)
Non-Hispanic—Asians—with- Hawaiian & Pacific-Islanders	18,251,837 (5.56)	119,950 (1.79)	52,397 (2.8)	43.68 (0.78)
Non-Hispanic—All-Others	8,735,791 (2.66)	144,053 (2.15)	46,529 (2.49)	32.30 (0.69)
Hispanics	61,755,289 (18.83)	364,174 (5.43)	136,640 (7.3)	37.52 (2.04)

3.2. Foreign-Born and Immigrants of Nashville

An analysis of Nashville's foreign-born (FB) population (Table 2A) shows that they comprise 4.85% of its total population. Out of the total FB, about 40% are naturalized US citizens (Table 2B), whereas 59.94% are not. The latter cohort comprises an important focus of this research despite its small share of the total metropolitan population. When

examining the race-based composition of the FB population (Table 2B), it is obvious that the Hispanics FBNC comprise the largest share—31.99% of the total FB—followed by Asians with Hawaiian/Pacific islanders at 12.52%, followed by All-Others (11.38%) and then Whites and Blacks.

Table 2. Demographic portfolio of Nashville’s foreign-born population, 2019.

	Sum	Shr/T-FB	Share
A: Foreign Born and Nativity Status, 2019			
Total Population 2019	1,871,903	100	1
Native Total, 2019	1,555,441	83.09	0.831
Total Foreign-Born	90,825	4.85	1
Native, Born in the State of Residence	968,399	51.73	0.517
Native, Born in Other US State	570,249	30.46	0.305
Native, Born Outside US	16,793	0.9	0.009
Native, Born Outside US, Puerto Rico	2643	0.14	0.001
Native, Born US Island Areas	702	0.04	0
Native, Born Abroad of American Parent(s)	13,448	0.72	0.007
B: Foreign Born Status by Race/Ethnicity, 2019			
Foreign-Born	90,825	0.0485	1
Foreign-Born Naturalized Citizens	36,383	0.0194	0.4006
Foreign-Born Not-yet-Citizens (FBNCs)	54,442	0.0291	0.5994
White, FBNCs	8760	0.0047	0.0964
Black, FBNCs	4212	0.0023	0.0464
Asian-w-Hawaiian and Pacific Islanders, FBNCs	11,374	0.0061	0.1252
All-Others, FBNCs	10,335	0.0055	0.1138
Hispanics, FBNCs	29,059	0.0155	0.3199
C: Foreign Born Status by Region of Entry, 2019			
FB—European Origin of Total FB Population	51,071	0.0273	0.5623
FB—Asian Origin of Total FB Population	28,110	0.015	0.3095
FB—Latin American Origin of Total FB Population	39,201	0.0209	0.4316
FB—Other Regions of Origin of Total FB Population	13,996	0.0075	0.1541
D: Foreign Born Status by Year of Entry, 2019			
FB—Entered 2010/later, FBNCs	23,995	0.0128	0.2642
FB—Entered 2000–2009, FBNCs	19,948	0.0107	0.2196
FB—Entered 1990–1999, FBNCs	6936	0.0037	0.0764
FB—Entered Before 1990, FBNCs	3563	0.0019	0.0392

Note: Shr/T-FB = Share out of Total Foreign-Born; these basic descriptive statistics are calculated for each population sub-group from the entire dataset for Nashville MSA.

Finally, out of the four major regions of immigrants’ origin (Table 2C), the largest share of foreign-born come from Europe (56.23%), followed by Latin America (43.16%), Asia (30.95%) and other regions (15.41%). Regarding years of entry into the USA (Table 2D), the largest share (26.42%) has entered after 2010, followed by the subsequent decades prior; this suggests that many FB who had entered decades ago have likely attained citizenship.

3.3. Education, Labor, and Socio-Economic Characteristics of Nashville

Almost 31.71% of 25 years/above population in Nashville (Table 3) hold a high school degree, followed by some college/associate degree (28.54%), Bachelor’s degree (17.5%), no high school (11%) and Master’s/Professional/Doctoral degrees (10.7%). There exists gender-based equal distribution (almost) in educational attainments.

Table 3. Educational attainment profile of Nashville's 25 years/above population.

Educational Attainment by Gender, Total, 25 Years/Above	Total	Share
Male, Total 25 Years/above	524,810	0.4733
Female, Total 25 Years/above	583,911	0.5267
Total Population, 25 Years/above	1,108,721	1.0000
Male, No Schooling of Total 25 Years/above	4991	0.0045
Female, No Schooling of Total 25 Years/above	5299	0.0048
Total No Schooling of Total 25 Years/above	10,290	0.0093
Male, No High School Degree of Total 25 Years/above	62,765	0.0566
Female, No High School Degree of Total 25 Years/above	60,147	0.0542
Total No High School Degree, of Total 25 Years/above	122,912	0.1109
Male, High School Degree of Total 25 Years/above	172,235	0.1553
Female, High School Degree of Total 25 Years/above	179,308	0.1617
Total High School Degree of Total 25 Years/above	351,543	0.3171
Male, Some College/ Assoc. Degree of Total 25 Years/above	141,407	0.1275
Female, Some College/ Assoc. Degree of Total 25 Years/above	175,073	0.1579
Total Some College/ Assoc. Degree of Total 25 Years/above	316,480	0.2854
Male, Bachelor's Degree of Total 25 Years/above	91,503	0.0825
Female, Bachelor's Degree of Total 25 Years/above	102,704	0.0926
Total Bachelor's Degree of Total 25 Years/above	194,207	0.1752
Male, Master's Degree of Total 25 Years/above	33,958	0.0306
Female, Master's Degree of Total 25 Years/above	46,557	0.0420
Total Master's Degree, of Total 25 Years/above	80,515	0.0726
Male, Professional Degree of Total 25 Years/above	9858	0.0089
Female, Professional Degree of Total 25 Years/above	8534	0.0077
Total Professional Degree, of Total 25 Years/above	18,392	0.0166
Male, Doctorate Degree, of Total 25 Years/above	8093	0.0073
Female, Doctorate Degree, of Total 25 Years/above	6289	0.0057
Total Doctorate Degree of Total 25 Years/above	14,382	0.0130

Regarding other characteristics of Nashville's population and labor (16 years/older), about 13% of Nashville's total population live below poverty, whereas 43.35% of its total population are civilian labor force (16 years/older) (Table 4). In terms of major employment types, 26.6% of the civilian labor is engaged in management/business/science/arts occupation, 14.19% is occupied in sales/office, 11.75% in production/transportation/material-moving, 8.8% is engaged in service, and 6.46% is engaged in natural resources/construction/maintenance-type occupations.

Table 4. Labor force characteristics of Nashville (16 years/older), 2019.

Labor Force/Employment Characteristics	Total	Shr-MS-Pop	Shr-LF
Below Poverty Level	246,456	0.1317	N/A
Total Labor, 16 Years/Older	811,391	0.4335	N/A
In Labor Force, Armed Forces	9099	0.0049	0.0112
In Labor Force, Civilians	802,292	0.4286	0.9888
Employed, Civilian Labor Force	760,415	0.4062	0.9372
Unemployed, Civilian Labor Force	41,877	0.0224	0.0516

Table 4. *Cont.*

Labor Force/Employment Characteristics	Total	Shr-MS-Pop	Shr-LF
Employed in Management/Business/Science/Arts	215,817	0.1153	0.2660
Employed in Service	71,423	0.0382	0.0880
Employed in Sales/Office	115,110	0.0615	0.1419
Employed in Natural Resources/Const./Maintenance	52,427	0.0280	0.0646
Employed in Production/Transportation/Material-Moving	95,339	0.0509	0.1175

Note: Shr-MS-Pop (share of Nashville's total population) and Shr-LF (share of total labor force).

Further analysis of per capita income and median household incomes by race (Table 5) highlights an important aspect of differentiation, and this helped us understand what might be attributing to homeownership differences. While the overall median household income in Nashville is \$55,386, there exists a significant difference in race-based mean per capita income; these figures are \$32,522 for non-Hispanic Whites, \$25,062 for Blacks, \$32,556 for Asians, and \$20,091 for Hispanics. Further investigation of the ratios of race-based per capita income (mean values) versus overall median housing value—which provides an overall housing purchase stress and each race's affordability toward buying homes—suggests that these ratio values are 15.19 for Whites, 15.07 for Asians, 11.49 for Blacks, and 9.27 for Hispanics, thence putting Hispanics as the most disadvantaged group in terms of housing affordability in Nashville.

Table 5. Race-based per capita income and income vs. median housing value ratios.

Racial/Ethnic Group's Per Capita Income (Inflation Adj.)	Mean Income (\$)
Median HH Income	55,386
Overall Per Capita Income	28,609
White Per Capita Income	32,522
Black Per Capita Income	25,062
American Indians Per Capita Income	26,304
Asian Per Capita Income	32,556
Native Hawaiians Per Capita Income	17,716
Some Other Races Per Capita Income	20,569
Two or More Races Per Capita Income	20,239
Hispanic Per Capita Income	20,091
Ratios of Per Capita Income compared to Median Housing Value	Mean
Ratio, White Per Capita Income vs. Median Home Value	0.1519
Ratio, Black Per Capita Income vs. Median Home Value	0.1149
Ratio, Asian Per Capita Income vs. Median Home Value	0.1507
Ratio, Hispanic Per Capita Income vs. Median Home Value	0.0927

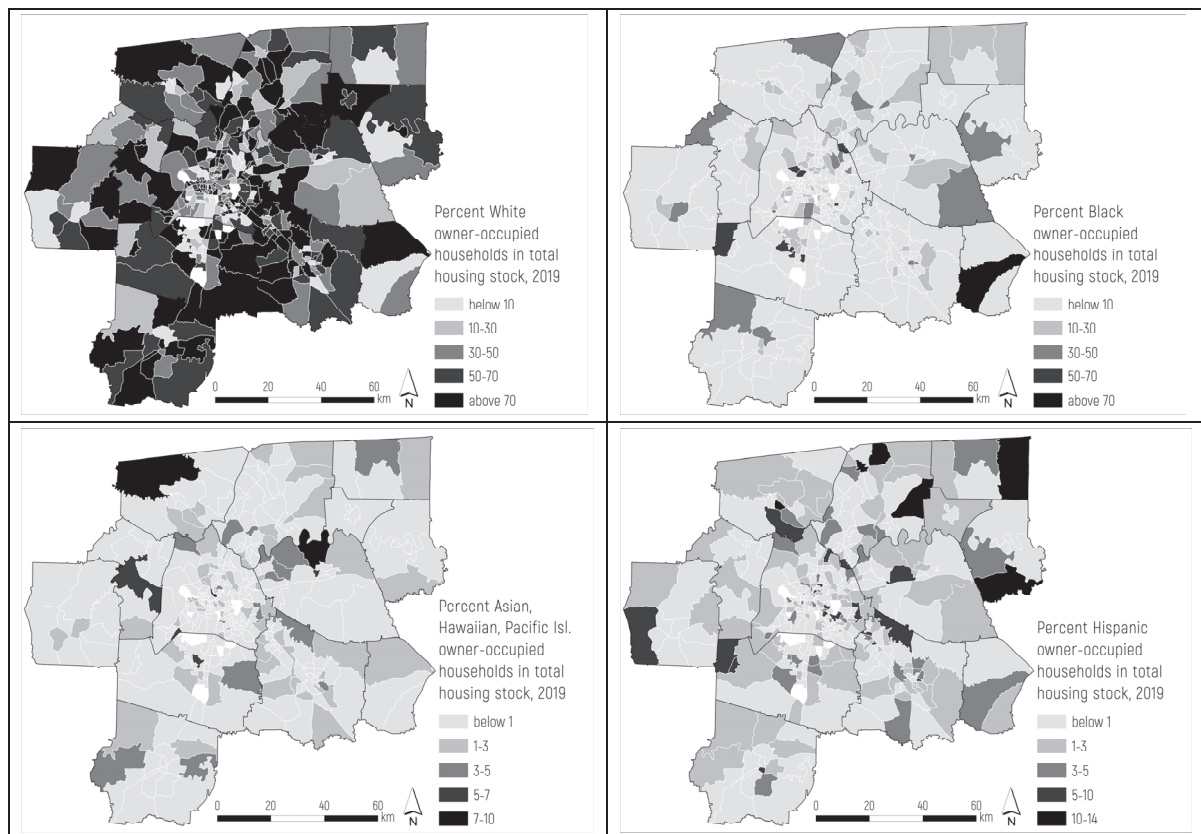
3.4. Nashville's Housing Composition and Housing Stock

A closer examination of race-based homeownership suggests wide racial gaps, with 47% homeownership for Whites (they comprise 72% of the total population), 6.85% for Blacks (comprise 15% of the total population), 1.44% for Hispanics (comprise 7.3% of the total population), and 0.76% for Asians (comprise 2.8% of the total population) (Table 6).

Table 6. Housing stock by race-based ownership and year of built structure.

Total Housing Stock	Numbers	Share
Total Stock of Housing Units	720,041	1.000
Total Occupied Homes	633,749	0.880
Total Vacant Homes	86,292	0.120
Housing Units by Built Year		
Built After 2014 of Total HH Stock	23,709	0.033
Built 2000–2013 of Total HH Stock	143,578	0.199
Built 1970–1999 of Total HH Stock	343,577	0.477
Built 1950–1969 of Total HH Stock	139,100	0.193
Built Before 1949 of Total HH Stock	70,077	0.097
Total Owner-Occupied Homes by Race		
White-Alone	337,359	0.469
Black-Alone	49,304	0.068
American Indian	887	0.001
Asian-w-Haw and Pacific Islanders	5468	0.008
All-Other Races	6541	0.009
Hispanic	10,397	0.014

Further analysis of Nashville's total housing stock (Table 6) suggests that about 56.9% of total housing stock in Nashville was owner-occupied; of these, 46.9% were owned by Whites, whereas Black, Hispanic, and Asian owners comprised 6.8%, 0.8% and 1.4% of the total housing stock. The year-built break-up suggests that a large share of the total housing stock was constructed during 1970–1999, followed by those built during 2000–2013 and 1950–1969, and a small share was built most recently, after 2014. Figure 1 illustrates the tract-scale spatial distribution of homeownerships for four major groups in Nashville.

**Figure 1.** Race-based homeownership in Nashville, 2019.

3.5. Regression Analysis of Homeownership by Race/Ethnicity

I proceed ahead with conducting bivariate correlation analyses of select variables to identify the best explanatory variables for regression models. Based upon these relationships and my educated understanding of housing scholarship, I proceeded with select variables of diversity scores, educational attainment categories, shares of foreign-born by years of entry, ratios of race-based income vs. median household incomes, shares of housing structure built by various years, and the location quotients (LQs) for five major occupational categories; these regression models are illustrated in Tables 7–9. I ran several reiterative models using stepwise backward regressions to derive the best-fit models, and the variables that were not significant dropped out of the final model. Major findings for homeownership by race are discussed below.

Concerning White homeownership (Table 7: Y1), many variables are significant (at 80% confidence level), and many are significant even at 95% and 90% levels. The strongest predictors for White homeownership have negative coefficients, with Master's (Beta = -0.262) being the strongest, followed by no schooling/no high school diploma (Beta = -0.258), some college/associate degree (Beta = -0.232); other variables with negative coefficients include DS-FBNC (Beta = -0.262), share-FB-entered 2010 or later (Beta = -0.204), the ratio of Hispanic income compared to overall (Beta = -0.113); other variables in LQ-various categories of occupation are significant at 90%/above levels and all have negative coefficients, except LQ-Sales/Office (Beta = 0.136 , significant at 90%), indicating higher level of White homeownership in tracts where labor is engaged in sales/office-type occupations. It is obvious from these values that White homeownership is lower in tracts with higher diversity among the FBNC and those with higher presence of recently-entered FB population. This model has an R-square value of 66.1%.

Table 7. Regression models for White and Black homeownership in Nashville, TN.

Predictors	Y1: White Homeowners					Y2: Black Homeowners				
	B	Beta	t	Sig.	VIF	B	Beta	t	Sig.	VIF
(Constant)	0.736		2.619	0.010		−0.375		−2.792	0.006	
Diversity Score, Overall	x	x	x	x	x	−0.062	−0.203	−2.865	0.005	1.051
Diversity Score, FB Not Citizen	−0.335	−0.262	−3.656	0.000	1.559	0.120	0.232	2.708	0.008	1.535
Share, FB Entered 2010/after, FB Not Citizen	−0.269	−0.204	−2.740	0.007	1.679	−0.145	−0.271	−3.031	0.003	1.678
Share, FB Entered 2000–2009, FB Not Citizen	−0.187	−0.105	−1.273	0.206	2.063	0.061	0.085	0.862	0.391	2.038
Share, No High School Diploma and No Schooling	−0.901	−0.258	−2.029	0.045	4.916	−0.229	−0.162	−1.132	0.260	4.313
Share, Some College/Ass. Degree	−0.615	−0.232	−2.068	0.041	3.831	0.229	0.214	2.032	0.045	2.327
Share, Master's, Professional, and Doctorate Degree	−0.676	−0.262	−2.039	0.044	5.005	0.177	0.170	1.125	0.263	4.783
Ratio, Black vs. Overall Per Capita Income	0.051	0.072	1.171	0.244	1.161	0.018	0.062	0.820	0.414	1.203
Ratio, White vs. Overall Per Capita Income	−0.179	−0.145	−2.008	0.047	1.589	0.181	0.363	4.225	0.000	1.551
Ratio, Asian vs. Overall Per Capita Income	−0.034	−0.074	−1.166	0.246	1.220	0.010	0.055	0.737	0.463	1.185
Ratio, Hispanic vs. Overall Per Capita Income	−0.061	−0.113	−1.863	0.065	1.116	0.038	0.172	2.380	0.019	1.102
Share, Employed in Labor, Civilians	0.781	0.268	3.962	0.000	1.392	0.130	0.110	1.388	0.168	1.318
LQ-Management/Business/Science/Arts	−0.083	−0.244	−2.535	0.013	2.829	x	x	x	x	x
LQ-Service	−0.117	−0.134	−2.106	0.038	1.227	x	x	x	x	x
LQ-Sales/Office	0.063	0.136	1.811	0.073	1.714	x	x	x	x	x
LQ-Natural Resources/Construction/Maintenance	−0.130	−0.250	−2.486	0.015	3.082	−0.022	−0.118	−1.319	0.190	1.680
LQ-Production/Transp./Material-Moving	x	x	x	x	x	0.089	0.425	3.773	0.000	2.668
Share, Built Before 1970, of Total HH Stock	x	x	x	x	x	−0.029	−0.070	−0.740	0.461	1.849
R-Value			0.813					0.714		
R-Square Value			0.661					0.509		
Adj. R-Square Value			0.612					0.438		

Note: x in the cells implies those variables got dropped during stepwise regressions, and hence they have no coefficients.

Regarding Black homeownership (Table 7: Y2), it is higher in tracts with high DS-FBNC (Beta = 0.120) and lower (Beta = −0.203) in tracts with overall diversity (DS-Overall); it is also negative in the tracts with higher presence of recently entered FB. Interestingly, Black homeownership is higher in tracts with some college/associate degree (Beta = 0.229) as well as those where White (Beta = 0.181) and Hispanic incomes (Beta = 0.038, significant at 80%) are higher compared to overall income—which is interesting, and points toward the greater role of class rather than race. Black homeownership is also higher in tracts where a higher share of labor is engaged in production/transportation/material-moving is higher (Beta = 0.425). This model has an R-square value of 50.92%.

Regarding Hispanic homeownership (Table 8: Y3), positive predictors include FB-NCs who entered during 2000–2009 (Beta = 0.2085), FBNCs who entered before 1990 (Beta = 0.1952), share of those with some college/associate degree (Beta = 0.4299) and Bachelors degree (Beta = 0.562), and share of those engaged in natural resources/construction/maintenance type occupations; none of the variables have negative Betas. The R-square value is lower at only 23.6%.

Table 8. Regression models for Hispanic and Asian homeownership in Nashville, TN.

Predictors	Y3: Hispanic Homeowners					Y4: Asian Homeowners				
	B	Beta	t-Value	Sig.	VIF	B	Beta	t-Value	Sig.	VIF
(Constant)	−0.0001		−2.3401	0.0212		−0.014		−0.471	0.638	
Diversity Score, Overall	0.0000	0.0645	0.7308	0.4665	1.0614	−0.011	−0.193	−2.432	0.017	1.039
Diversity Score, FB Not Citizen	x	x	x	x	x	0.018	0.191	2.186	0.031	1.257
Share, FB Entered 2010/later, FB Not Citizen	0.0000	−0.1285	−1.2369	0.2189	1.4697	−0.037	−0.381	−4.221	0.000	1.346
Share, FB Entered 2000–2009, FB Not Citizen	0.0000	0.2085	1.9150	0.0582	1.6146	x	x	x	x	x
Share, FB Entered Before 1990, FB Not Citizen	0.0001	0.1952	2.1598	0.0331	1.1126	−0.044	−0.108	−1.289	0.200	1.156
Share, No High School Diploma and No Schooling	0.0001	0.2602	1.4051	0.1630	4.6696	x	x	x	x	x
Share, Some College/Ass. Degree	0.0001	0.4299	2.4991	0.0140	4.0311	0.023	0.116	0.976	0.331	2.345
Share, Bachelor's Degree	0.0001	0.5620	2.6121	0.0103	6.3052	0.054	0.324	2.243	0.027	3.454
Share, Master's, Professional and Doctorate Degree	x	x	x	x	x	x	x	x	x	x
Ratio, Black vs. Overall Per Capita Income	x	x	x	x	x	0.009	0.178	2.072	0.041	1.219
Ratio, White vs. Overall Per Capita Income	x	x	x	x	x	0.005	0.053	0.597	0.552	1.313
Ratio, Asian vs. Overall Per Capita Income	0.0000	−0.0853	−0.9277	0.3557	1.1525	0.004	0.113	1.360	0.177	1.147
Ratio, Hispanic vs. Overall Per Capita Income	0.0000	0.1212	1.3251	0.1880	1.1387	0.003	0.082	1.020	0.310	1.065
Share, Employed in Labor, Civilians	x	x	x	x	x	0.015	0.069	0.767	0.445	1.336
LQ-Management/Business/Science/Arts	x	x	x	x	x	x	x	x	x	x
LQ-Service	0.0000	−0.1645	−1.2450	0.2159	2.3776	x	x	x	x	x
LQ-Sales/Office	0.0000	0.0854	0.9243	0.3575	1.1641	−0.002	−0.037	−0.449	0.654	1.102
LQ-Natural Resources/Construction/Maintenance	0.0000	0.2466	2.1291	0.0356	1.8269	−0.003	−0.096	−0.923	0.358	1.804
LQ-Production/Transp./Material-Moving	x	x	x	x	x	x	x	x	x	x
Share, Built After 2014, of Total HH Stock	0.0000	−0.1017	−0.8539	0.3951	1.9326	x	x	x	x	x
Share, Built 2000–2013, of Total HH Stock	0.0000	−0.0716	−0.5808	0.5626	2.0696	x	x	x	x	x
Share, Built 1970–1999, of Total HH Stock	x	x	x	x	x	x	x	x	x	x
Share, Built Before 1970, of Total HH Stock	x	x	x	x	x	−0.014	−0.183	−1.721	0.088	1.859
R-Value			0.486					0.609		
R-Square Value			0.236					0.371		
Adj. R-Square Value			0.134					0.286		

Note: x in the cells implies those variables got dropped during stepwise regressions, and hence they have no coefficients.

In contrast, Asian homeownership (Table 8: Y4) predictors include significant positive relationship with DS_{FBNC} (Beta = 0.191) and share of those with Bachelor's degree (Beta = 0.324), which is also one of the strongest predictors; negative Betas load on overall diversity (Beta = −0.193) and the share of FBNC who entered 2010/after (Beta = −0.381); other positive Betas load on Black per capita income compared to overall income (Beta = 0.324) and negatively with the share of housing built before 1970 (Beta = −0.183). These values indicate that Asian homeownership is better in the tracts with a greater presence of diverse FB groups but not in tracts that have a significant presence of overall diversity or larger shares of recently arrived FB; they have lower homeownership in tracts that have older homes, built before 1970. Tracts with better relative income for Blacks have higher Asian homeownerships as well, though the relative income of other groups has no impact. The R-square value is better at 37.1%.

Finally, I also conducted regression analyses for two other minority groups—non-Asian Minorities (this included Blacks, Hispanics, American-Indians, and All-Others together as one group, (Table 9: Y5) and Hispanics and Blacks combined together as one group (Table 9: Y6) because these two comprise the most disadvantaged social group in most American metropolises, and I wanted to examine their status in the emerging metropolis of Nashville.

Table 9. Regression models for non-Asian minorities and Blacks and Hispanics combined homeowners.

Predictors	Y5: Non-Asian Minority Homeowners					Y6: Black + Hispanics (Combined)				
	B	Beta	t-Value	Sig.	VIF	B	Beta	t-Value	Sig.	VIF
(Constant)	−0.334		−3.649	0.000		−0.375		−2.502	0.014	
Diversity Score, Overall	−0.074	−0.208	−3.034	0.003	1.042	−0.066	−0.196	−2.847	0.005	1.052
Diversity Score, FB Not Citizen	0.187	0.309	3.743	0.000	1.511	0.150	0.264	3.160	0.002	1.539
Share, FB Entered 2010/after, FB Not Citizen	−0.203	−0.325	−3.924	0.000	1.521	−0.176	−0.299	−3.421	0.001	1.685
Share, FB Entered 2000–2009, FB Not Citizen	0.071	0.084	0.948	0.345	1.741	0.089	0.112	1.162	0.248	2.040
Share, FB Entered before 1990, FB Not Citizen	x	x	x	x	x	x	x	x	x	x
Share, No High School Diploma and No Schooling	x	x	x	x	x	−0.258	−0.166	−1.184	0.239	4.360
Share, Some College/ Ass. Degree	0.413	0.330	3.364	0.001	2.134	0.259	0.219	2.119	0.037	2.370
Share, Bachelor's Degree	x	x	x	x	x	x	x	x	x	x
Share, Master's, Professional and Doctorate Degree	0.308	0.253	2.025	0.045	3.456	0.201	0.175	1.188	0.237	4.790
Ratio, Black vs. Overall Per Capita Income	0.029	0.088	1.201	0.233	1.188	0.024	0.078	1.053	0.295	1.204
Ratio, White vs. Overall Per Capita Income	0.184	0.316	3.733	0.000	1.580	0.177	0.323	3.845	0.000	1.559
Ratio, Asian vs. Overall Per Capita Income	x	x	x	x	x	0.012	0.060	0.822	0.413	1.185
Ratio, Hispanic vs. Overall Per Capita Income	0.052	0.203	2.872	0.005	1.101	0.048	0.197	2.784	0.006	1.110
Share, Employed in Labor, Civilians	x	x	x	x	x	0.130	0.100	1.271	0.207	1.370
LQ-Management/Business/Science/Arts	x	x	x	x	x	x	x	x	x	x
LQ-Service	−0.022	−0.136	−1.366	0.175	2.198	x	x	x	x	x
LQ-Sales/Office	x	x	x	x	x	x	x	x	x	x
LQ-Natural Resources/Construction/Maintenance	−0.023	−0.104	−1.226	0.223	1.594	−0.015	−0.074	−0.849	0.398	1.680
LQ-Production/Transp./Material-Moving	0.085	0.349	3.126	0.002	2.753	0.097	0.420	3.819	0.000	2.670
Share, Built After 2014, of Total HH Stock	0.150	0.072	0.805	0.422	1.785	x	x	x	x	x
Share, Built 2000–2013, of Total HH Stock	x	x	x	x	x	−0.015	−0.023	−0.266	0.791	1.676
Share, Built 1970–1999, of Total HH Stock	0.058	0.106	1.260	0.211	1.557	x	x	x	x	x
Share, Built before 1970, of Total HH Stock	x	x	x	x	x	−0.051	−0.110	−1.056	0.294	2.394
R-Value			0.728					0.734		
R-Square Value			0.530					0.538		
Adj. R-Square Value			0.466					0.466		

Note: x in the cells implies those variables got dropped during stepwise regressions, and hence they have no coefficients.

The models derived in this analysis suggest that the variables that show up as significant at various levels of confidence are almost quite similar, except that the presence of a Master's degree is associated with a higher level of non-Asian Minority homeownership (Beta = 0.253) whereas this variable is not significant in the Black and Hispanic combined model. Other common variables with positive betas include DS-FBNC, some college/associate degrees, and the relative income of Whites and Hispanics compared to overall income and tracts with higher LQs for production/transportation/material moving. Those with negative Betas include DS-Overall and the recently arrived FBNCs (2010/later).

4. Conclusions and Policy Implications

When examining these six models that explain homeownership differences across major racial/ethnic groups, some major patterns emerge. White homeownership is lower in the tracts with a higher presence of diverse FBNCs and recently-entered FB populations. In contrast, tracts with higher LQs for sales/office-type occupations obtain positive Betas, whereas other occupation-types associate with negative Betas, suggesting greater White homeownership in the former. However, for almost all models for homeownership among minority groups, tracts with higher LQs for production/transportation/material-moving have higher/positive homeownership for Black Nashvillians as well as other non-Asian-minorities and for Blacks and Hispanics combined. For Hispanic homeownership, tracts with higher LQs for natural resources/construction/maintenance-type occupations (largely blue-collar occupations) are associated with higher homeownership, whereas none of these matter for Asians. These also indicate that engagement in the blue-collar economic sector has remained a better predictor of economic well-being, especially among the minority populations, and it has indeed propelled a sense of homeownership, and this could also be likely due to the better pay structure in manufacturing and other types of blue-collar economic activities. Research suggests Nashville's gain in car assembly plants and other related manufacturing jobs over the last few decades, and these have likely contributed to improved homeownership. This finding has a policy implication that to improve the economic condition of people in general, it helps to attract more manufacturing and local-based economies as they improve resident's purchasing power and local well-being. Regarding the age of the built-in structure, Asian homeownership is lower in older tracts (i.e., homes built before 1970); other groups do not show any specific pattern.

Finally, while the above models collectively illustrate neighborhood-scale characteristics that associate positively or negatively with homeownership for various population groups, what is not obvious is that the level of non-citizenship in each census tract is difficult to extract and model statistically since their numbers are very small in each tract, making it difficult to create robust models. This requires more in-depth field-based investigation as that could add rich contexts into race and citizenship-based differences in homeownership.

This research also points toward an important aspect of the built environment. The availability of newly built homes provides a larger pool of housing, which eventually helps people buy homes. It also helps specific racial/ethnic groups if the housing pool comprises mixed-plan communities, offering homes in various price ranges (see Sharma 2016b). The availability of mixed-plan communities helps increase diversity and affordability across communities, and this is much needed in Nashville, which remains a magnet metropolis that attracts people of diverse races and cultures. These are also critical to maintaining the overall pool of built-environment and urban spaces in one of the fastest-growing metropolises of Nashville. This has important policy implications as more investment in the housing market would likely propel economic development in basic and non-basic industries—which are essential in the long-term growth and sustainability of urban spaces.

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Notes

- ¹ In this manuscript, I use the terms Blacks and African Americans interchangeably to refer to the non-Hispanic Black population in the USA and in Nashville. Also, the term ‘Black’ sounds rude, but my interaction with several Black scholars has indicated a preference for the term ‘Black’ instead of African Americans since many Black communities have originated outside of Africa. While the terms race and ethnicity imply different meanings, in this study, I use the term race for Non-Hispanic (NH) Whites, NH-Blacks, NH-Asians-along-with-Hawaiian and Pacific Islanders, NH-American Indians and Native Americans, and NH-All Others, and Hispanics are the only ethnic group, even though this includes specific racial groups (e.g., White, Black, etc.). In the text, I have used White, Black, etc., which actually refer to the non-Hispanic groups of each of these races.
- ² This study was initiated when the 5-year estimates (2015–2019) were the latest available data provided by the NHGIS. While more recent data is now available, this paper focuses on 2015–2019 as the point-of-time analysis. I use the terms Nashville, Nashville MSA, and Nashville metropolis for the same geographic entity—the entire metropolitan statistical area of Nashville, comprising the 13 counties based on the US Bureau of Census’s Office of Management & Budget definition in 2019.

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Article

Drawing a Long Shadow: Analyzing Spatial Segregation of Afghan Immigrants in Tehran

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Abstract: Although recent dramatic political changes in Afghanistan have brought that country to global attention, migration from Afghanistan to Iran has a long history. Nearly three quarters of Afghan immigrants in Iran are located in cities, particularly in Tehran's metropolitan area. However, despite the long-term presence of Afghan immigrants in Iran, research on patterns and drivers of spatial segregation of immigrants has been very limited. The research method involves a secondary analysis of census data. Therefore, this article utilizes 2006 Iran census tract data to examine patterns of spatial segregation of Afghan immigrants in the Tehran metropolis. The required data for two-group segregation indices, Getis–Ord statistics, and Geographically Weighted Regression, were analyzed as a map using ArcMap and Geo-Segregation Analyzer. The results reveal that the spatial segregation of Afghans is high and that most live in lower-SES census tracts. Multivariable analyses indicate that the extent of segregation can be explained by education, job class, and generation status. It can be concluded that generational transition and access to human capital have reduced various indicators of spatial segregation of Afghan immigrants in Tehran.

Keywords: spatial segregation; generational status; integration; human capital; Afghan immigrants; geographically weighted regression; Getis–Ord statistics; Tehran

1. Introduction

The majority of population growth in the 20th century occurred in cities, making urban expansion a global phenomenon (Rabiei-Dastjerdi et al. 2023). Today, various aspects of human behavior in different urban neighborhoods and contexts are being studied (Matthews 2008; Rajabi et al. 2024). In all cities, specific neighborhoods can be found where particular groups of individuals or immigrants are concentrated and areas experiencing severe poverty. Conversely, there are also neighborhoods where high-income residents reside (Moya-Gómez et al. 2021). In other words, urban communities are not homogenous, resulting from a process involving infrastructures and amenities that cater to specific social groups such as immigrants and minorities (Rasse 2019). Therefore, segregation patterns reveal not only differences between separate spaces but also indicators of inequality.

Spatial segregation refers to the relative distribution of different groups about one another. Despite the presence of inequality in cities, segregation is not necessarily unfavorable. However, it becomes problematic when individuals become increasingly isolated from one another based on factors such as immigrant status, wealth, and occupation, leading to exclusion and feelings of discrimination. This issue is particularly prevalent when distinct spatial boundaries are established in cities (van Ham et al. 2016). Spatial segregation ultimately results in social segregation in such circumstances (Firman 2004; Yao et al. 2019).

Therefore, the residential segregation of a particular ethnic group or any subgroup within the population, defined by social, cultural, religious, or other criteria, signifies a spatial distribution that differs from the rest of the population (Benassi et al. 2020).

The study of migration volume and cross-border population movements has become increasingly significant as migration rates have risen rapidly over the past half-century. As a phenomenon, migration has played a fundamental role in reshaping urban spaces (Portes 2000). Immigrants play a crucial role in the dynamism, shaping, and configuration of socio-spatial structures in modern urban and metropolitan contexts and in their influence on urban population structures (Benassi et al. 2022b). The spatial distribution of migration occurs not only based on varying population levels but also in conjunction with the distribution of settlements in proportion to their population. Migration patterns can take on diverse spatial forms in different time periods depending on the circumstances of the time and place. Irregular migration patterns and their concentration in specific settlements have resulted in distinct spatial arrangements compared to other areas (Benassi et al. 2023).

International immigrants come from countries with diverse traditions, religions, and political institutions, bringing a wide range of backgrounds when they enter their destination country. These immigrants speak different languages and have distinct cultural practices and physical differences, such as varying skin tones and appearances. Many immigrant groups are concentrated in specific occupations, often with low social status, and live marginalized lives in low-income regions. Immigrants are often portrayed as having alien status or are seen as non-citizens.

The segregation of international immigrants is a social issue that impacts individuals, households, communities, and cities (Tamaru et al. 2016), especially when involuntary. Immigrants and their families often have limited choices and tend to settle in areas with affordable and accessible housing. This form of spatial segregation is typically associated with poverty and inequality (van Ham et al. 2016). Therefore, immigrants are one of the primary groups affected by segregation, whether by choice or circumstance (Benassi et al. 2022a).

Therefore, forming specific immigrant communities is one of the most common segregation patterns in urban spaces. These communities, which emerge due to segregation, become hubs for creating, developing, and perpetuating a distinct culture and way of life. Both segregation and the culture of the segregated group heavily influence them. Immigrants who face obstacles such as acceptance by the host community, religious disparities, and language barriers are often the most vulnerable social group in modern urban settings (Martín-Legendre et al. 2021).

Crises in neighboring countries and the Middle East/Persian Gulf region have significantly influenced Iran. These include Iraq's invasion of Kuwait in 1989–1990, the U.S. invasion and subsequent occupation of Iraq in the early 2000s, the Soviet–Russian occupation of Afghanistan during the 1980s, and the Taliban's rise, fall, and resurgence over the last two decades. Periodic instability in Afghanistan has triggered multiple waves of Afghan migration into Iran. These events have profoundly affected Iran's urbanization dynamics, impacting the socio-spatial patterns within its cities (Rabiei-Dastjerdi 2023).

Over the past four decades, Iran has become a significant destination for forced migration from neighboring countries to its west and east, particularly Afghanistan. According to the 2016 census, there were 1,654,388 foreign nationals in Iran, with 96% being Afghans (Statistical Center of Iran 2016). Since the Taliban's rise to power in 2021 and the resulting new wave of migration, this number has now exceeded five million (Zandi-Navgran et al. 2023).

The UNHCR reported that by the end of 2020, the majority of Afghan refugees, 85 percent, were located in neighboring countries such as Iran and Pakistan. Germany ranked third with approximately 148,000 Afghan refugees, making up around 5.5 percent of the total (Rahimitabar et al. 2023). Austria, France, and Sweden are also significant destinations for Afghan refugees in Europe.

The distribution of Afghans across Iran's provinces, as shown in the 2016 census, reveals that Tehran is a primary hub, with approximately one third (32%) of Afghans residing there. As the capital and a major metropolis, Tehran plays a crucial role in the

national system. Its continuous development has led to imbalances within this system (Rabiei-Dastjerdi and Kazemi 2016). Consequently, Tehran significantly influences the socioeconomic situation of the country and remains a primary center of population attraction, particularly for Afghan immigrants.

Afghans in Iran have access to different rights and services depending on their residency status (Amayesh card holder, passport/visa holder, undocumented). In 2022, out of the 4.2 million Afghan immigrants living in Iran, 24 percent were registered with Amayesh cards; 18 percent had short-term passports; 3 percent held long-term residence permits, and 55 percent lived in the country without any legal documentation (Sadeghi 2022).

Due to the limitations and challenges immigrants face when fully adapting to their new society, unique social networks develop distinct qualities in social interactions. This can result in a diverse mix of cultures, languages, and backgrounds while also causing service disruptions, increased demands for housing and employment, heightened class divisions, and social tensions in cities. This situation presents both opportunities and threats for immigrants. Socioeconomic and cultural differences may marginalize immigrant minorities and reinforce a sense of exclusion from the new society, further isolating them. Therefore, it is essential to examine the spatial patterns of immigrant concentrations, as an overconcentration of immigrants in specific areas indicates a lack of social integration in the host country. Understanding the spatial manifestation of these processes provides valuable insights into the mechanisms at play (Benassi et al. 2022a; Pratschke and Benassi 2024). Thus, measuring and modeling spatial inequality better allows us to understand the main mechanisms or driving factors in the spatial patterns of immigrants (Kim 2008; Shorrocks and Wan 2005; Benassi et al. 2023). Although we may have some understanding of who the marginalized and underserved populations are, as well as their numbers, identifying “where” spatial inequality exists requires mapping and disaggregation. Without this, generating hypotheses about the underlying processes becomes difficult. In the same way, it is crucial to measure and map various aspects of segregation across different levels of integration (Rabiei-Dastjerdi and Matthews 2021; Gupta et al. 2024).

Despite the long-standing presence of Afghan immigrants in Iran, research on the social aspects of their integration remains limited (Rabiei-Dastjerdi 2023; Zandi-Navgran et al. 2024; Fattahzadeh et al. 2024; Sohrabi et al. 2022; Abbasi Shavazi and Sadeghi 2015; Songori et al. 2014), as well as the spatial and residential segregation of immigrants. This study aims to address three main questions: (1) What is the spatial distribution of Afghan immigrants in Iran? (2) To what extent are Afghan immigrants segregated in Tehran? (3) What spatial segregation patterns are based on generational, educational, and occupational groups?

2. Theoretical Background

The concept of segregation encompasses a range of theoretical approaches. The Chicago School was the first serious trend related to spatial–physical segregation (Fainstein 2005; Van Kempen and Muriethe 2009). According to the Chicago School, spatial segregation is an ecological process that involves the voluntary or forced separation of social groups or classes at different stages of life (Jalilisadrabad et al. 2018). Based on the fundamental principles of the ecological model, cultural and social cohesion drive residential movements (Bernt and Volkmann 2023). A key theory suggests that new immigrants, for various reasons, prefer to live in neighborhoods dominated by their ethnic group, forming strong local social networks known as ethnic enclaves (Fong and Chan 2010).

Marxists perceive urban segregation as a consequence of capitalist production and the unequal distribution of urban resources (Kaplan et al. 2004). The Neo-Marxist approach regards spatial segregation as reflecting social classes and the economic structure, emphasizing power. They believe that justice in cities can only be achieved through the fair distribution of resources (Harvey 2009). Neoclassical economic models were initially criticized for their strong focus on economic factors alone. To address this, behavioral and life-cycle models were introduced in the 1970s and 1980s, offering a more nuanced

understanding of how households make decisions. A household's characteristics and changes throughout its life cycle became central to these models (Haandrikman et al. 2023). It was assumed that households adjust their housing needs according to their life stage (single, families with or without children, elderly households) by modifying their living conditions to suit their evolving needs (Van Ham 2012).

The behavioral approach to segregation focuses on the behaviors of social groups as they choose their place of residence. This includes personal preferences, the labor market, land, and real estate markets, as well as government and investment policies. Segregation can be based on personal preferences, as people prefer neighbors similar to themselves (Schelling 1971; Feitosa 2010). For instance, research shows that unemployed individuals living with other unemployed people are less likely to feel bad (Goyal and Ghiglini 2010).

The labor market approach reveals that the labor market, with its social and economic impacts such as deprivation and social inequality, contributes to segregation and creates unsafe living conditions for low-income families (Gerometta et al. 2005). The government and investment policies approach emphasizes how government actions can lead to segregation and perpetuate it through unequal capital distribution, extensive public housing projects, and regulatory tools like exclusive zoning (Anderson 1999; Glynn 2010; Massey and Denton 2001).

In the social approach, the influence of social status and social class on ethnic and racial segregation and the process of choosing neighborhoods is analyzed. There are two hypotheses regarding this approach: the first is the attraction hypothesis, which states that as socioeconomic status rises, the spatial integration of minorities into the majority group also increases. The second hypothesis, the social distance hypothesis, suggests that physical distance in an urban space is directly related to the social distance of ethnic groups. This means that the segregation of ethnic groups is due to their social distance rather than their different socioeconomic status. The social network theory in this approach emphasizes that individuals are not isolated but are connected through social networks across different geographical locations (Ryan 2009). The migration network can be defined as a combination of interpersonal relationships where immigrants interact with their families and friends (Haug 2009). These networks are crucial in understanding migration patterns, settlement, employment, and connections with their home country (Ryan 2002).

According to the spatial integration theory, immigrants typically begin their employment in a new country by moving to neighborhoods where people of their ethnicity reside. However, as time passes, many relocate to residences and communities that better suit their preferences, resources, and requirements. The theory assumes that the preferences of immigrant minorities for settling in neighborhoods with nearby peers depend on their level of social integration into the new society and the degree of discrimination they experience. New immigrants and less-integrated minority groups often require greater support from ethnic networks in their area, which influences their housing choices. Conversely, residents of segregated areas, who establish a stronger foothold in the new country over time, may shift their preferences towards moving away from these areas. The spatial integration theory is based on a series of assumptions. Firstly, it is assumed that new and less-integrated immigrants prefer to settle in neighborhoods where people of the same ethnicities reside. Secondly, as immigrants' financial situations improve over time, they integrate into the host country, leading them to adopt the norms and core values of the native population. Thirdly, changes in integration are believed to influence their preferences for residing in segregated areas. Lastly, these evolving preferences are expected to result in residential mobility away from ethnically diverse communities. Furthermore, their housing preferences may influence the spatial clustering of immigrants. Numerous studies indicate that immigrants prefer renting compared to natives, which limits their housing and neighborhood options (Andersen 2010; Khosravi Kazazi et al. 2022; Rabiei-Dastjerdi 2019).

Spatial segregation can result from various economic, social, cultural, political, and urban management forces. As a result, different theories regarding spatial segregation exist, with each theory and approach focusing on a specific factor. These theories can help explain

the spatial segregation of Afghan immigrants in Iran because each focuses on different factors that may play a role in creating the residential patterns of these immigrants. For example, spatial integration theory suggests that Afghan immigrants may prefer to settle in neighborhoods with a large Afghan presence due to their need for social support from ethnic networks. The Marxist and Neo-Marxist approaches examine the role of economic inequalities and the unfair distribution of urban resources that can create segregated areas for immigrants. Labor market theory also shows that the limited access of Afghan immigrants to suitable job opportunities leads them to live in low-income neighborhoods. Finally, combining these theories can provide a more comprehensive understanding of the complex dynamics of the spatial segregation of Afghan immigrants in Iran.

3. Materials and Methods

3.1. Data

This study utilizes data from the 2006 census of Tehran at the census tract level. The census recorded 90,057 Afghan immigrants. The detailed demographic information, including the gender distribution of Afghan immigrants, provides a nuanced understanding of the city's population. According to the 2006 census, Tehran comprises 22 urban districts (Figure 1a) and 4334 census tracts (Figure 1b). The most significant feature of the city is the north–south spatial inequality. The north of Tehran, at the foot of the Alborz Mountain range, enjoys better economic and social conditions, where the wealthy reside. In contrast, the southern part faces challenges, such as high population density, poverty, low access to urban facilities and services, and environmental pollution.

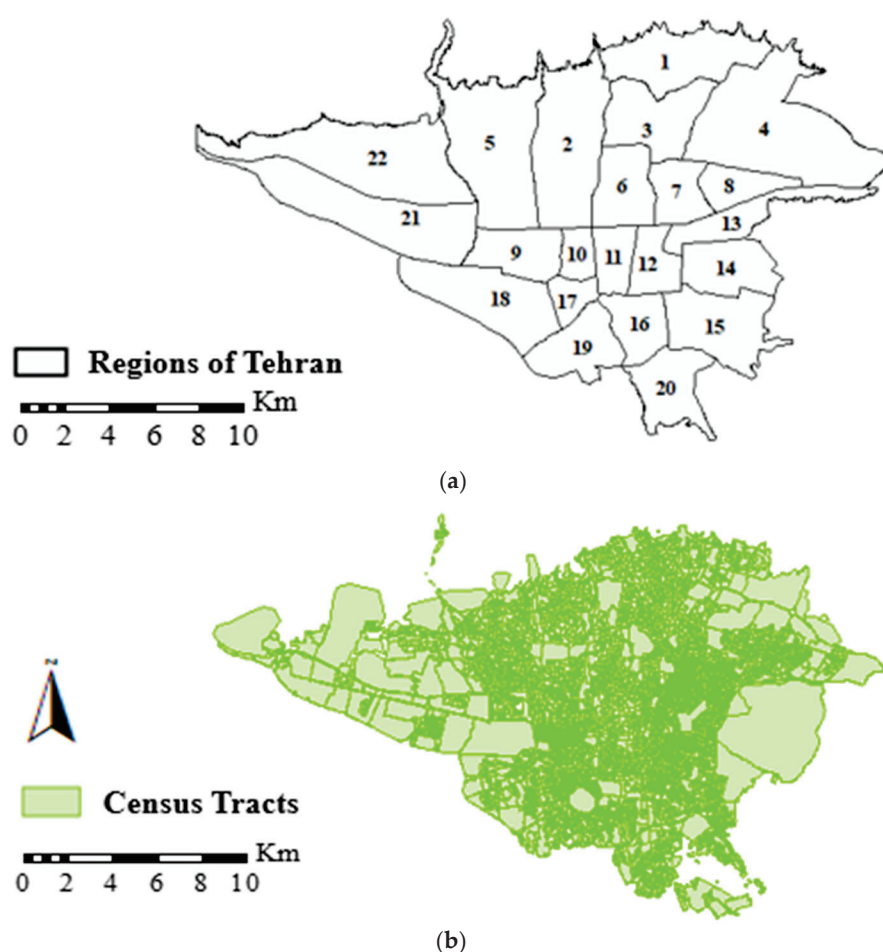


Figure 1. (a) Map of regions of Tehran city, 2006. (b) Map of census tracts in Tehran city, 2006.

3.2. Methodology

The research method of this study is a secondary analysis of census data at the census tract level. It includes four sections:

1. Descriptive section: This section uses a map to illustrate the spatial distribution of Afghan immigrants and reveal their residential distribution patterns.

2. Utilizing the Hot Spot Analysis (Getis–Ord statistics): The Hot Spot Analysis has been used to identify the areas with the highest spatial concentration of various variables. This analysis evaluates each individual within the context of their neighbors (Fischer and Getis 2009). While it may be intriguing and significant if an individual has high values, they alone may not constitute a statistically significant hot spot. For an individual to be categorized as a hot spot and statistically significant, they and their neighboring individuals must display high values. A positive Z-score indicates that the higher the score, the more clustered the high values are, forming a hot spot. Conversely, a negative Z-score suggests that the lower the Z-score, the more clustered the low values are, indicating cold spots (Getis and Ord 1992). Where x_i is the attribute value for feature j , w_{ij} is the spatial weight between feature i and j , and n is equal to the total number of features.

$$G_i^* = \frac{\sum_{j=1}^i w_{ij}x_j - \bar{X}\sum_{j=1}^n w_{ij}}{S\sqrt{\frac{n\sum_{j=1}^n w_{ij}^2 - \left(\sum_{j=1}^i w_{ij}\right)^2}{n-1}}}$$

3. Applying Geographically Weighted Regression (GWR): This statistical method is crucial in the analysis as it considers spatial dependency and spatial heterogeneity in data. The rationale behind using spatial models and the GWR method is rooted in the first law of geography, which states that nearby things are more related than distant things (Brunsdon et al. 1998; Matthews and Yang 2012). The development of Geographical Information Systems (GIS) and the increased availability of georeferencing data have enabled us to explore spatially heterogeneous patterns of social phenomena. GWR allows for different relationships in various spaces based on multiple regression models using spatial weights. It provides location-based information that highlights spatial changes in the relationships between variables. Therefore, the maps generated from these analyses are crucial in describing and interpreting the spatial dynamics between the variables.

The general GWR equation is defined as:

$$y_i = \beta_0(u_i, v_i) + \beta_1(u_i, v_i)x_{1i} + \beta_2(u_i, v_i)x_{2i} + \dots + \beta_k(u_i, v_i)x_{ki} + \epsilon_i$$

where:

y_i : The dependent variable at location i .

$\beta_0(u_i, v_i)$: The intercept for location (u_i, v_i) .

$\beta_k(u_i, v_i)$: The coefficient for the k -th independent variable at location (u_i, v_i) .

x_{ki} : The value of the k -th independent variable for observation i .

ϵ_i : The error term for observation i .

(u_i, v_i) : The geographic coordinates (or other spatial variables) associated with observation i .

GWR constructs a separate equation for every spatial unit (i) of the area that is being studied, incorporating the dependent and explanatory variables. The weights for each observation are usually determined by a kernel function, which is often expressed as:

$$w_{ij} = K\left(\frac{d_{ij}}{h}\right)$$

w_{ij} : The weight of observation j in the estimation for observation i .

d_{ij} : The distance between locations i and j .

h : The bandwidth parameter that controls the size of the neighborhood around observation i .

K : The kernel function.

In this article, the dependent variable (y) is the concentration of Afghan immigrants. The independent variables (x) are sex ratio, age structure (0–14, 15–64, and 65+), literacy rate, different levels of education (primary, lower and upper secondary, and tertiary), economic participation rate, employment rate, and job levels (low, middle, and high).

4. Calculating spatial segregation indices: Two-group segregation indices were used to measure the spatial segregation of immigrants. These metrics comprise indices for two groups within the studied area (Bruch 2014). Numerous indices have been employed in studying residential segregation and its effects. Among these, measures of evenness are the most commonly utilized in research. Evenness refers to how evenly subgroups within a population are spread across a particular geographic area. In contrast, exposure measures the likelihood of individuals from one group interacting with members of either their own group or other groups (Table 1). The “exposure index” is designed “to measure the experience of segregation as felt by the average minority or majority member” (Massey and Denton 1988).

Table 1. The formula of two-group segregation indices.

Indices	Formula
Segregation Index (IS)	$IS = \frac{1}{2} \sum_{i=1}^n \left \frac{x_i}{X} - \frac{t_i - x_i}{T - X} \right $
Isolation Index (xPx)	$xPx = \sum_{i=1}^n \left[\left(\frac{x_i}{X} \right) \left(\frac{x_i}{t_i} \right) \right]$
Absolute Concentration Index (ACO)	$ACO = 1 - \left\{ \frac{\left[\sum_{i=1}^n \left(\frac{x_i A_i}{X} \right) - \sum_{i=1}^{n_1} \left(\frac{t_i A_i}{T_1} \right) \right]}{\left[\sum_{i=n_2}^n \left(\frac{t_i A_i}{T_2} \right) - \sum_{i=1}^{n_1} \left(\frac{t_i A_i}{T_1} \right) \right]} \right\}$
Absolute Clustering Index (ACL)	$ACL = \frac{\left\{ \left[\sum_{i=1}^n \left(\frac{x_i}{X} \right) \sum_{j=1}^n (c_{ij} x_j) \right] - \left[\frac{X}{n^2} \sum_{i=1}^n \sum_{j=1}^n c_{ij} \right] \right\}}{\left\{ \left[\sum_{i=1}^n \left(\frac{x_i}{X} \right) \sum_{j=1}^n (c_{ij} t_j) \right] - \left[\frac{X}{n^2} \sum_{i=1}^n \sum_{j=1}^n c_{ij} \right] \right\}}$
A_i	Area of spatial unit i .
A_j	Area of spatial unit j .
A	Area of metropolitan area.
c_{ij}	Cell value of the binary contiguity matrix: 1 where i and j are contiguous and 0 otherwise.
n	Number of spatial units in the metropolitan area.
n_1	Rank of spatial unit where the sum of all t_i equals X (from 1 to n_1).
n_2	Rank of spatial unit where the sum of all t_i equals X (from n to n_2).
T	Total population in the metropolitan area.
T_1	Sum of all t_i in spatial unit 1 to spatial unit n_1 .
T_2	Sum of all t_i in spatial unit n_2 to spatial unit n .
t_i	Total population in spatial unit i .
t_j	Total population in spatial unit j .
X	Total population of group X in metropolitan area.
x_i	Total population of group X in spatial unit i .
x_j	Total population of group X in spatial unit j .

Table 2 illustrates the dimensions and indices of spatial segregation. The segregation index was used to measure evenness, the isolation index for exposure, the absolute concentration index for concentration, and the absolute clustering index for clustering, all to analyze the spatial segregation of immigrants.

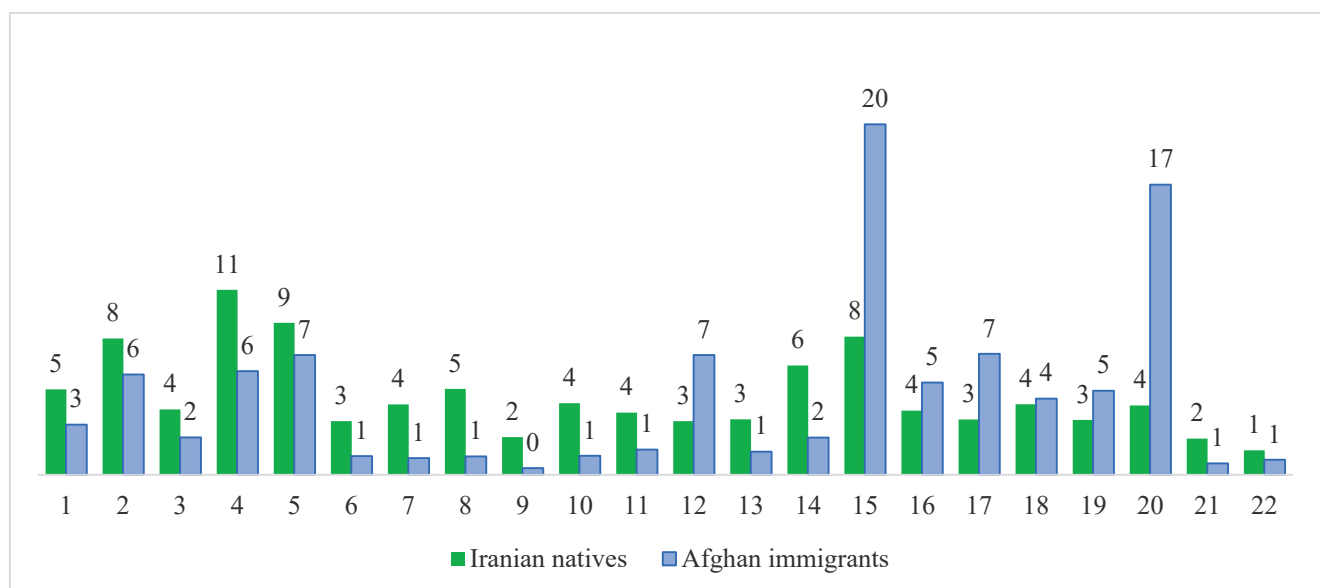
Table 2. Dimensions and indices of spatial segregation used in this study.

Dimensions	Indices	Definition
Evenness	Segregation Index (<i>IS</i>)	Segregation is a widely used index in this field (Duncan and Duncan 1955). Its straightforward calculation and clear interpretation make it popular among sociologists and demographers, and this method has been utilized for many years. The value of this index ranges from 0 to 1, with 0 indicating a fair and unbiased distribution and 1 indicating complete segregation.
Exposition	Isolation Index (<i>xPx</i>)	This index measures the amount of space that minority group members exclusively allocate to their peers. It ranges from 0 to 1, with 0 indicating no exposure and 1 indicating high exposure. A higher value suggests greater segregation within the group based on ethnicity.
Concentration	Absolute Concentration Index (<i>ACO</i>)	This index is calculated by determining the total residential area occupied by a group and comparing it to the minimum and maximum possible areas that the group could occupy within the city. The value of this index ranges from 0 to 1, with 0 indicating the minimum concentration and 1 indicating the maximum concentration.
Clustering	Absolute Clustering Index (<i>ACL</i>)	This index measures the degree of clustering in an urban area. It was initially developed by establishing spherical and central coordinates for spatial units within urban areas and then defining a distance function between these areas. The value of the index ranges from 0 to 1, where 0 signifies no proximity and 1 signifies high proximity.

4. Result

4.1. The Spatial Distribution of Afghan Immigrants

The spatial distribution of Afghan immigrants within the city is heterogeneous. Afghans choose specific areas to reside in, resulting in notable segregation from the native population. Figure 2 shows that around 37% of Afghan immigrants reside in Districts 15 and 20. Following closely behind, Districts 17, 12, and 5 also have significant Afghan populations. In contrast, the majority of Iranians reside in Districts 4, 5, 2, and 15 of the city.

**Figure 2.** Distribution of Afghan immigrants and Iranian natives by 22 districts of Tehran, 2006 (%).

According to the 2006 census data, there were a total of 90,057 Afghan immigrants living in Tehran city. Among them, 62% were male and 38% were female. The average age of Afghan immigrants was 23.2 years, with 30% under the age of 15, 68% in the 15–64 age group, and 2% aged 65 and above. Regarding education, 40% were illiterate, 33% had lower secondary education, 24% had upper secondary education, and 3% had tertiary education. Of those aged ten and above, 55% were employed and 45% were non-employed. Regarding marital status, 52% were married, 44% were never-married, and 4% were divorced or widowed. Additionally, 65% of Afghan immigrants were first-generation immigrants, while 35% were second-generation immigrants (see Table A1 in Appendix A).

Figure 3 illustrates the spatial distribution of Afghan immigrants based on various variables at the census tract level in Tehran. The highest number of Afghan immigrants is located in the southern part of the city. The spatial distribution pattern of first- and second-generation Afghan immigrants in Tehran is clustered. The southern areas of the city have underdeveloped socioeconomic structures and urban infrastructure. Due to the deteriorating fabric of these areas, it is easier for individuals to form kinship networks, live in clusters, and avoid paying upfront housing costs.

The spatial distribution of first- and second-generation immigrants across Tehran indicates notable differences in their residential areas. While first-generation Afghan immigrants are more prevalent in the northern and southern parts of Tehran, they are dispersed across all geographical levels of the census tracts. One significant reason for the presence of first-generation Afghans in affluent areas in the north of Tehran (Districts 1, 2, 3, and 5) is employment opportunities as custodians and guards in exchange for housing. In contrast, most second-generation Afghan immigrants reside in the central and western parts of Tehran, where social and economic conditions are more favorable. (See Figure 3a,b).

Afghan immigrants in Tehran have an unusual gender composition, with a sex ratio above 110. It seems that job opportunities for Afghan immigrants in Iran are gender-based, as most positions are more easily accessible to men. Additionally, the spatial distribution map indicates that the majority of Afghan immigrants aged 0–14 are concentrated in the southern districts of Tehran, particularly in Districts 15, 16, 17, 18, 19, and 20. However, the age group 0–14 makes up less than 15% of the Afghan immigrant population in the central areas (Figure 3c). More than 70 percent of the Afghan immigrant population in Tehran are between the ages of 15 and 64. The northern areas of Tehran, particularly Districts 1, 2, 3, 5, and 22, have a higher concentration of this age group compared to the southern areas. In most census tracts, Afghan immigrants aged 65 and above make up less than 4% of the population. However, the central parts of Tehran have the highest number of Afghan immigrants in this age group (Figure 3d,e).

Literacy and educational levels play a significant role in immigrant integration. Individuals with higher education are better equipped to adapt to diverse environments because they have more opportunities to secure jobs, internalize social values and norms during their education, and are more adept at problem-solving (Renee Reichl 2010; Shaykh-Baygloo and Soltani 2021). Among Afghan immigrants, the spatial distribution of literacy rates is less than 70% in most census tracts. Additionally, more than 20% of Afghan immigrants have only primary education in nearly all areas where they reside. Notably, Afghan immigrants with primary education are more prevalent in the northern part of Tehran compared to the southern part (Figure 3g).

According to Figure 3, in most areas where Afghan immigrants reside, less than 20% possess an upper secondary education. However, in some northern parts of Tehran, approximately 20–25% of immigrants have completed upper secondary education. Regarding spatial distribution, most immigrants with tertiary education are concentrated in the northern regions of Tehran. Those with tertiary education exhibit a clustered spatial pattern. As a result, immigrants tend to relocate as their educational level increases. For example, most Afghan immigrants with tertiary education reside in Districts 2, 3, and 6, which are considered developed and privileged (Figure 3j).

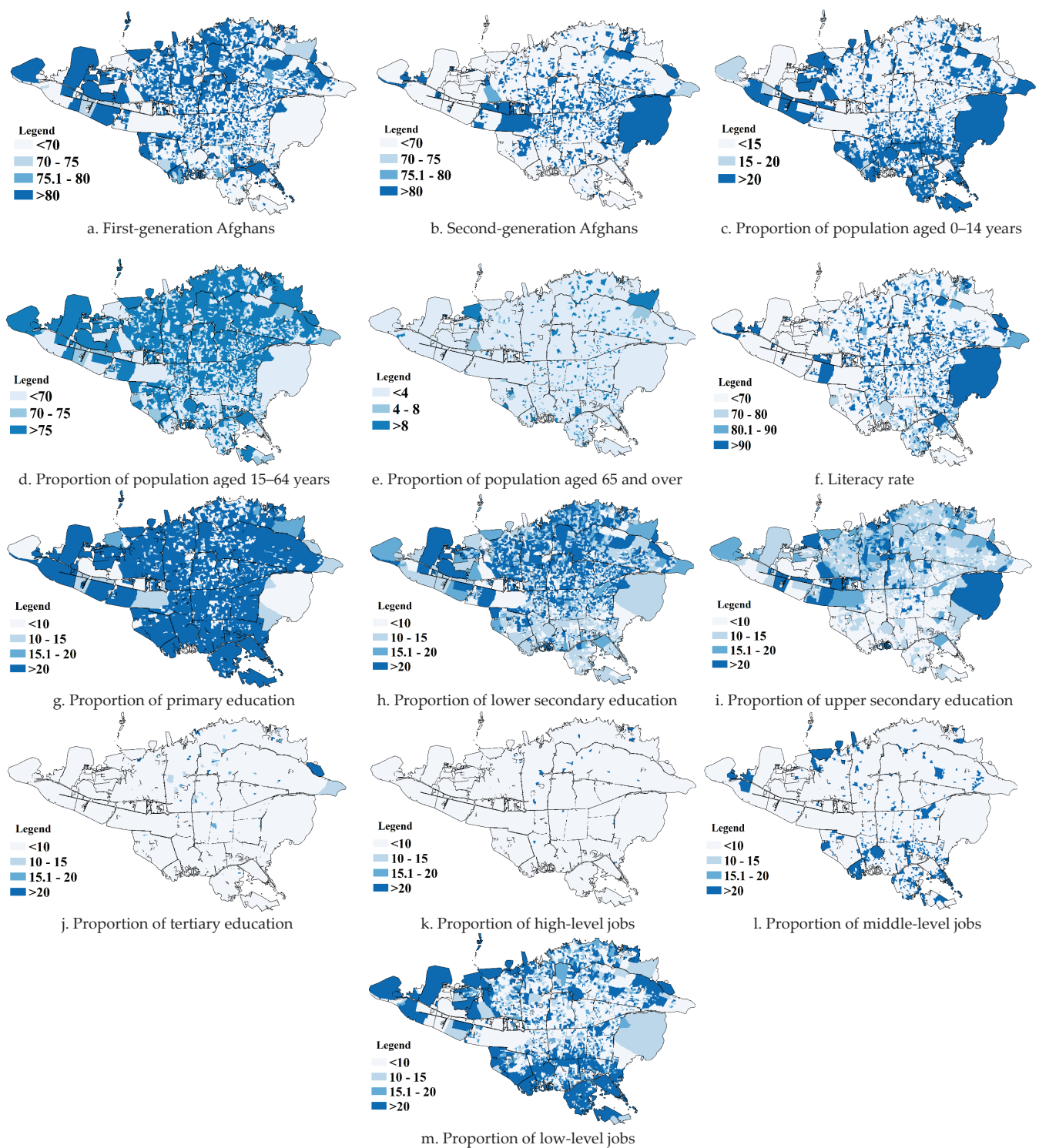


Figure 3. Spatial distribution of Afghan immigrants by selected variables in census tracts of Tehran, 2006.

There is a significant difference between Afghan immigrants and Iranians regarding the spatial distribution of high-status jobs, such as lawmakers, managers, and specialists. In most census tracts, less than 10% of Afghan immigrants hold high- or middle-status jobs, which include technicians, technical personnel, administrative workers, service workers, industrial employees, and military personnel. However, Afghan immigrants with middle-status jobs are more prevalent in the south of Tehran compared to those in other areas. The

distribution of individuals employed in low-status jobs, such as farmers and unskilled workers across Tehran, shows that more Afghan immigrants in the south and north of Tehran hold low-status jobs than in other areas. The spatial distribution pattern of Afghan immigrants working low-status occupations is also clustered (see Figure 3m). Afghan immigrants in northern Tehran are mainly employed as guards or custodians, while those in the northwest of Tehran work as construction workers due to ongoing construction projects in District 22. Additionally, many of them live in groups in unfinished buildings.

Higher economic participation rates, lower unemployment rates, and higher employment rates among Afghan immigrants in low-status jobs highlight the importance of livelihood strategies within this population. Afghan immigrants tend to hold low-status, unskilled jobs, with most working as laborers in occupations that do not require specialized skills. Furthermore, due to deteriorating infrastructure, weak social and economic foundations, declining environmental quality, low housing rents, wholesale markets, warehouses, some manufacturing facilities, and the preference of locals to live in more upscale areas, the southern part of Tehran has presented a unique opportunity for skilled and semi-skilled Afghan immigrants to settle.

4.2. The Hot Spot Analysis (Getis–Ord Statistics)

The Getis–Ord index reveals that the spatial distribution of Afghan immigrants across different areas of Tehran varies according to factors such as migration generation, age group, literacy level, and employment status.

Geographical hot and cold spots based on migration generation: In the southern parts of Tehran, first-generation Afghan immigrants are concentrated in hot spots, meaning there is a higher-than-average concentration of first-generation immigrants in these areas. In contrast, in the northern parts of the city, cold spots (lower-than-average values) have formed, indicating a negative spatial autocorrelation and fewer first-generation Afghan immigrants. Second-generation Afghan immigrants form hot spots in the central areas of Tehran, indicating a higher concentration of second-generation immigrants in these regions.

Age analysis and hot spots: In the southern areas of Tehran, Afghan immigrants aged 0–14 form hot spot clusters, showing a high number of Afghan children residing in these areas. Afghan immigrants aged 15–64, considered the active workforce, are concentrated in hot spots in the northern parts of the city. Older individuals (65 years and above) form hot spots in the central areas of Tehran.

Literacy analysis: Hot spots in terms of literacy are observed in the southern and certain northern parts of Tehran, indicating a higher-than-average literacy rate among Afghan immigrants in these regions. Conversely, central and southern areas of Tehran display cold spots, indicating lower literacy levels among Afghan immigrants in these areas.

Employment status analysis: Regarding high-status jobs, a small area in northern Tehran shows a hot spot, indicating relatively fewer Afghan immigrants in these jobs. For middle-status jobs, the southern parts of Tehran display hot spots, while the central and northern areas show cold spots, reflecting the concentration of middle-status jobs in the south and their scarcity in the center and north. For low-status jobs, hot spots are observed in both the northern and some southern parts of Tehran.

Hot spots in the southern areas suggest a high concentration of characteristics such as children, active workforce, and literate individuals. In contrast, cold spots in the northern and central areas indicate lower levels of these characteristics. Additionally, spatial disparities across Tehran regarding job opportunities for Afghan immigrants are evident, which could result from socio-economic factors and housing and employment policies in these regions (Figure 4).

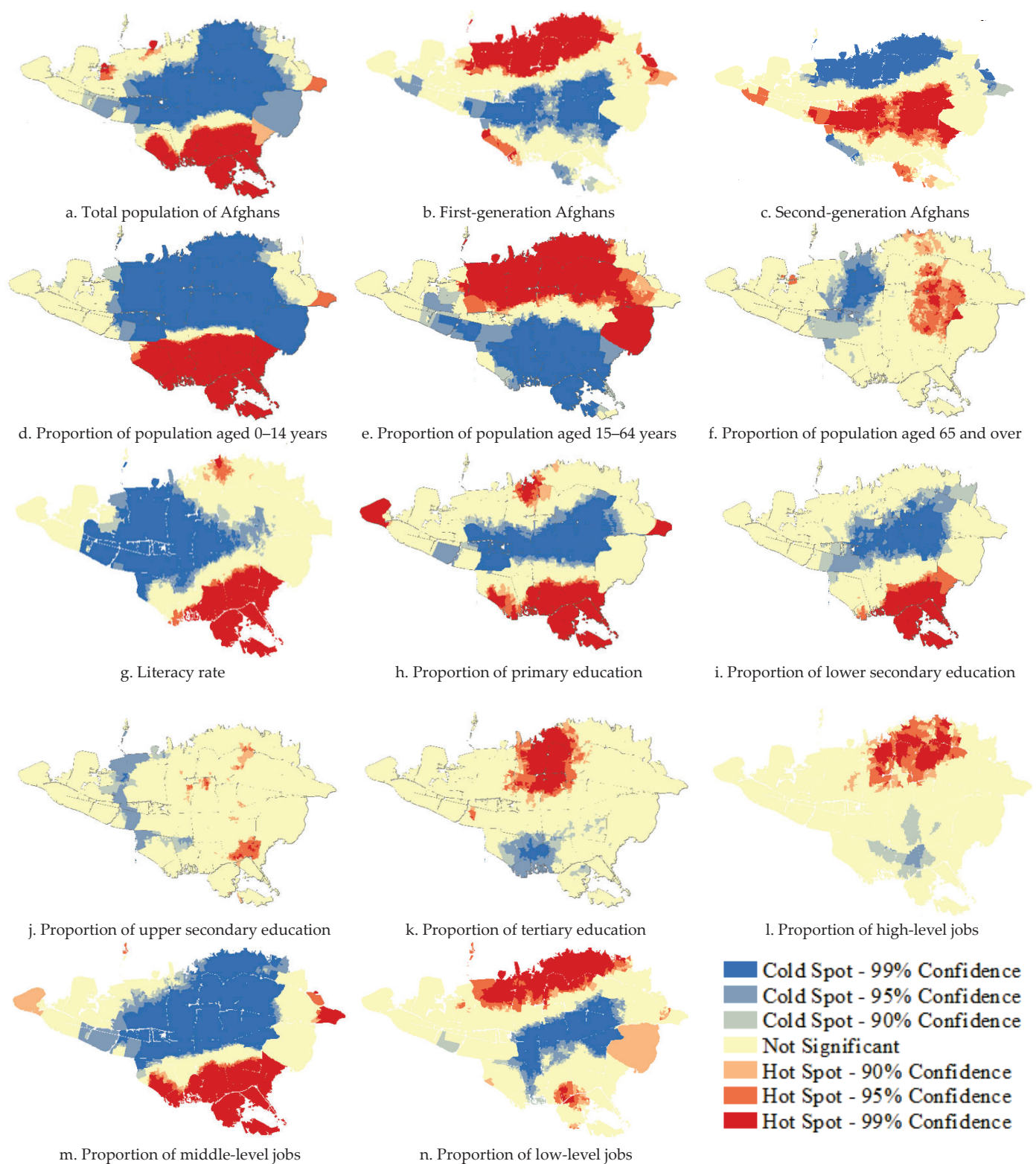


Figure 4. Getis–Ord statistics for Afghan immigrants by selected variables in census tracts of Tehran, 2006.

4.3. Geographically Weighted Regression Results

The Geographically Weighted Regression (GWR) method was used to analyze the impact of socio-demographic and economic variables on the concentration of Afghan immigrants. Initially, an Ordinary Least Squares (OLS) regression was performed. The

results of both regressions were compared to determine the most appropriate model. Table 3 illustrates that variables such as age structure (age groups 0–14, 15–64, and 65 and above), primary education, and lower secondary education have positive impacts. Conversely, the level of literacy, upper secondary and tertiary education, employment rates, and high-value jobs have negative and significant effects on the concentration of Afghan immigrants in Tehran. On the other hand, variables such as gender ratios, economic participation, and low- and middle-status jobs do not significantly influence the concentration of Afghan immigrants in Tehran. Based on the OLS regression, these variables account for 25% of the variance in the dependent variable. We excluded variables with a Variance Inflation Factor (VIF) exceeding 7.5 in the OLS regression for the GWR analysis. Specifically, sex ratio, economic participation, and low- and middle-status jobs were removed. Eliminating these variables led to a decrease in the GWR's Akaike Information Criterion (AIC), indicating improved efficiency and model implementation, making it suitable for use. According to the GWR findings, the independent variables explain 38% of the variance in the distribution of Afghan immigrants, which is higher than the OLS regression.

Table 3. GWR regression model of the effects of independent variables on the distribution of Afghan immigrants in Tehran.

Independent Variables		Coefficient	STD	t	p	VIF
Intercept		0.03	1.34	4.01	0.001	—
Sex ratio		0.10	0.07	1.33	0.175	10.7
Age structure	0–14	0.17	0.05	18.4	0.001	1.2
	15–64	0.23	0.04	10.9	0.001	4
	65+	0.32	0.09	3.24	0.001	1.1
Literacy rate		−0.35	0.03	−12.09	0.001	1.1
Education	Primary	0.68	0.06	24.5	0.001	1.3
	Lower secondary	0.19	0.09	12.7	0.001	2.1
	Upper secondary	−0.18	0.10	−7.41	0.001	1.1
	Tertiary	−0.25	0.11	−2.14	0.001	3.2
Economic participation rate		−0.12	0.13	−2.88	0.166	32.9
Employment rate		−0.21	0.12	−2.69	0.008	5
Job levels	Low	0.02	0.15	1.24	0.101	9.1
	Middle	0.16	0.08	1.54	0.071	12.1
	High	−0.19	0.12	−2.07	0.029	4.1
F				147.3		
Sig.				0.001		
R^2 (%)				25.4%		
Adjusted R^2 (%)				25.1%		
AIC				462.5		
After removing variables with high VIF (7.5+)				$R^2 = 39\%$ adj $R^2 = 38\%$ AICc = 438.9		

According to Figure 5, age groups, literacy rate, educational level, employment rate, and high-status jobs are more effective in explaining the variance of the spatial distribution of Afghans in Tehran city (39%). These independent variables explain the highest variance rate in the concentration of Afghan immigrants in the eastern areas (Districts 1, 4, 8, 13, 14, 15, and 20), central areas (District 9 and around Azadi Square), and a small part of the western region of Tehran (Chitgar). However, they exhibit the lowest variance rate in the northwestern areas (e.g., Districts 2, 5, 21, and 22). Such that the independent variables explain less than 38% of the spatial concentration of Afghan immigrants (dependent variable) in these areas.

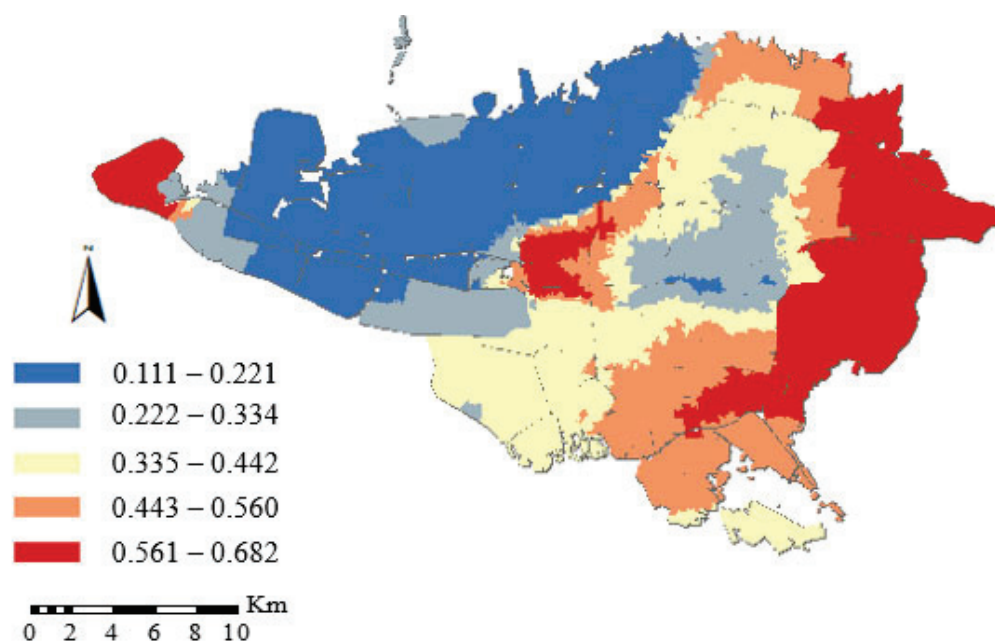


Figure 5. Local R-squared coefficient based on GWR for Afghan immigrants.

According to the results shown in Figure 6, when holding other variables constant, the concentration of Afghan immigrants in the south and northwest of Tehran increases by 0.39–0.45 with a 1-unit increase in the population share of the 0–14 age group. In contrast, in the central and northern areas of Tehran, the concentration of Afghan immigrants rises by 0.15–0.21 with the same increase in the population share of the 0–14 age group. The 15–64 age group also positively influences the concentration of Afghan immigrants in Tehran, with the strongest impact observed in the south and a lesser effect in other parts of the city. A 1-unit increase in the population share of the 65 and above age group results in a concentration increase of 0.65–0.83 in the south and northwest of the city, indicating the highest impact of this age group on Afghan immigrant concentration in those areas. Conversely, it has the least effect on the concentration of Afghan immigrants in Tehran's central and western parts.

If we include the variable of literacy rate in the model and keep the other variables constant, a 1-unit increase in literacy rate decreases the concentration of Afghan immigrants by 0.57–0.46 in the south of Tehran, which is the most significant reverse effect of literacy rate on the concentration of Afghan immigrants in Tehran. This variable has the least impact in the central, northern, eastern, and western areas of Tehran. A 1-unit increase in the literacy rate decreases the concentration of Afghan immigrants by a range of 0.16–0.07. However, primary and lower secondary education levels have a positive effect on the concentration of Afghan immigrants. These two variables have the highest and lowest impacts in the south and north of Tehran, respectively. Conversely, upper secondary and tertiary education negatively impacts the concentration of Afghan immigrants. In other words, a 1-unit increase in upper secondary education decreases the concentration of Afghan immigrants in the western half of Tehran by 0.21–0.18, the greatest reverse impact of upper secondary education on the concentration of Afghan immigrants in Tehran. Regarding tertiary education, this variable decreases the concentration of Afghan immigrants by 0.29–0.24 in almost all areas of the city.

Furthermore, employment rates negatively impact the concentration of Afghan immigrants in almost all areas. Moreover, when we include the variable of high-status jobs in the model while holding other variables constant, a 1-unit increase in the rate of high-status jobs decreases the concentration of Afghan immigrants by 0.41–0.34 in the central and northern areas of Tehran. This signifies the most significant reverse impact that high-status

jobs have on the concentration of Afghan immigrants in Tehran, with the smallest impact observed in the southern part of the city.

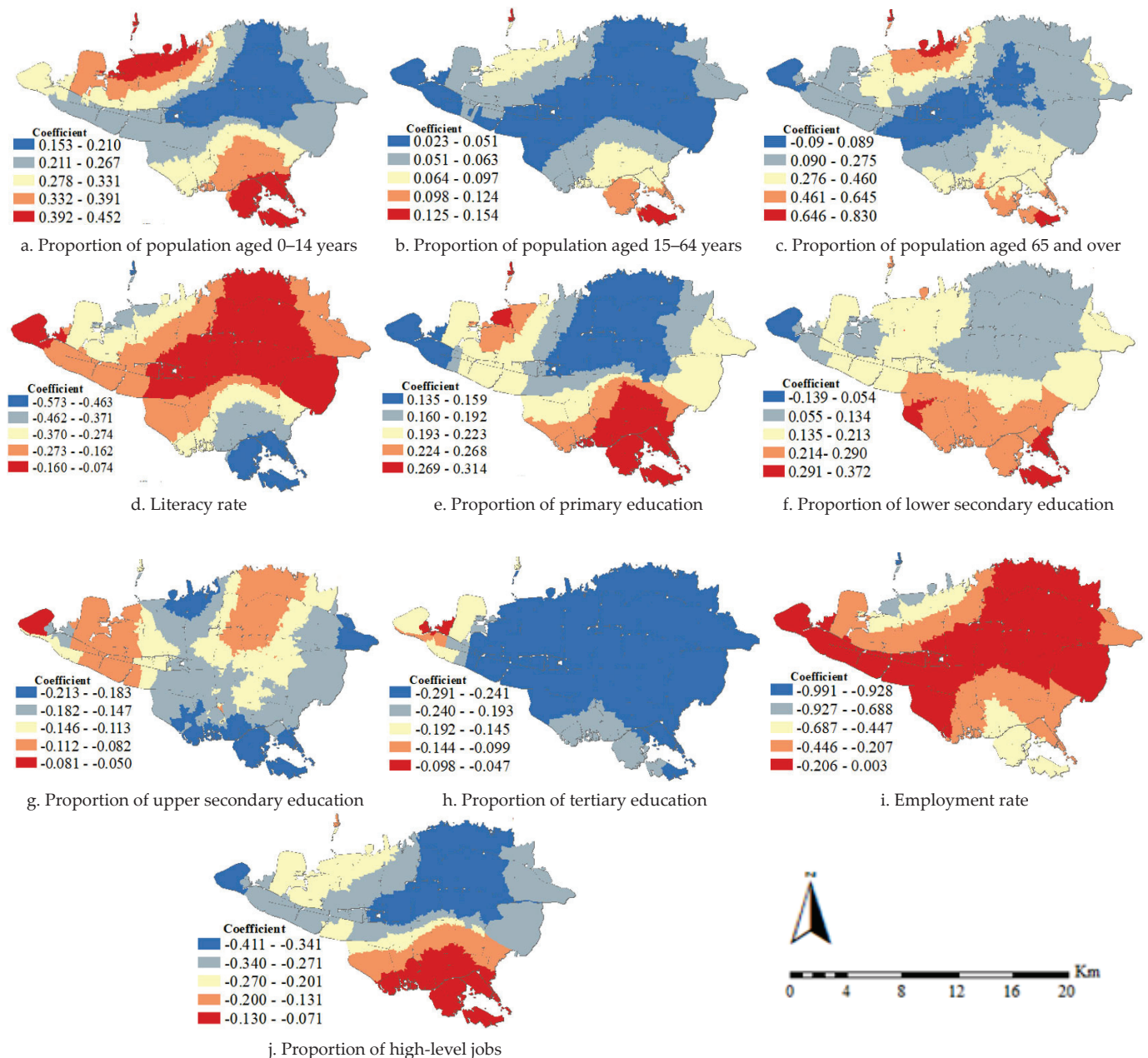


Figure 6. The net effects coefficient of selected variables on the distribution of Afghan immigrants from GWR.

4.4. Two-Group Segregation Indices

Table 4 displays the values of two-group segregation indices for Afghan immigrants compared to the Iranian natives across various economic and demographic variables. The Evenness Dimension index reveals that the distribution of Afghan immigrants across various ages, genders, generations, education levels, and occupational groups is less equitable than that of Iranians. Instead, they experience a high level of segregation. This is particularly pronounced among women, the 0–14 age group, first-generation immigrants, the illiterate, and those with primary education and low-status jobs. While segregation persists, enhancing education and occupational status can help decrease segregation among Afghan immigrants.

Table 4. Two-group segregation indices for Afghan immigrants at the census tract level by selected variables, 2006.

Variables	Segregation Index (IS)	Isolation Index (xPx)	Absolute Concentration Index (ACO)	Absolute Clustering Index (ACL)
Afghan immigrants (Total)	0.77	0.78	0.79	0.50
Afghan males	0.59	0.64	0.85	0.69
Afghan females	0.76	0.75	0.72	0.81
Aged 0–14	0.48	0.66	0.34	0.67
Aged 15–64	0.47	0.67	0.56	0.51
Aged 65+	0.37	0.49	0.26	0.47
Afghan first-generation	0.94	0.86	0.89	0.59
Afghan second-generation	0.79	0.75	0.41	0.23
Illiterate population	0.74	0.82	0.81	0.70
Literate population	0.31	0.67	0.71	0.50
People with a primary education	0.57	0.78	0.56	0.74
People with a lower secondary education	0.41	0.37	0.32	0.37
People with an upper secondary education	0.39	0.31	0.28	0.41
People with a tertiary education	0.20	0.28	0.24	0.25
Economic active population	0.32	0.73	0.30	0.58
Employed population	0.37	0.62	0.37	0.47
People with a low-level job	0.49	0.58	0.66	0.41
People with a middle-level job	0.27	0.33	0.33	0.20
People with a high-level job	0.10	0.13	0.20	0.10

Regarding the Isolation Index, Afghan immigrants experience significant segregation based on various variables. Members of this group primarily live in areas where their peers reside. Table 4 depicts that the first-generation, the illiterate, and those with primary education experience the most isolation, while individuals with upper secondary and tertiary education, as well as those with high-status jobs, experience the least segregation. Another segregation index studied is the Absolute Concentration Index, which is obtained by calculating the total residential area occupied by a group and comparing it to the minimum and maximum possible areas that the group could occupy within the city. The results show that the first generation of immigrants, Afghan men and women, and individuals with low-status jobs are more segregated than other groups in Tehran. Lastly, according to the Absolute Clustering Index, Afghan immigrants are more segregated and tend to settle in the proximity of similar groups.

Therefore, the results suggest that there are high levels of segregation among Afghan immigrants in Tehran. However, there is a noticeable decrease in segregation as the first-generation transitions to the second-generation and as educational and occupational statuses improve. This reduction in segregation levels can be attributed to the generational shift and increased access to human capital among Afghan immigrants in Tehran.

5. Discussion

As previously mentioned, this paper explores the spatial segregation of Afghan immigrants through a secondary analysis of the 2006 census data, utilizing spatial models, statistics, and segregation indices. The results indicate that the spatial distribution of Afghan immigrants is influenced by the socio-economic situations of Tehran's districts, with a tendency for them to settle in less developed areas in the south or southeast of the city. However, there is a gradual shift in the distribution of immigrants in Tehran, a trend expected to continue with the new generation. The first-generation Afghan immigrants primarily reside in the southern regions, whereas the second-generation are more concentrated in the central and western parts of the city.

Based on the results of the Getis–Ord statistics, it is evident that Afghan immigrants are clustered in specific hot spots in southern Tehran. The age group of Afghan immigrants

in the southern areas skews towards a younger population, whereas those in the north and center are predominantly of working age. Regarding education, Afghan immigrants with lower educational levels tend to reside in the south or a portion of the center, while those with upper secondary and tertiary education primarily live in the north and a section of the west. Afghan immigrants in high-status jobs are mainly located in the north of Tehran, while those with low-status occupations are more commonly found in the south. Thus, Afghan immigrants experience varying spatial distribution patterns in the census tracts of Tehran. Social, economic, and cultural factors highly influence these patterns.

Furthermore, the results showed that Geographically Weighted Regression (GWR) was more efficient in explaining the correlation between research variables and the spatial concentration of Afghan immigrants. They also revealed that the adjusted R-squared values varied in different areas of Tehran. Several variables, such as the younger and older age groups, positively impacted the concentration of Afghan immigrants. Additionally, literacy rates, upper secondary and university education, and high-status occupations had a negative effect on immigrant concentration, while low-status jobs had a positive impact. These results are consistent with previous studies (Sadeghi and Abbasi-Shavazi 2016; Murayama and Nagayasu 2021; Maré et al. 2016; Iceland and Scopilliti 2008; Wessel et al. 2017; Čermáková and Leontiyeva 2017; Hao 2015; Andersen 2010; Namvari et al. 2023). As Massey (1981) stated, the spatial segregation of immigrants in Tehran is significantly influenced by social status, opportunities, and unequal benefits.

Therefore, the spatial distribution of Afghan immigrants in most studied variables is clustered. This means that immigrants accumulate in urban areas regardless of their characteristics. This phenomenon demonstrates that factors such as social networks, mass migration, housing conditions, and the labor market influence people's decisions regarding their residence in a census tract or neighborhood. These results align with the findings of previous studies (Rabiei-Dastjerdi 2023; Ghalehnoee and Sabet 2020; Rafieian et al. 2018; Pourahmad and Biranvand 2019; Zaki et al. 2020; Galeano and Carrasco 2018; Andersen 2016; Willem et al. 2021; Čermáková and Leontiyeva 2017; Török 2017; Wu et al. 2014; Ellis et al. 2006; Pan Ké Shon 2011; Stachowski 2020; Warfa et al. 2012). Moreover, according to the behavioral approach, immigrants may consider their personal preferences (e.g., language, culture, economics, and amenities in the destination) when choosing where to reside. Labor market conditions also play a significant role in immigrants' decisions on where to settle. People may seek good job opportunities and choose neighborhoods with better labor market conditions and higher-status jobs (Feitosa 2010). On the other hand, housing costs and availability in different areas are crucial factors in immigrants' decision-making processes when selecting their residence. Considerations such as buying and renting prices, public amenities, neighborhood conditions, and proximity to the city center all come into play (Gauvin et al. 2013). Additionally, government policies such as immigration laws, unequal resource distribution, labor market support for immigrants, and public housing initiatives influence immigrants' decision-making processes.

Previous studies have indicated that Afghan immigrants in Iran have achieved significant educational success but face challenges in the job market due to lower human capital and legal restrictions (Hugo et al. 2012). At the micro level, Afghans exhibit various adaptation strategies, with integration being the most prevalent, followed by separation, assimilation, and marginalization (Abbasi Shavazi and Sadeghi 2015). Emotional experiences of Afghan immigrants in Iran are generally negative (Zandi-Navgran et al. 2023). Afghanophobia, a core social process, hinders positive changes despite efforts to promote intergroup interactions (Ruhani et al. 2023). Furthermore, Iran's immigration policies have shifted from open-door to restrictive (Siavoshi 2022), resulting in economic disparities, educational limitations, and identity uncertainty among Afghan immigrants (Zandi-Navgran et al. 2024). Consequently, the interplay of immigration regulations, policies, societal attitudes, and individual situations has led to a partial and uneven integration of Afghan immigrants in Iran.

The urban space of Tehran is plagued by social, economic, and service imbalances, as reflected in spatial segregation (Ghaderi et al. 2024; Farash et al. 2021; Sadeghi and Zanjari 2017; Rabiei-Dastjerdi et al. 2018; Rabiei-Dastjerdi et al. 2024). According to segregation indices, Afghan immigrants experience high levels of segregation. They often reside in close proximity to one another, particularly in areas with a high Afghan population. While improvements in education and employment can help reduce segregation, it persists. However, the transition from the first- to the second-generation and increased educational attainment and job status have significantly decreased segregation levels. It can be concluded that generational transition and access to human capital lead to decreased segregation indices among Afghan immigrants in Tehran.

6. Conclusions

Overall, it can be concluded that most Afghans still need to successfully integrate into the urban community of Tehran despite their long-standing presence and efforts to improve their conditions. Due to differences in backgrounds, such as educational levels, employment, history of residence, first- or second-generation status, and legal status, Afghan immigrants experience various paths to spatial integration or segregation. Those with higher education or better job opportunities have a greater chance of integration. However, over time, the segregation indices of Afghan immigrants, especially for the second generation, have decreased due to improved education, employment, social situations, and living conditions. Changes in the social and economic circumstances of immigrants can influence their preferences for residence and lead them to choose areas with better amenities for further integration.

This study relied solely on official data, primarily concerning legal immigrants. However, there may be discrepancies between the data and actual social conditions. With the rise of the Taliban in 2021, there has been an influx of Afghan immigrants, many of whom have entered Iran illegally. Data on this particular group of immigrants are not readily available, and analyzing new data may uncover changes in their situations. The lack of access to updated data on Afghan immigrants was another limitation of this research. Ultimately, qualitative and field data are needed to fully understand the dynamics of spatial segregation among Afghan immigrants.

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Appendix A

Table A1. Description of Afghan immigrants in Tehran based on the composition of age, sex, generational status, and education by urban areas.

Zone	Age Structure (%)			Sex (%)		Generational Status (%)			Education (%)			
	0–14	15–64	65+	Male	Female	First	Second	Illiterate	Primary	Lower Secondary	Upper Secondary	Tertiary
1	1.6	3.4	3.9	3.5	1.9	3	2.7	3	1.3	2.6	3.9	10.7
2	4.9	6.3	3.7	6.7	4.5	5.9	5.6	6.2	4.8	5.8	6.5	10.5

Table A1. Cont.

Zone	Age Structure (%)			Sex (%)		Generational Status (%)			Education (%)			
	0–14	15–64	65+	Male	Female	First	Second	Illiterate	Primary	Lower Secondary	Upper Secondary	Tertiary
3	0.8	2.7	3.7	2.7	1.3	2.3	1.9	2.4	0.6	1.7	4.5	17.7
4	4.7	6.6	5	6.3	5.5	6.4	5.1	7.4	4	5.1	6.6	4.2
5	6.5	7.2	4.1	7.7	5.7	7.7	5.4	8.7	4.4	4.9	6	9.4
6	0.6	1.4	1.1	1.6	0.5	1.2	0.9	1.3	1	0.7	1.6	6.1
7	0.5	1.1	2.7	1.1	0.7	0.8	1.2	0.9	0.4	0.6	2.3	3.3
8	0.8	1.1	1.7	1.3	0.7	1.1	1	1.3	0.6	0.9	0.9	3.1
9	0.3	0.4	0.2	0.5	0.3	0.4	4.3	0.4	0.4	0.1	3	1
10	0.8	1.2	1.2	1.1	1.1	1.1	5.2	1.1	1.2	1.2	2.2	2
11	1.5	1.4	2.6	1.5	1.4	1.4	6.5	1.6	1.4	1.5	1.8	3
12	7.4	6.8	3.6	7	6.8	7.9	9	8	4.2	6.1	4.9	5
13	0.6	1.7	0.5	1.7	0.8	1.3	5.4	1.8	1.2	0.6	2.1	1.9
14	1.3	2.4	4.1	2.5	1.5	2.2	6.1	2.7	1	1.3	4.4	3.2
15	24.5	18.3	16.8	17.6	24	19.9	8.2	16.8	27.7	21.5	15.3	5.9
16	5.9	5	6.6	4.8	6.1	5.4	5.1	5.2	5	6.4	5.1	1.1
17	7.9	6.5	7.2	6.1	8.2	6.7	10.6	6	8.3	7.5	9.3	0.9
18	4.5	4.3	3.7	4.8	3.8	4.8	3.6	5.6	3.1	4.6	1.6	2.1
19	4.8	4.8	7	4.7	5.1	5.2	4.1	5.3	4.5	4.7	2.9	1.1
20	19.3	15.5	18.8	15	19.4	13.7	7.5	12.2	24.2	20.8	14.4	4.5
21	0.4	0.8	0.8	0.7	0.5	0.6	0.8	0.8	0.4	0.4	0.6	3.3
22	0.5	1	1.3	1.2	0.4	1	0.6	1.3	0.2	0.9	0	0
total	100	100	100	100	100	100	100	100	100	100	100	100

Table A2. OLS results after excluding variables with a VIF 7.5 or more (output from ArcMap).

Independent Variables	Coefficient	STD	t	p	VIF
Intercept	0.04	1.1	3.2	0.001	-
Age structure	0–14	0.18	0.02	3.6	0.001
	15–64	0.22	0.02	20.5	0.001
	65+	0.24	0.05	31.4	0.001
Literacy rate	−0.31	0.01	−23.6	0.001	1.1
Education	Primary	0.08	0.03	7.5	0.001
	Lower secondary	0.02	0.04	1.8	0.034
	Upper secondary	0.07	0.04	−6.3	0.001
	Tertiary	−0.18	0.06	−7.1	0.001
Employment rate	0.26	0.02	14.9	0.008	5
Job levels (High)	−0.09	0.08	−3.8	0.029	4.5
F			528.4		
Sig.			0.001		
R ² (%)			36.8%		
Adjusted R ² (%)			36.7%		
AIC			402.45		

Table A3. OLS results after excluding variables with a VIF 7.5 or more (output from SPSS).

Independent Variables		Model1		Model2		Model3	
		Beta	p-Value	Beta	p-Value	Beta	p-Value
Age structure	0–14	0.130	0.001	0.198	0.001	0.166	0.001
	15–64	0.312	0.001	0.254	0.001	0.224	0.001
	65+	0.342	0.001	0.273	0.001	0.239	0.001
Literacy rate				−0.370	0.001	−0.312	0.001
Education	Primary			0.079	0.011	0.079	0.001
	Lower secondary			0.013	0.042	0.019	0.071
	Upper secondary			−0.083	0.001	0.075	0.001
	Tertiary			−0.097	0.001	−0.176	0.001
Employment rate						0.256	0.001
Job levels (High)						−0.088	0.001

Table A3. Cont.

Independent Variables	Model1		Model2		Model3	
	Beta	p-Value	Beta	p-Value	Beta	p-Value
r		0.52		0.57		0.60
R ² (%)		0.27		0.33		0.36
Adjusted R ² (%)		0.27		0.33		0.36
F		66.1		60.7		52.4
Sig.		0.001		0.001		0.001

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Article

Exploring Urban Socio-Spatial Disparities in Liverpool, Manchester, and Newcastle upon Tyne Metropolitan Areas

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Abstract: In recent decades, rising social disparities in European cities have structured new forms of urban inequalities. Employing an innovative analysis approach based on statistical, geographical, and spatial methods, this paper aims to explore the social geography of population groups in Liverpool, Manchester, and Newcastle upon Tyne by examining how the spatial distribution of socio-economic groups intersects with urban settlements of the resident foreign population. The study addresses methodological challenges in segregation measurement while shedding light on existing spatial patterns of vulnerable groups and emerging trajectories of residential segregation at the metropolitan scale, utilising the most recent UK Census data.

Keywords: residential segregation; England's cities; spatial analysis; urban inequalities

1. Introduction

In recent decades, European cities have witnessed a marked rise in social and spatial inequalities, reflecting global trends of widening income polarisation and economic restructuring (Musterd et al. 2017; Van Ham et al. 2021). These changes have significantly altered the social composition of many neighborhoods in Western cities, contributing to growing socio-spatial divisions and reshaping the distribution of social groups across urban spaces (Benassi and Alberio 2013; Hamnett 2001; Moulaert et al. 2003). As a result, new patterns of urban inequity have emerged, where vulnerable socio-economic groups and migrant communities are increasingly confined to marginalized and economically deprived areas, increasing their risk of poverty and social isolation (Musterd 2005).

The concentration of social groups in specific urban areas is one of the ways through which urban segregation, understood in more general terms as the physical separation that occurs between two or more groups defined on the basis of social characteristics, manifests itself, leading to an unequal distribution in urban space (Massey and Denton 1988). A long-standing academic tradition posits that the spatial distribution of social groups approximates their position within the social stratification system (Park 1926). This perspective suggests that individuals are sorted within urban spaces according to their socio-economic status, ethnicity, and other relevant factors, driven by both macro- and micro-level mechanisms (Maloutas and Fujita 2012).

However, the city is not merely a spatial reflection of social inequalities driven by economic and market forces. Rather, urban spaces actively contribute to the creation of these disparities. Cities contain a variety of resources that are unevenly distributed, and the intersection of urban segregation with these inequalities leads to distinct patterns of social disparities. These dynamics not only deepen segregation but also create additional urban inequalities, forming a mutually reinforcing cycle (Oberti and Préteceille 2017). Numerous studies have shown that segregation negatively impacts vulnerable social groups. The concentration of individuals with similar social characteristics in specific areas limits their opportunities for upward social mobility and reduces interactions between different social groups, raising concerns about social cohesion (Cassiers and Kesteloot 2012). Segregation

also diminishes the diversity and reach of social networks, which are essential for accessing employment and educational opportunities, as well as for social mobilization and political influence. As a result, residential segregation can hinder the inclusion of marginalized groups and exacerbate social inequalities. This occurs because the social composition of neighborhoods, combined with the uneven distribution of services and resources, shapes the constraints and opportunities available to individuals. Such dynamics can perpetuate and even transmit the cycle of inequality across generations (De Falco 2023).

Research on residential segregation in Europe has primarily focused on the socio-professional dimension and the spatial distribution of foreign populations within urban areas (Daconto and Montesano 2024). In particular, the segregation of foreigners in European cities is a complex phenomenon shaped by various factors, including migration patterns, labor market structures, and housing policies (Arbaci 2019; Benassi et al. 2020, 2023; Consolazio et al. 2023). Immigrants often face distinct socio-economic disadvantages, leading to their concentration in lower-income neighborhoods. This pattern is further exacerbated by discriminatory practices in housing markets (OECD 2015) and limited access to employment opportunities (Heath and Cheung 2007).

The process of gentrification adds another layer to these segregation dynamics. Characterized by the arrival of middle- and upper-class groups, gentrification contributes to the displacement of less privileged residents (Lees and Phillips 2018). It fuels the suburbanization process of vulnerable groups by increasing property values and rents, making it difficult for long-term, low-income residents—including many immigrants—to afford their homes. Economic pressures force many to relocate to more affordable areas, often further from the city center or regions with fewer resources and opportunities. As a result, gentrification not only alters the demographic composition of neighborhoods but also disrupts existing social networks and community cohesion, which are crucial for the support and resilience of marginalized groups (Völker et al. 2012). As vulnerable populations are displaced from urban cores, they often move to suburban areas in search of affordable housing. However, this mobility is not simply a redistribution of the population; it reinforces existing patterns of segregation by concentrating low-income groups in deprived suburbs while urban cores become dominated by middle- and upper-class residents (Hochstenbach and Musterd 2018). This shift creates a new social geography in which city center become increasingly privileged spaces, while suburbs are marked by the accumulation of poverty and social exclusion.

Research shows that foreign populations are often concentrated in urban areas with higher poverty levels and lower socio-economic status than native-born residents (Benassi and Iglesias-Pascual 2022). The degree and nature of this segregation can vary significantly across European contexts. For example, while cities like London and Paris exhibit a strong relationship between socio-economic and ethnic segregation patterns (Van Ham et al. 2021), other cities may present a different picture due to varying economic and social conditions, as well as national immigration and integration policies Benassi et al. (2020).

The relationship between ethnic and socio-economic segregation remains underexplored in empirical research, despite evidence suggesting connections between these phenomena (Petsimeris and Rimoldi 2015). For instance, Costa and de Valk (2018) found that individuals with migrant backgrounds are disproportionately concentrated in socio-economically marginalized neighborhoods. These spatial patterns of disadvantage can be traced back to the transition from an industrial to a service-oriented economy, which has significantly exacerbated social and spatial inequalities in European cities, disproportionately affecting migrants (Kesteloot et al. 2006; Morlicchio 2020). This economic shift has often relegated migrants to lower-skilled, lower-paying jobs, typically located in more affordable but less desirable neighborhoods. Moreover, the continued demand for unskilled labor in Western cities has attracted new migrants, who often settle in these deprived areas (Costa and de Valk 2018).

Supporting this perspective, McAvay and Verdugo (2021) identified a strong correlation between socio-economic vulnerability and the presence of immigrants in neighbor-

hoods. This relation underscores the complex interplay between ethnic and socio-economic segregation, which mutually reinforce one another through a cycle of cumulative neighborhood disadvantage. Various studies (Hedman et al. 2015; Sampson et al. 2002; van Ham and Manley 2010) highlight how the concentration of socio-economic deprivation in neighborhoods can limit residents' life opportunities through negative contextual effects. These effects contribute to the intergenerational transmission of poverty and inequality, further perpetuating and reinforcing spatial segregation.

When socio-economically marginalized neighborhoods are characterized by high concentrations of migrant populations, the intersection of ethnic and socio-economic segregation can create a compounded form of disadvantage. This intensified inequality deepens the spatial separation of social groups within urban environments, exacerbating overall socio-spatial disparities (Costa and de Valk 2018).

Building on these premises, this study sets out to investigate the social geography of population groups within the metropolitan regions of Liverpool, Manchester, and Newcastle upon Tyne. The primary focus is on examining the intricate relationship between the spatial distribution of socio-economic groups and the urban settlements of resident foreign populations. By delving into this connection, the study seeks to understand how socio-economic and migrant groups are spatially organized and how their distribution patterns overlap or diverge across different urban landscapes. A key component of this research involves addressing the methodological challenges inherent in measuring segregation, particularly in complex urban settings where multiple factors interplay. By refining and applying advanced analytical techniques, the study aims to generate new insights into the existing spatial patterns of vulnerable groups within these cities. Furthermore, the research extends its scope to analyze the trajectories of residential segregation at the metropolitan level, contributing to the existing literature on the topic (Harris et al. 2017). This analysis is grounded in the most recent data from the UK Census, providing a robust empirical foundation to explore shifts in residential segregation and their implications for social inequality and urban planning.

2. The Economic and Socio-Demographic Profile of Liverpool, Manchester, and Newcastle upon Tyne

The cities of Liverpool, Manchester, and Newcastle upon Tyne, once at the forefront of industrial production, have undergone significant socio-economic transformations since the mid-20th century. The decline of traditional manufacturing industries from the 1970s prompted a substantial shift towards service-oriented economies. This transition has reshaped the socio-demographic landscapes of these cities, leading to significant changes in the cities' social and economic structure and transformations of entire urban areas.

In Manchester, a concerted effort to revitalize the city's image through strategic public-private partnerships and substantial investments has marked its post-industrial era. Despite these advancements, socio-economic disparities persist, illustrating a complex urban landscape characterized by significant inequalities (Hincks 2015). The concept of "two Manchesters" encapsulates these contrasting realities, reflecting deep-seated socio-economic divides (Kennedy 2009b). Liverpool, similarly impacted by industrial decline and subsequent high unemployment rates, experienced a period of economic downturn that also affected the city's social composition. To reverse this trend, the city implemented projects to mitigate the effects of industrial decline. However, while central areas have witnessed economic growth and redevelopment, peripheral neighborhoods continue to struggle with persistent economic challenges and high levels of deprivation (Belchem 2006). Newcastle upon Tyne has also faced the challenges of post-industrial decline by deploying a strategy based on the growth of the service sector and urban regeneration of some severely declining city areas. The shift to service-based employment and related regeneration initiatives has changed the socio-economic fabric of Newcastle upon Tyne, reducing social diversity, especially in the central areas of the city (Cameron 2003).

In relation to migration flows, all three cities have historically been characterized by international migration, albeit with varying degrees and intensities. After the decline of the industrial sector and the onset of industrial restructuring, Liverpool relied on economic migrants to fill job gaps, both skilled and unskilled (Scullion and Pemberton 2010). Manchester, on the other hand, has emerged as an attractive center for international migrants, especially those with qualifications. This is due to the significant expansion of businesses in advanced service sectors such as IT, finance, insurance, banking, and law. The growth of these sectors has increased the demand for highly skilled professionals, making Manchester a preferred destination for skilled workers (Kennedy 2009a). In general, immigration to the United Kingdom often gravitates toward specific “concentrations”, “gateway cities”, or “ports of entry”, referred to in this context as “immigrant settlement areas”. These areas, characterized by their employment and housing opportunities, both attract and accommodate a significant number of immigrants (Catney and Simpson 2010). Studies have often emphasized the role played by established ethnic neighborhoods in urban centers. Such neighborhoods serve as initial reception areas for newly arrived immigrants, providing a community base for both low-level and qualified immigrants (Peach 1996).

Table 1 provides an analysis of the distribution of the migrant population within the functional urban areas (FUAs) of Liverpool, Manchester, and Newcastle upon Tyne, categorized by country of birth and distinguishing between European and non-European migrants. Manchester stands out as the metropolitan area with the highest number of migrants, both European and non-European, representing 4.7% and 10.1% of the total population, respectively. Notably, it has a high concentration of non-European immigrants, mainly from the Middle East and Asia (6.6%) and Africa (2.7%), making the city a significant hub, especially for migrants from outside Europe. Liverpool has a smaller migrant population, with non-European migrants (4.6%) outnumbering European ones (3.7%). In contrast, Newcastle upon Tyne reports the lowest proportion of European migrants (2.8%) but a higher proportion of non-European migrants (5.1%). In both Liverpool and Newcastle upon Tyne, the predominant nationalities are from the Middle East, Asia, and Africa. However, the overall proportions of European and non-European migrants are relatively similar in these two metropolitan areas.

Table 1. Distribution of European and non-European migrants in the Liverpool, Manchester, and Newcastle upon Tyne FUAs, by country of birth.

	Liverpool	Manchester	Newcastle upon Tyne
European migrants			
United Kingdom	1,408,745	2,907,824	1,077,271
Europe	56,813	162,256	33,212
Non-European migrants			
Africa	17,287	91,257	13,791
Middle East and Asia	40,843	225,333	39,668
The Americas and the Caribbean	10,197	23,843	5065
Antarctica and Oceania (including Australasia) and other	1856	4790	1550
British Overseas	217	1159	139
Total	1,535,958	3,416,462	1,170,696

Source: Authors' own elaboration on 2021 UK Census data.

3. Data and Methods

3.1. Study Areas

This study utilized the OECD's methodology for identifying urban and metropolitan areas (OECD 2012). Traditionally, the definition of metropolitan regions varies across countries, often relying on criteria such as population, density, and administrative borders. These varying definitions can misrepresent the actual economic and functional linkages between cities, complicating comparative studies. To address these discrepancies, the OECD introduced the concept of functional urban areas (FUAs), which are defined based on demographic, functional, and economic criteria. A FUA comprises a densely populated

city and its economically integrated, less dense hinterland. FUAs are categorized by population size into four groups: small urban areas (<200,000 people), medium-size urban areas (200,000–500,000), metropolitan areas (500,000–1.5 million), and large metropolitan areas (>1.5 million). This classification allows for more accurate comparisons across regions by overcoming the limitations of traditional administrative boundaries and core-hinterland distinctions (Benassi et al. 2020).

Regarding the data, the work relied on several sources: the 2021 UK Census data; income estimates for small areas in England for 2020; the 2018 UK Corine Land Cover dataset; the Traveline National Dataset (TNDS); and the OpenStreetMap data.

The UK Census data, produced by the Office for National Statistics (ONS), offer detailed socio-demographic information at high spatial resolution. The smallest data aggregation unit is the output area (OA), specifically designed to ensure consistent population sizes.

The income estimates made available by the Office for National Statistics (ONS) are defined using small area estimation methods at the middle layer super output area (MSOA) level. The data encompass (1) the total annual household income; (2) the net annual household income; (3) the net annual household income (equivalised) before housing costs; and (4) the net annual household income (equivalised) after housing costs.

The Corine Land Cover (CLC) dataset, developed by the European Environment Agency (EEA), supplies detailed and uniform data on land cover and land use across Europe.

The Traveline National Dataset (TNDS) provides timetable and real-time data on various public transportation modes in Great Britain. These data, available upon request, are provided as open data in the TransXChange format.

Lastly, the OpenStreetMap data offer extensive geographic information, including detailed mapping of urban road networks.

3.2. Research Strategy

This study adapted and applied the methodological approach proposed in De Falco and Irpino (2024), which was specifically designed to address challenges associated with residential segregation analysis and more broadly, ecological analysis.

The first step of the analysis strategy involves defining the unit of analysis for the study¹. Research on residential segregation often relies on demographic data collected at the individual level, which national statistical agencies then aggregate and release. However, the design of aggregated units can significantly influence statistical results, a challenge known in the literature as the Modifiable Areal Unit Problem (MAUP) (Openshaw and Taylor 1979). The MAUP is divided into two main components: the scaling problem and the zoning problem.

The scaling problem arises when aggregate units of varying sizes are used. The scale of analysis can greatly affect results, as the intensity of the observed phenomenon may vary with different levels of aggregation. The zoning problem, on the other hand, occurs when the boundaries of spatial units are altered. Even if the scale remains constant, changing boundaries can significantly impact analysis results based on how spatial units are delineated. Thus, data collected at different spatial scales or according to varying zonal systems for the same area may yield inconsistent results, making them arbitrary if the chosen scale and zoning settings are not appropriate for the analysis.

To address the MAUP, researchers have developed several strategies, including multi-scalar analysis approaches (Hennerdal and Nielsen 2017), as well as reconfiguring study areas by aggregating different areal units or using geolocated population data when available (Osth et al. 2014; Pratschke and Benassi 2024). Another approach is to use areal interpolation methods, which transfer data from one set of spatial units to another, often converting them into grids of small, regular cells to approximate a continuous surface (Goodchild and Siu-Ngan Lam 1980). Grid-based methods have gained popularity for analyzing residential segregation due to the uniform shape and size of the cells, which mitigate biases found in traditional areal units and ensure consistency over time. Additionally, the

spatial resolution of grid cells can be adjusted to align with research objectives (Benassi et al. 2023; Catney and Lloyd 2020). Various methods for disaggregating census data into grid cells exist, such as areal-weighted and dasymetric techniques, which use auxiliary data to refine population estimates (Comber and Zeng 2019).

In this study, a dasymetric binary interpolation method was used to redistribute population and income data from various spatial units (OAs and MSOAs) into a uniform hexagonal grid with a cell area of 0.5 square kilometers.

The areal interpolation procedure was applied to each study area for seven selected indicators used to define the ethnic and socio-economic composition of urban areas:

- European_migrants: count data related to the population born in European countries (excluding people born in the UK);
- Non_European_migrants: count data related to the population born outside Europe;
- NS_SEC_1: count data of higher managerial, administrative, and professional occupations;
- NS_SEC_2: count data of routine and manual occupations;
- Qual_lev_1: count data of level 1 qualifications, which represent the lowest level of qualifications according to the classification system adopted by the ONS;
- Qual_lev_4: count data of level 4 qualifications or above, which stands for the highest qualification level according to the classification system adopted by the ONS;
- Tot_income: total annual household income by middle layer super output area (MSOA), financial year ending 2020 (GBP).

The process to define population grid data involved four main steps:

1. Data preparation: collect and organize input data, including spatial census units, population and income data, and CORINE Land Cover (CLC) data.
2. Reclassification: reclassify the CLC data into inhabited and uninhabited areas, keeping residential zones such as urban fabric while excluding non-residential areas.
3. Intersection: perform an intersection between the populated polygons and a grid layer to create a target zone mask, removing cells that do not overlap with inhabited areas.
4. Data redistribution: redistribute the data into a 500-m hexagonal grid using the areal-weighted interpolation method.

Formally, the estimation of population or income data from the source zones (OAs and MSOAs) to the target zones (grid cells) follows a specific equation (Langford 2013):

$$\hat{P}_t = \sum_{s=1}^N \frac{A_{tsp}}{A_{sp}} \cdot P_s \quad (1)$$

where $\hat{P}_t$ is the estimated population or income data value of cell t ; A_{tsp} is the area of intersection between the cell t and source zone s having land cover identified as populated; A_{sp} is the area of source zone s having land cover identified as populated; P_s is the population or income data value of source zone s ; N is the total number of source zones.

After redistributing the selected indicators into hexagonal grid cells, a compositional data analysis (CoDA) strategy, as defined by Aitchison (1986), was employed in the second phase. Compositional data refer to vectors where the components represent proportions or percentages summing to a constant (either 1 or 100). Due to the inherent constraints of compositional data, which are confined within a simplex, standard statistical methods—such as correlation coefficients—can produce biased results. The reliance on categorical population data poses methodological challenges in residential segregation analysis when using measures designed for numerical variables, making traditional statistical methods unsuitable.

To address this issue, a centered log-ratio (clr) transformation was applied to the population data (European_migrants and Non_European_migrants; NS_SEC_1 and NS_SEC_2; Qual_lev_1 and Qual_lev_4). This transformation converts the data into log-ratios relative to their geometric mean and is considered the most appropriate for a multivariate analysis (Greenacre 2021). Regarding the treatment of zero values, a small positive value was used to replace them, following the approach suggested by Greenacre (2018).

This strategy allowed the data to be analyzed in an Euclidean space, where standard statistical techniques can be applied, thus mitigating any distortion caused by the compositional nature of the data.

In the third phase, the strategy for measuring socio-economic and ethnic segregation was implemented. To explore relationships and patterns among the indicators, a Principal Component Analysis (PCA) was employed on the selected variables². PCA is a powerful multivariate statistical technique that reduces dataset dimensionality by identifying principal components (PCs), which are linear combinations of the original variables. These PCs capture the most significant variance in the data, with each variable's contribution and relationship to a PC represented by its loadings.

PCA is particularly effective in simplifying complex datasets and uncovering underlying patterns. To account for the influence of grid cells with smaller population sizes, row weights were applied. These weights were calculated based on the sum of NS-SEC and migrants' data for each grid cell, ensuring that each of them contributed appropriately to the analysis. The total sum of the weights was normalized to equal 1, maintaining consistency in the analysis.

The weighted PCA was conducted separately for the three datasets corresponding to the Liverpool, Manchester, and Newcastle upon Tyne FUAs. The first two components were selected for analysis, as they accounted for nearly all the variance in the original data. Interpretation was guided by examining the loadings, which indicated the strength and direction of relationships between the variables and the PCs.

The scores from the 1st and 2nd PCs were used to rank each grid cell. To improve comparability and facilitate interpretation, these scores were rescaled to a standardized range of 0 to 100. To reduce the influence of extreme values, scores above the 95th percentile were set to 100, while those below the 5th percentile were set to 0.

In the fourth phase, a spatial autocorrelation analysis was conducted using both the global and local Moran indices (Anselin 1995; Moran 1948) to identify spatial patterns in the distribution of scores across the study areas. Moran's index is a widely used statistical measure that quantifies the degree of spatial autocorrelation within a dataset, which refers to the tendency for similar values to cluster spatially, revealing spatial patterns within the study area.

The global Moran index provides an overall measure for the entire study area, indicating whether there is statistically significant clustering of similar values (high or low) across the area. A positive global Moran's index value suggests spatial clustering, with similar scores grouped together, whereas a negative value indicates a dispersed distribution. In contrast, the local Moran index offers a more detailed view by providing a value for each areal unit within the study area, allowing for the identification of specific locations where clustering occurs. A positive local Moran's index value indicates that a unit is surrounded by others with similar values, denoting spatial clusters, while a negative value points to a unit surrounded by dissimilar values, indicating spatial outliers. Therefore, while the global index reveals overall patterns, the local index pinpoints where these patterns occur and their extension.

For this analysis, the scores from the 1st and 2nd PCs were used to calculate Moran's index. The spatial relationships among the areal units were defined using a spatial weight matrix based on temporal distances, as this approach may provide a more realistic representation of connectivity between areas and potential interactions among social groups. Specifically, the spatial weight matrix for Moran's index was constructed using the median travel time between cells across various transportation modes (walking, biking, driving, and public transit). To assess the presence and strength of spatial autocorrelation within the scores of the two components, the global Moran's index was initially calculated using various temporal distance thresholds. Following this, the local Moran's index (Anselin 1995) was applied using the spatial weight matrix configuration that yielded the highest autocorrelation value. This two-step process allowed for a thorough examination of both overall and localized spatial patterns within the data.

Formally, the spatial weight matrix W was defined by adopting a criterion based on a temporal dissimilarity, defined as a function of the travel time distributions of people moving from one areal unit to another.

The temporal dissimilarity metric is defined as:

$$w_{ij} = \frac{1}{t_{ij} + 1} \quad (2)$$

where t_{ij} is the median time (in minutes) to get from point i to point j according to four travel modes (bicycle, car, transit, walk); +1 (minute) is the assumed minimum travel time.

For each FUA, the following steps were undertaken to define the spatial connectivity structure between grid cells: Centroids of 500 m grid cells were used as origin and destination points. Travel times between these points were estimated using the *r5r* R package (version 1.1.0), which utilized OpenStreetMap network data and GTFS data (public transport timetable information) obtained and converted from the TravelineData dataset. A travel time matrix was created for each transportation mode (bicycle, car, transit, walking), and a single matrix was derived by calculating the median travel time across the four modes. To account for variability in public transport, travel times were recorded at one-minute intervals between 7:00 and 9:00 a.m. Since the travel time from point A to point B may differ from that of point B to point A, the 'undirected' travel time for each distance matrix was calculated by averaging the two values.

The spatio-temporal distance matrix, with greater distances indicating weaker connections, was used to define the weights. The *Spdep* R package (version 1.2.8) was then employed to create the spatial weight matrix and calculate Moran's index without weight standardization, to accurately represent the spatial relationships between areal units. To assess the intensity of spatial interactions, the global Moran's index was calculated with bandwidths ranging from 5 to 60 min under the assumption of randomization. Subsequently, the local Moran's I was applied to the 1st PC and 2nd PC scores using the definition of spatial weight matrix that maximized global autocorrelation values. Statistical inference was conducted using conditional random permutations to test the null hypothesis of no local spatial association, with a significance level set at $\alpha = 0.05$.

For a detailed explanation of the steps outlined here, interested readers can refer to the cited work (De Falco and Irpino 2024) which offers comprehensive explanations of each phase.

4. Results

4.1. PCA

The results of the PCA provided insights into potential relationships between ethnic segregation and socio-economic segregation. Table 2 presents the outcomes of the weighted PCA conducted separately for the three FUAs.

In all three metropolitan areas, the 1st PC explained at least 60 percent of the variance, thereby capturing a significant portion of the variability present in the original indicators. This component was strongly associated with socio-economic variables such as *NS_SEC_1* (upper class), *Qual_lev_4* (high educational attainment), and *Tot_income* (total annual household income). Conversely, *NS_SEC_2* (working class) showed a high negative loading on the 1st PC, suggesting that this component effectively distinguished between higher and lower social classes.

While these results were consistent across all the study areas, there were notable differences in the loadings associated with European and non-European migrant variables. Liverpool exhibited the highest loadings, followed by Newcastle upon Tyne, whereas Manchester showed significantly lower loadings. This suggested that the association between the migrant variables and the socio-economic dimension was less pronounced in Manchester.

Table 2. Loadings and explained variance for selected variables in Liverpool, Manchester, and Newcastle upon Tyne FUAs.

Variables	Liverpool		Manchester		Newcastle upon Tyne	
	1st PC	2nd PC	1st PC	2nd PC	1st PC	2nd PC
European_migrants	−0.44	0.90	−0.14	0.99	−0.34	0.94
Non_European_migrants	0.44	−0.90	0.14	−0.99	0.34	−0.94
NS_SEC_1	0.97	0.18	0.98	0.06	0.97	0.17
NS_SEC_2	−0.97	−0.18	−0.98	−0.06	−0.97	−0.17
Qual_lev_4	0.93	0.16	0.95	0.07	0.93	0.18
Tot_income	0.82	0.34	0.86	0.10	0.80	0.18
% explained variance	63.6	30.3	60.0	33.1	60.5	31.6

Another noteworthy finding was the contrast in loadings, with negative values for European immigrants and positive values for non-European immigrants. This suggested that these groups were associated with different socio-economic characteristics in the Liverpool and Newcastle upon Tyne FUAs. Positive loadings on the 1st PC denoted areas with a high socio-economic profile, characterized by a high income, education, and upper-class presence. Conversely, negative loadings indicated a lower socio-economic profile associated with a working-class status and lower levels of both income and higher education.

The 2nd PC accounted for 30.3 to 33.1 percent of the variance across the three FUAs. This component primarily distinguished between European and non-European migrants, with positive loadings for European migrants and negative loadings for non-European migrants. In contrast, the other variables had negligible weights across all three FUAs. The 2nd PC can therefore be interpreted as capturing the residential patterns of these migrant groups, reflecting their geographical distribution across the urban areas.

To explain the different patterns revealed by the PCA analysis, it is important to consider the migration histories of the cities. Liverpool, for example, has a long tradition of immigration closely tied to its industrial past. Nevertheless, the city's shift toward a tertiary economy has contributed to a more polarized socio-spatial structure (De Falco 2023). In contrast, since the 1990s, Manchester has evolved into a significant regional center in the North West, characterized by a dynamic economy and a strong presence in specialized sectors. This has likely attracted migrants with a different socio-demographic profile compared to Liverpool and Newcastle upon Tyne. Migration patterns in Manchester are characterized by skilled workers seeking employment in advanced tertiary sectors such as finance, business management, and information technology, as well as international students drawn by the city's educational opportunities (Devine et al. 2003). This lack of a strong association between migrants and the 1st PC in Manchester suggested a more even distribution of both European and non-European migrants across the socio-economic strata.

4.2. Segregation Patterns

The PCA results facilitated a comprehensive investigation of the relationship between ethnic and socio-economic segregation. To further explore the spatial structure of the data, a spatial analysis was conducted on the scores of the 1st and 2nd PCs, which were rescaled to a range from 1 to 100 for both components. A preliminary inspection of these scores revealed their geographic distribution, indicating distinct patterns of low and high index values across metropolitan areas (see Figures 1–3).

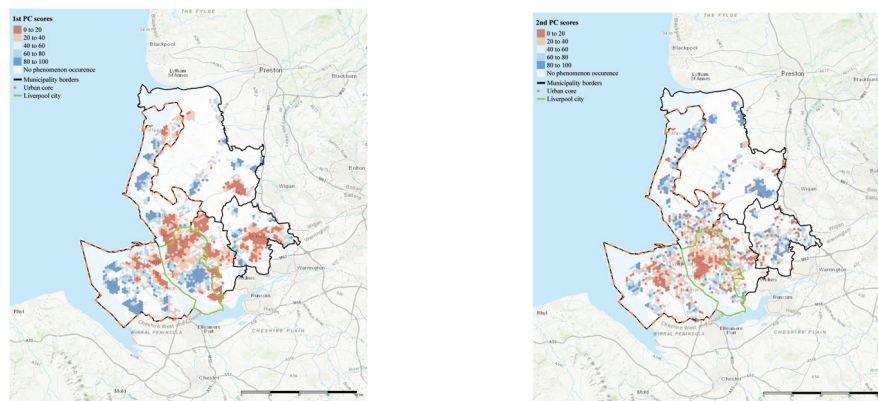


Figure 1. Scores of 1st PC (left) and 2nd PC (right) of Liverpool FUA. (Grid cell counts within brackets).

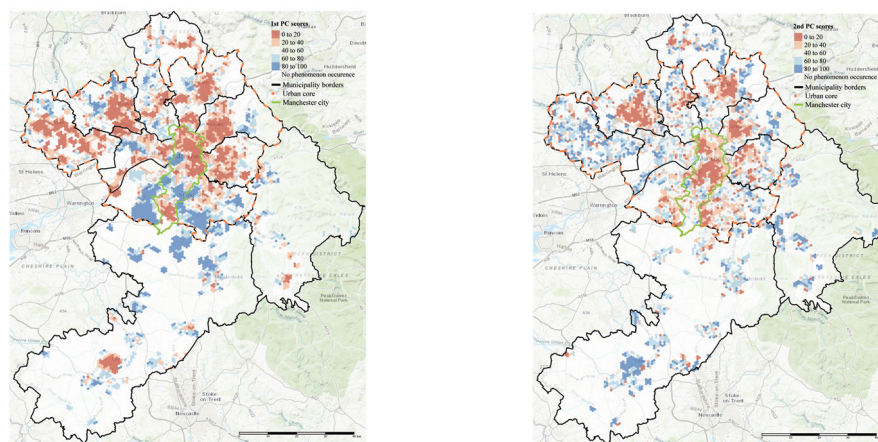


Figure 2. Scores of 1st PC (left) and 2nd PC (right) of Manchester FUA. (Grid cell counts within brackets).

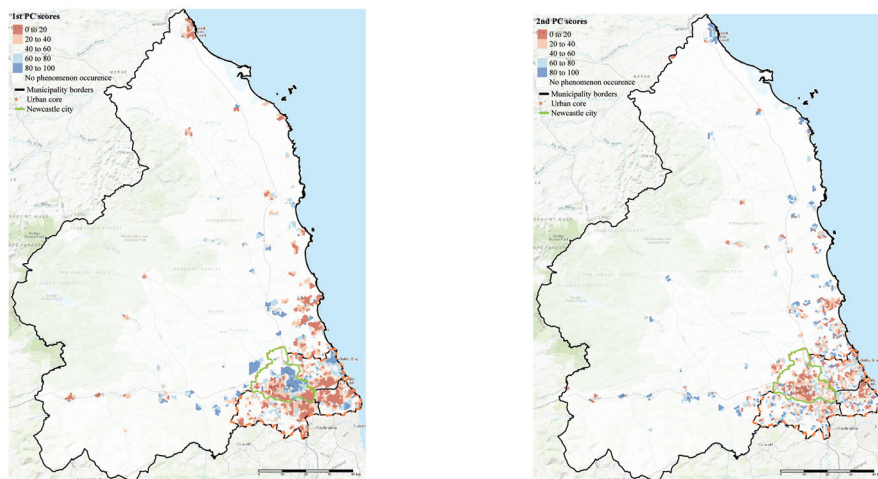


Figure 3. Scores of 1st PC (left) and 2nd PC (right) of Newcastle upon Tyne FUA. (Grid cell counts within brackets).

To determine whether the distribution of the 1st and 2nd PC scores exhibited significant spatial patterns, global and local Moran's I analyses were conducted for each study area. The results of the global Moran's I analysis across various temporal intervals confirmed a non-random spatial distribution of the scores within the study areas, rejecting the null hypothesis (p -value < 0.001). This indicated a clustered structure in the data.

Figure 4 displays the global Moran's I coefficients for the 1st and 2nd PC scores. For the 1st PC scores, the Moran's I coefficients were notably high, with the temporal distance

that maximized global autocorrelation being ten minutes for the Liverpool and Newcastle upon Tyne FUAs, and fifteen minutes for the Manchester FUA. In contrast, the results for the 2nd PC scores showed lower Moran's I coefficients compared to 1st PC scores, with the peak global autocorrelation for all three FUAs occurring at ten minutes.

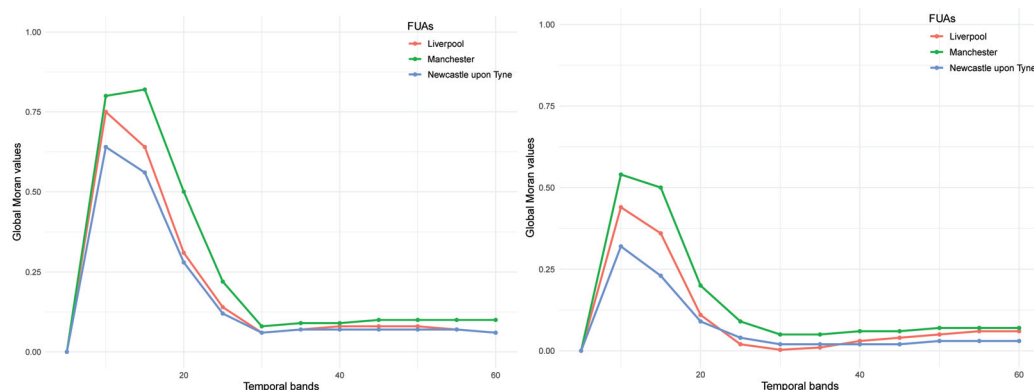


Figure 4. Global Moran's coefficients for 1st PC (left) and 2nd PC (right) scores for Liverpool, Manchester, and Newcastle upon Tyne FUAs.

4.2.1. Moran Map of 1st PC Scores

The local Moran's I analysis identified areas within the three FUAs where the scores from the two PCs were spatially concentrated. This analysis revealed regions with significant clusters of similar observations (high–high or low–low), as well as areas with contrasting observations (high–low and low–high).

- Liverpool and Newcastle upon Tyne: high–high clusters indicated regions of socio-economic advantage, characterized by a significant upper-class presence, higher levels of education, income, and non-European migrants, especially in Liverpool. In contrast, low–low clusters denoted areas of socio-economic disadvantage, dominated by working-class populations and European migrants with lower income and education levels.
- Manchester: high–high clusters primarily reflected areas of socio-economic advantage, while low–low clusters represented areas of disadvantage. Unlike in Liverpool and Newcastle upon Tyne, migrant-related variables did not show a significant correlation with this component, indicating that patterns of advantage and disadvantage were not related to the presence of European or non-European migrants.

High–low and low–high clusters identified areas where scores deviated from those of surrounding regions, while grid cells without significant local Moran values indicated scores that did not significantly differ from the mean score.

Across all three areas analyzed, two dominant cluster types were evident:

- Liverpool: High–high clusters were primarily concentrated in the core areas, particularly within the municipalities of Liverpool, Sefton, and Wirral. In contrast, low–low clusters were predominantly located in the peripheral zones of Liverpool and its surrounding regions (Figure 5).
- Manchester: High–high clusters were located in Manchester's central district and extended into surrounding municipalities, including Cheshire East, Stockport, and Trafford. Low–low clusters were mainly found in the peripheral areas of Manchester and in the northern and northwestern parts of the metropolitan core (Figure 6).
- Newcastle upon Tyne: High–high clusters were concentrated in the urban center of Newcastle upon Tyne and its surrounding municipalities. Low–low clusters were predominantly located in the southern and eastern regions (Figure 7).

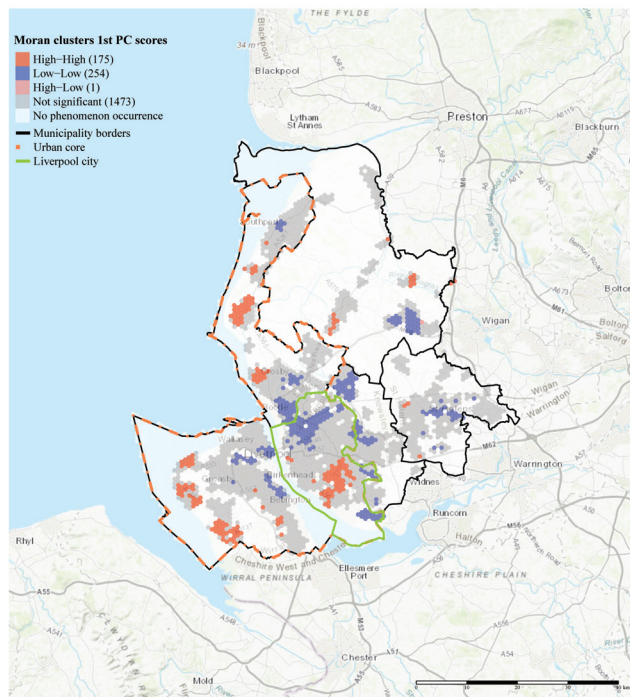


Figure 5. Moran map of Liverpool FUA showing the spatial distribution of 1st PC scores. (Grid cell counts within brackets).

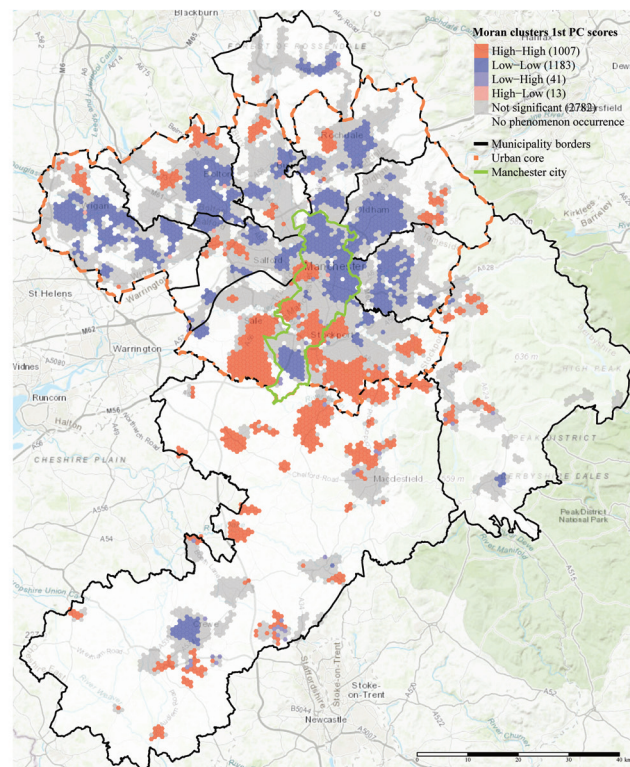


Figure 6. Moran map of Manchester FUA showing the spatial distribution of 1st PC scores. (Grid cell counts within brackets).

The spatial analysis of the three FUAs revealed a consistent pattern of segregation across all three cities. This segregation was primarily characterized by a division between areas with a high concentration of upper-class residents and non-European migrants,

and areas representing working-class neighborhoods with European migrants, who were typically associated with a lower economic status.

A notable finding was the pronounced socio-spatial division between central and peripheral areas. This division highlighted distinctive socio-spatial patterns that extended beyond the geographic and administrative cores of these metropolitan regions. In all three cities, there was a clear separation between socio-economically privileged zones (high–high clusters) and vulnerable zones (low–low clusters), which aligned with patterns observed in other industrial cities in the UK (Koch et al. 2021).

While Manchester, Liverpool, and Newcastle upon Tyne all exhibited these socio-spatial divisions, there was some variation in the distribution of clusters. Manchester displayed a more diffuse distribution of clusters, indicating a more complex socio-spatial structure. In contrast, Liverpool and Newcastle upon Tyne showed more concentrated patterns. Specifically, Liverpool and Newcastle upon Tyne had more pronounced and peripheral low–low clusters, suggesting a localized concentration of socio-economically vulnerable areas. Meanwhile, Manchester’s low–low clusters were more widely distributed, indicating a broader spatial presence of the working class.

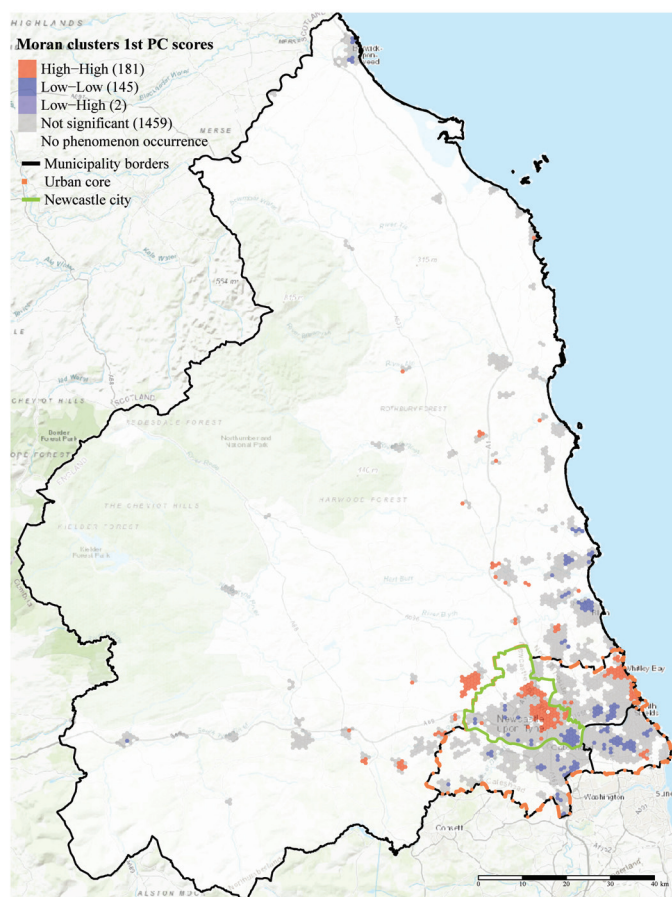


Figure 7. Moran map of Newcastle upon Tyne FUA showing the spatial distribution of 1st PC scores. (Grid cell counts within brackets).

4.2.2. Moran Map of 2nd PC Scores

The Moran index analysis of the 2nd PC scores revealed distinct settlement patterns between European and non-European migrants, identifying areas of significant concentration. In contrast to the 1st PC, which was primarily associated with socio-economic differences, this 2nd PC provided complementary insights into ethnic distribution, highlighting a distinction between European and non-European migrants in settlement patterns. Specifically, high–high clusters indicated areas with significant concentrations of European migrants,

while low–low clusters indicated areas with a substantial presence of non-European migrants. High–low and low–high clusters highlighted areas where scores differed from surrounding areas, while grid cells without significant local Moran values indicated scores similar to the mean score.

- Liverpool: High–high clusters were primarily concentrated in the northern and north-eastern areas of the Liverpool metropolitan region, particularly within the Sefton and West Lancashire municipalities. Conversely, low–low clusters were mainly found within the city of Liverpool itself (Figure 8).
- Manchester: High–high clusters were more evenly distributed between the metropolitan core and its hinterland, with a notable concentration in the Cheshire East area. Low–low clusters were predominantly situated within the city of Manchester and in the northern and northwestern parts of the metropolitan core (Figure 9).
- Newcastle upon Tyne: High–high clusters were almost exclusively located in Northumberland. Low–low clusters were mainly concentrated in the core areas, particularly within Newcastle upon Tyne and South Tyneside municipalities (Figure 10).

The spatial analysis of the 2nd PC scores revealed significant concentrations within the three FUAs, indicating distinct settlement patterns among European and non-European migrants. These patterns underscored the different dynamics of spatial segregation across the metropolitan regions.

In Liverpool, Manchester, and Newcastle upon Tyne, socio-spatial divisions were evident, but the distribution of segregated clusters varied notably. Liverpool and Manchester exhibited a higher concentration of clusters with similar values, suggesting stronger pockets of socio-spatial segregation. In contrast, Newcastle upon Tyne presented a more dispersed and less concentrated distribution of these clusters, indicating a weaker intensity of segregation compared to the other two cities.

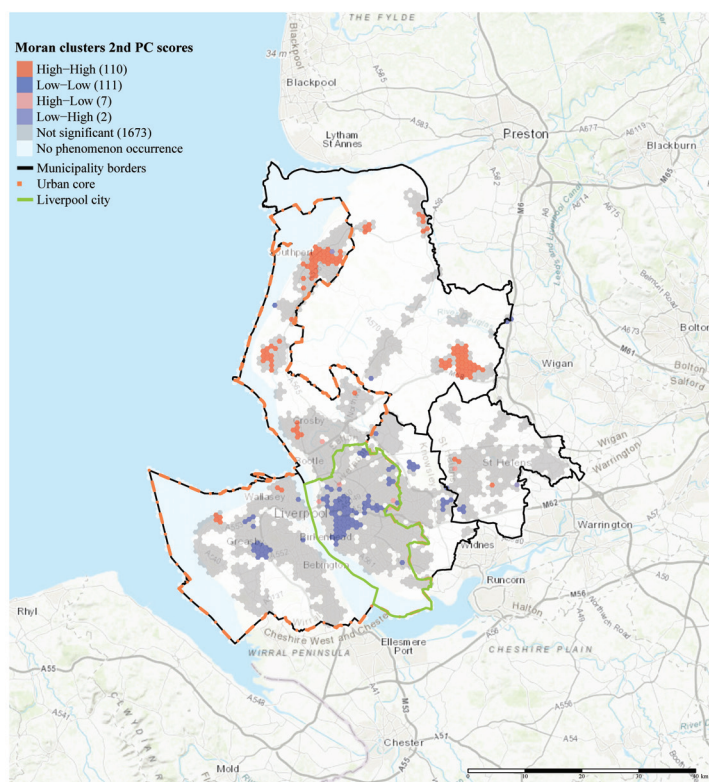


Figure 8. Moran map of Liverpool FUA showing the spatial distribution of 2nd PC scores. (Grid cell counts within brackets).

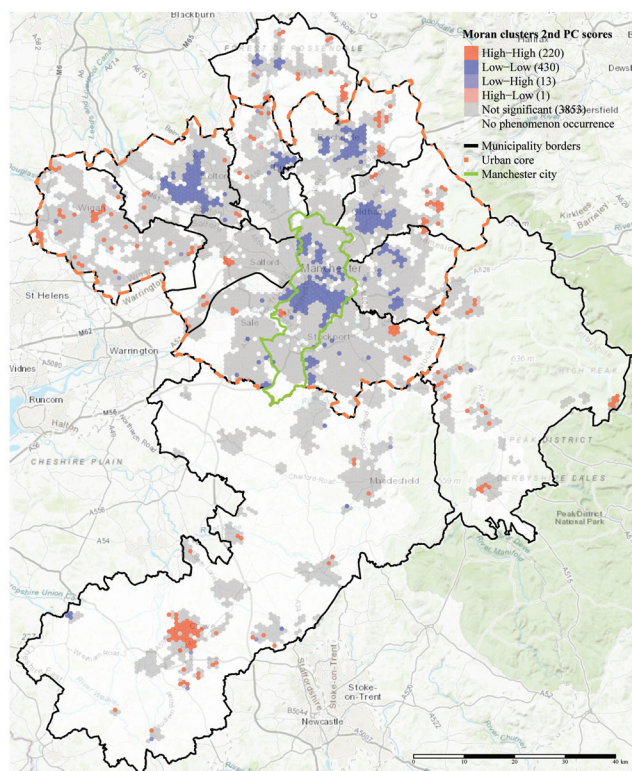


Figure 9. Moran map of Manchester FUA showing the spatial distribution of 2nd PC scores. (Grid cell counts within brackets).

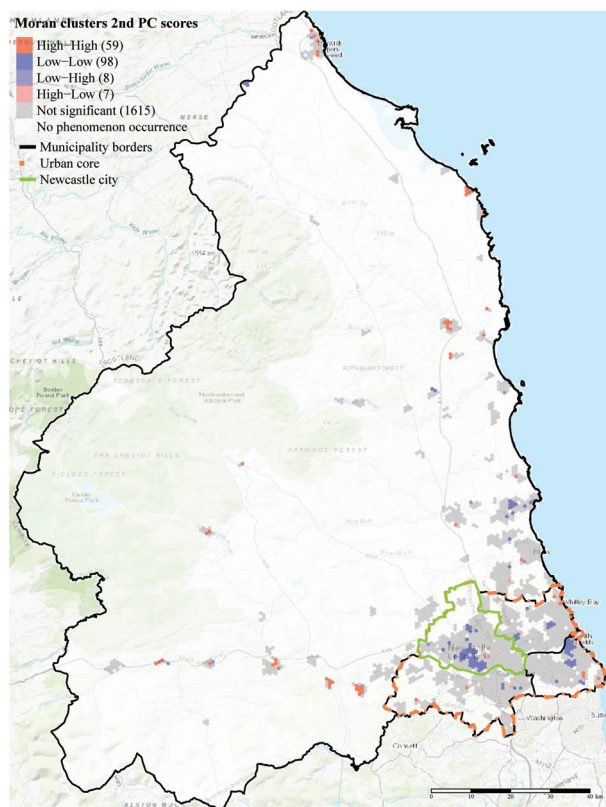


Figure 10. Moran map of Newcastle upon Tyne FUA showing the spatial distribution of 2nd PC scores. (Grid cell counts within brackets).

Liverpool displayed nearly equal numbers of clusters for European and non-European immigrants, reflecting a balanced yet segregated distribution. On the other hand, Manchester and Newcastle upon Tyne displayed a more pronounced clustering of non-European immigrants, which supported previous research suggesting that non-European foreigners experience higher levels of segregation than their European counterparts (Benassi et al. 2020). This pattern highlights the varying degrees of spatial segregation among immigrant groups and suggests that the intensity and nature of segregation differ significantly across these urban areas.

5. Discussion and Conclusions

This paper aimed to contribute to the literature on urban segregation and spatial inequalities in European cities by examining the relationships between ethnic and socio-economic segregation in three UK metropolitan areas. The research used a robust quantitative methodology to address key issues in segregation analysis, facilitating the exploration of relationships between socio-economic and ethnic variables and identifying population patterns at a micro-scale.

The analysis yielded some interesting findings. Firstly, socio-spatial divisions were evident in all three metropolitan areas. Moran's local analysis highlighted distinct spatial patterns within the municipal cores of the three FUAs, revealing wealthier zones concentrated in central areas, while working-class populations predominantly resided in the suburbs. This pattern of segregation is consistent with existing literature on socio-spatial dynamics in many Western cities, reflecting broader trends of gentrification (Van Gent and Hochstenbach 2020) suburbanization (Hochstenbach and Musterd 2018), and socio-economic polarization (Sassen 1991) that have reshaped urban fabrics.

The findings suggest that these socio-spatial changes are shaping a dual city structure characterized by a classic center-periphery model. In this pattern, middle- and upper-class residents are increasingly concentrated in central urban areas, attracted by the availability of amenities, cultural assets, and economic opportunities. In contrast, lower-income and vulnerable populations are being displaced to the outskirts, experiencing what has been termed the suburbanization of poverty (Benassi et al. 2020). In all three FUAs analyzed, this trend appeared to be driven predominantly by socio-economic disparities rather than by ethnic segregation, suggesting that socio-economic inequality is the primary factor shaping the spatial divisions. In the specific cases of Liverpool and Newcastle upon Tyne, this socio-spatial dualization also appeared to be associated with the presence of immigrants. Interestingly, unlike patterns observed in other research, non-European migrants in these FUAs were linked to more privileged socio-economic conditions, while European migrants were overrepresented in socially and economically vulnerable areas. This divergence may be attributed to various factors, including differences in migrant networks, labor market conditions, and the skill sets of immigrants.

An important result related to the settlement patterns of migrants across the three metropolitan areas. The data indicated significant differences in localization dynamics between European and non-European migrants. Specifically, non-European migrants tended to concentrate more broadly in the central municipalities of the metropolitan areas and displayed a more clustered spatial distribution compared to their European counterparts. This pattern was particularly pronounced in Manchester and Newcastle upon Tyne FUAs.

The greater concentration of non-European migrants in urban centers could be explained by a range of factors, including the attractiveness of these areas. Urban centers offer more economic opportunities and better access to services, which may be particularly appealing to non-European migrants. The growing urbanization and globalization have reinforced the role of large cities as magnets for international migrants. Additionally, the preference for central urban contexts may be linked to the presence of social networks and established ethnic communities, which facilitate the economic and social integration of these groups.

Overall, the differences in settlement patterns between European and non-European migrants in the metropolitan areas of Manchester and Newcastle upon Tyne suggest a complex interaction of economic, social, and cultural factors that influence the spatial distribution of migrants within these areas.

Combining the 1st and 2nd PC scores provides additional insights into the socio-spatial structure of the three FUAs. In Liverpool, a pronounced polarization was observed, with socio-economically advantaged areas concentrated in the center, but these areas did not significantly overlap with zones containing higher concentrations of non-European migrants. On the other hand, outside the core municipality, areas characterized by a higher concentration of European migrants displayed a heterogeneous pattern, without consistent overlap with either advantaged or disadvantaged zones. Manchester, on the other hand, presented a more complex socio-spatial structure. The combined analysis indicated that in the city of Manchester, areas with a concentration of non-European migrants, while located in central urban areas, only partially intersected with regions marked by higher or lower socio-economic affluence. This partial overlap extended to zones beyond the core municipality. Newcastle upon Tyne showed minimal overlap between the socio-economic areas and migrant settlement patterns, reflecting a distinct socio-spatial configuration compared to Liverpool and Manchester. Here, the areas associated with socio-economic disadvantage were largely separate from the zones with a higher concentration of migrants, whether European or non-European. This suggests that in Newcastle upon Tyne, clusters of migrant populations are more spatially dispersed and do not clearly align with areas of wealth or deprivation.

Future research could enhance this work by providing a detailed characterization of spatial clusters for both 1st and 2nd PC scores, offering a more detailed description of the socio-demographic characteristics of the areal units, thus enriching the findings. Additionally, the analysis could benefit from a combined examination of the 1st and 2nd PC scores to better define the spatial positioning of the cells across both components.

Incorporating qualitative methods could provide deeper insights into the factors influencing the residential choices of foreign populations at macro and micro levels. Extending this analysis to other European cities with similar socio-economic contexts would also help determine whether the patterns identified in the three English cities are generalizable or unique to these areas. Lastly, a more in-depth investigation of the demographic and socio-economic processes associated with gentrification and suburbanization within the selected FUAs could provide a better understanding of their relationship to the spatial segregation of vulnerable groups.

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Notes

¹ All the analyses were performed using the R software environment (R Core Team 2021).

² The variable `Qual_lev_1` was excluded from the analysis in order to reduce redundancy and improve the ability of the principal components to explain the overall variance.

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Article

The Internal Socio-Economic Polarization of Urban Neighborhoods: The Case of the Municipality of Nice

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Abstract: In continuity with the research on social segregation and the phenomenon of urban gentrification, this article examines the cohabitation patterns of populations with diametrically opposed incomes within the same neighborhood, typically observed in the city center. This phenomenon is defined here as internal socio-economic polarization. It is measured through the combination of two original indexes (poverty and wealth indexes) constructed based on income deciles per consumption unit for the year of 2017. The analysis focuses on the municipality of Nice, characterized by a low demographic dynamic, a relative concentration of seniors, and a strong tourist attractiveness, particularly in the highly polarized neighborhoods that occupy almost the entire city center. This study is complemented by a principal component analysis summarizing the characteristics of the population and housing stock in the neighborhoods of Nice. The main objective of this research is to identify and locate polarized neighborhoods within the urban context of Nice, to analyze the distinctive traits of their population and housing stock, and, finally, to highlight potential trends in the population's socio-economic status. Moreover, the economic trajectories of polarized neighborhoods, in connection with their population and housing characteristics (such as the secondary use of a portion of the housing stock, often low-quality old buildings, social housing, and the overrepresentation of retirees), help explain the forms of socio-economic polarization observed in these neighborhoods (such as the indications of gentrification, unfinished gentrification, and sustainable cohabitation).

Keywords: internal socio-economic polarization; gentrification; secondary residences; incomes; Nice

1. Introduction

1.1. Urban Social Segregation: An Extensive Term to Characterize the Urban Space

Since the 1980s, the term socio-spatial segregation has been frequently used in France in public debates and scientific works, notably in geography and urban sociology. The concept was first proposed by the Chicago school in the 1920s to understand the recomposition of urban space, particularly areas grouping populations of the same social, ethnic, and racial origins. The Chicago school interprets this phenomenon through the processes of domination–invasion–succession, reflecting individual behaviors and the elements of urban territorial structuring (Decamps 2009). The use of the notion of segregation to characterize today's French urban space no longer corresponds exactly to the notion mobilized by the Chicago school in 1920. Its current more polysemous meaning (Grafmeyer 1994) concerns not only the physical separation that may be observed but also the processes that have generated this separation and those that are its consequence (Brun 1994; Grafmeyer and Authier 2019; Frantz 2010). To characterize this broader set of processes, most current definitions describe urban social segregation as the spatial expression of social relations. This is referred to as the “social division of space” (Roncayolo 1994) or the “social differentiation of urban territories” (Oberti and Préteceille 2016; Grafmeyer and Authier 2019). The term was initially used to designate neighborhoods accumulating social problems, often corresponding to neighborhoods targeted by urban policy generally located on the outskirts of large French cities. Some studies have also analyzed affluent neighborhoods as another facet of

social segregation (Pinçon and Pinçon-Charlot 1989; Zilio 1999; Grafmeyer 1992). Urban social segregation is most often interpreted according to two theoretical approaches. The Marxist approach interprets social segregation as the spatial expression of the reproduction of the socio-economic structure. The marginalization of disadvantaged populations is indicated by the economic development and public policies in urban planning (Préteceille 1995; Lehman-Frisch 2009; Frantz 2010). The other approach is structured around households' preference for a homogeneous neighborhood in cultural and socio-economic terms, a preference that arises not only from the privileged classes (Pinçon and Pinçon-Charlot 2014) but also from the working classes (Lehman-Frisch 2009). Often, the intertwining of different aspects of socio-spatial segregation necessitates the superimposition of the two theoretical interpretations (Madoré 2015; Lehman-Frisch 2009). These two theoretical interpretations find their extension in the phenomenon of "touristification" (Gotham 2005) more recently observed in large metropolises where the housing stock intended for the temporary accommodation of visitors tends to develop and add to an already growing set of secondary and occasional residences.

1.2. Internal Social Polarization of French Urban Spaces

While the neighborhoods targeted by urban policy and affluent neighborhoods are considered the most striking and frequent configurations of segregative phenomena in France, there are, however, other forms of social inequalities within a city that do not correspond to this dualization of space (Oberti and Préteceille 2016; Brun 1994). The deployment of various processes within urban space shapes the geographical diversity of the city's social composition, producing spaces where socially different groups coexist, particularly in the city center.

The aim of this article is to analyze, within the city of Nice, these situations here referred to as the internal socio-economic polarization of neighborhoods, as well as to identify their population characteristics and real estate stock. The emphasis on the opposition between "rich" and "poor" neighborhoods can distort the understanding of the overall socio-urban fabric. Therefore, this study of these socio-economically polarized neighborhoods aims to shed light on these under-researched cases within the field of urban geography. To sum up, this article seeks not only to identify these polarized neighborhoods and their characteristics but also to analyze the evolution of household income distributions in these areas, in order to position the neighborhoods within broader socio-spatial processes.

The Different Manifestations of the Geographical Coexistence of Social Groups in City Centers: Between Life Course Transitions and Spatial Transformations

The local configurations and specificities of each French urban context create a diversity of situations that do not correspond to a global and uniform trend driving the organization and functioning of cities (Maloutas and Spyrellis 2019; Oberti and Préteceille 2016; Bourdin 2008). The unique political, economic, social, and urban history of each city shapes the distribution of socio-economic groups within its space, resulting in both segregative forms and forms of coexistence of different populations (Bouzouina 2007). Thus, the city center presents a great geographical diversity of social combinations, the result of various urban, sociodemographic, and economic processes with rich neighborhoods and poor neighborhoods, as well as neighborhoods with a heterogeneous internal socio-economic composition (Oberti and Préteceille 2016; Préteceille 2006a; Bouzouina 2007; Van Criekingen and Decroly 2003). We can observe not only rich neighborhoods and poor neighborhoods but also neighborhoods with an internally heterogeneous socio-economic composition (Bouzouina 2007). These heterogeneous neighborhoods concentrate both low-income and affluent populations (Préteceille 2006a; Oberti and Préteceille 2016; Authier 2003; Bouzouina 2007). This coexistence of socio-economically distant households does not always imply great social mixing. This co-presence may not indeed lead to truly profound social relations but rather to a more passive coexistence. Social hierarchies continue to exist,

reminding us of the absence of equivalence between social interaction and spatial proximity (Tissot 2011; Lenel 2011; Authier and Lehman-Frisch 2013; Bourdin 2008; Giroud 2015; Oberti and Préteceille 2016; Préteceille 2006b; Bouzouina 2007; Roncayolo 2001; Audren et al. 2016; Collet 2015; Park 2004).

The presence of high-income populations in the city center is explained by the concentration of urban amenities and its symbolic image (Bridge 2006; Zukin 1998; Brueckner et al. 1999), but the proximity to the job market and the support networks offered by centrality also attract low-income populations. These heterogeneous neighborhoods within the same district reflect differentiated preferences and stages of life (Tissot 2011; Lenel 2011; Bouzouina 2008). This is particularly the case for young adults in professional and family transitions who temporarily occupy central neighborhoods in a rental market of highly variable quality while waiting for professional and family stability, leading a significant portion of them to settle in a family housing neighborhood, often in the suburbs (Van Criekingen and Decroly 2003; Bourdin 2008; Lenel 2011). There is therefore a constant renewal of this type of population, largely linked to the presence in the city center of a housing stock mostly composed of small apartments for private rent (Van Criekingen and Decroly 2003; Authier 2003). These young adults in professional transition do not constitute a uniform group because, on the one hand, they do not all have the same qualifications, which strongly differentiates their salaries, and, on the other hand, they are not all at the same stage of this professional transition, which again determines their financial resources. The relative specialization of the housing stock in the central districts of large cities thus makes it a space where young adults in transition concentrate, who, due to the diversity of their previous paths and their progress in this transition, generate a certain socio-economic heterogeneity among the inhabitants of the same neighborhood.

At the same time, most large cities began urban renewal policies as early as the 1970s, but much more clearly during the 1990s and 2000s, particularly in initially poor neighborhoods where the housing was often degraded. Similarly, following in the wake of “pioneer” social groups, such as artists or gays (Giraud 2010), some initially poor neighborhoods in large cities were invested in by new populations with higher financial means. These socio-spatial transformation processes, which can overlap, are generally considered through the notion of gentrification. Ruth Glass defined this notion of gentrification in the 1960s, and this term now encompasses a wide range of urban changes (Bourne 1993; Van Criekingen and Decroly 2003). Always involving the settlement of materially wealthier populations in initially less socio-economically advantaged urban environments, gentrification results, at least temporarily, in the cohabitation of households with very unequal resources. In this context, the internal socio-economic polarization of urban neighborhoods would just be a stage of gentrification leading to the eviction of low-income populations. While many neighborhoods in large French cities can illustrate this process, it is extremely simplistic to consider all situations of the cohabitation of different socio-economic groups within the same neighborhood as the intermediate phase of an inexorable gentrification (Giroud and Ter Minassian 2016; Oberti and Préteceille 2016; Authier 2003; Bouzouina 2007; Grafmeyer and Authier 2019). Indeed, comparing the gentrification processes initiated in the neighborhoods of different cities and/or within the same city reveals quite diverse evolutions (Van Criekingen and Decroly 2003). These gentrification processes are not always linear and can lead to different situations. In some cases, the replacement of low-income populations with higher income populations appears almost complete, while, in other cases, social changes can lead to more or less lasting internal social polarization (Giroud and Ter Minassian 2016; Oberti and Préteceille 2016; Authier 2003; Bouzouina 2007; Jeanmougin and Bouillon 2016). Thus, the massive but dispersed presence of degraded buildings difficult to transform, the presence of social housing, and the hyperspecialization of housing into very small apartments as a result of a large student population, can limit urban transformation and favor the retention in the neighborhood of economically disadvantaged households who then cohabit with newly settled wealthier households. The internal socio-economic polarization of these neighborhoods then constitutes a lasting state, even though the changes to part

of the housing stock and the redevelopment of public spaces have led to the arrival of wealthier classes. The terms sporadic, incomplete, or even marginal gentrification are used to describe these neighborhoods where high-income households live alongside pockets of poverty (Jourdan 2008; Bacqué and Fijalkow 2006; Authier 1995, 2003).

Finally, the example of the countries severely affected by the 2008 economic crisis also shows (Maloutas and Spyrellis 2019) that, in some neighborhoods, internal socio-economic polarization can also be a transitional stage of pauperization. Although the intensity of the economic and social crisis experienced by France is far from comparable to what Greece or other countries in Europe, particularly in the South, faced, these processes of potential impoverishment in urban neighborhoods undergoing gentrification have also been observed (Jeanmougin and Bouillon 2016).

1.3. The Context of Nice

Nice is a metropolitanized tourist area (Christofle and Héliou 2018) characterized by particularities related to its topography. On one hand, the physical constraint of the terrain influences its urban development. On the other hand, it does not follow the general socio-spatial trends of major French cities (Schwabe 2007). This singularity, partly due to its Mediterranean character, makes it particularly interesting to study from the perspective of socio-economic polarization within urban neighborhoods.

Thus, the municipality experiences a strong tourist attraction, resulting in a significant proportion of secondary residences within its housing stock. This leads to competition in the housing market between temporary and permanent populations. At the same time, moderate demographic growth is accompanied by a significant proportion of elderly people compared to what is observed in the central cities of most major French urban areas.

1.3.1. Demographic Diversity Within the Nice Côte d'Azur Metropolitan Area: Relative Population Stagnation in Nice and Demographic Dynamism in the Suburbs and Hinterland

Nice is located at the foot of the Alps and on the Mediterranean coast, near the French–Italian border and the Principality of Monaco. Constrained by the terrain, the development of the Nice area follows the valleys (Decoupigny et al. 2007; Fusco and Scarella 2008b). It is the fifth most populous municipality in France, behind Toulouse, and the second in the Provence–Alpes–Côte d'Azur region, after Marseille. In 2017, the Nice Côte d'Azur metropolitan area (NCA) comprised 49 communes, with a population of 537,999 and a surface area of 1400 km². Its average density, which is relatively moderate, is 367 inhabitants/km² (INSEE 2020), combining the very dense coastal municipalities with the very low-density mountain municipalities that include the Mercantour National Park. Unlike other French urban areas (Bordeaux, Lille, or Paris), the municipality of Nice has a predominant weight within the metropolis. It hosts more than half of the metropolis's population, nearly 63% or 340,017 inhabitants (Figure 1).

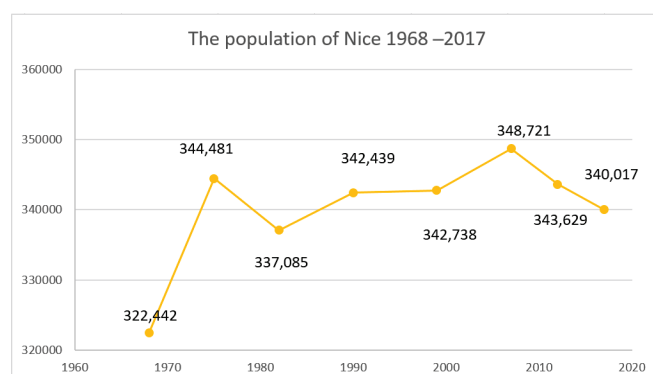


Figure 1. Demographic trends of municipality of Nice. Source: INSEE Population Censuses; Own elaboration.

Over the decades within the Nice Côte d'Azur metropolitan area, different areas have experienced varied demographic trajectories. Since the late 1960s, the population growth of the urban area has been less sustained than the suburban and hinterland areas, which have proven to be more dynamic (Figure 2). In the 1990s, the metropolitan population continued to grow at a slower pace, mainly due to the other municipalities, as the municipality of Nice experienced relative stagnation. In the early 2000s, the metropolitan population saw a slight increase marked by less contrasting demographic dynamism between its different parts. Between 2007 and 2017, the population of Nice decreased very slightly, following the overall trend of the Nice Côte d'Azur metropolitan area, while the population of the other municipalities in the metropolitan area varied little.

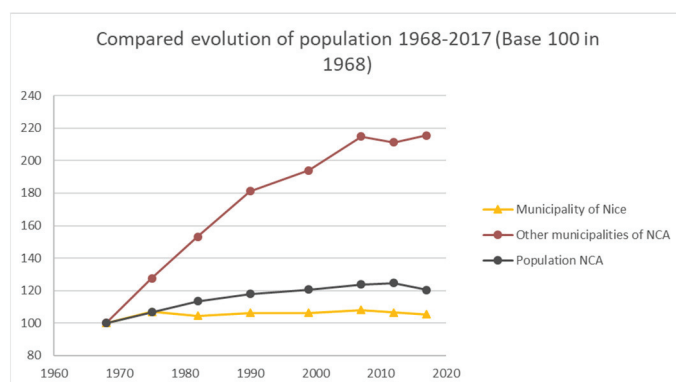


Figure 2. General demographic trends of Nice Côte d'Azur metropolitan area. Source: INSEE Population Censuses; Own elaboration.

1.3.2. Relative Concentration of Seniors and a Slight Deficit of Young Adults

In 2017, the population of the municipality of Nice maintained a singular demographic structure, characterized by a relatively high concentration of people aged 65 and over (Conseil Communautaire 2010; Schwabe 2007), while remaining well below the levels observed in certain small French seaside towns such as Saint-Raphaël, Arcachon, Royan, or La Baule. This trend has resulted in a generational imbalance, with nearly 24% of the population aged 65 and over, while those under 18 represent about 19%. Compared to other large French cities, Nice shows a notable deficit in the 18 to 25 age group and, to a lesser extent, the 25 to 30 age group (Figure 3). This deficit of young adult populations can be explained by the lower concentration of higher education institutions compared to other large French cities, such as Lille and Toulouse.

Several analyses and studies converge to describe a significant concentration of elderly individuals along the coastal front of the metropolis, particularly in the city center of Nice (Conseil Communautaire 2010; Chauvot and Pougnaud 2014). Due to the small size of their households, they predominantly reside in small-sized accommodations within the collective rental housing stock in the urban core of Nice (Conseil Communautaire 2010). The proximity of the services offered by the urban centrality are also likely to contribute to this presence of elderly people in the city center, who often coexist with low-income populations, including isolated unemployed individuals (Conseil Communautaire 2010; INSEE 2014; Chauvot and Pougnaud 2014). Families more frequently reside in the periphery in larger accommodations that better meet their needs. The INSEE's infra-communal mapping analysis of the Nice Côte d'Azur metropolis in 2011 reveals an overrepresentation of individuals aged 60 and over in the coastal part of one of the zones where the unemployed are overrepresented (Figure 4) (INSEE 2014). In this central coastal zone, the average fiscal income varies considerably from one micro-area to another.

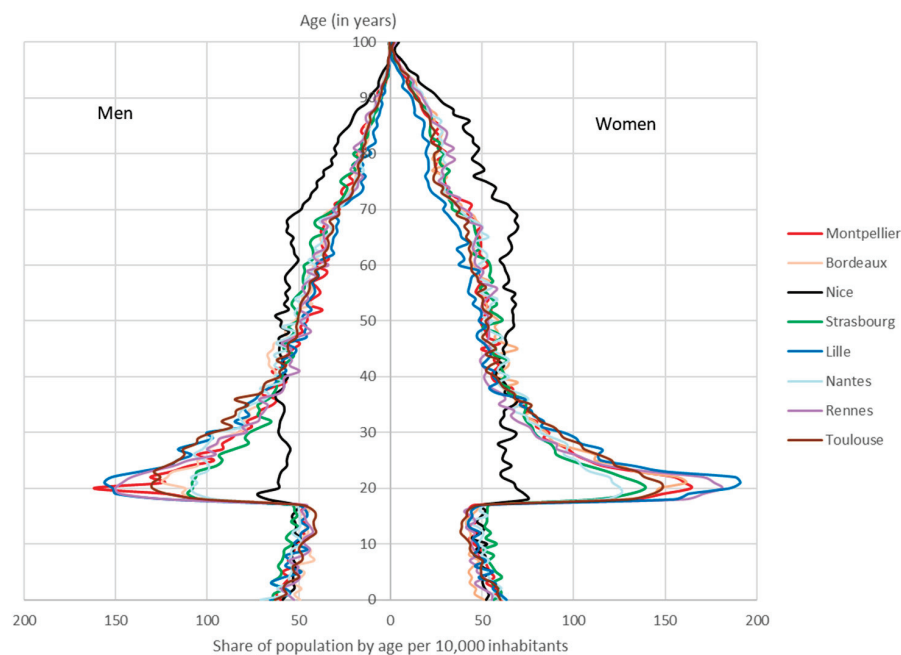


Figure 3. Pyramid population of the municipality of Nice and comparable municipalities in 2017. Source: INSEE Population Censuses; own elaboration.

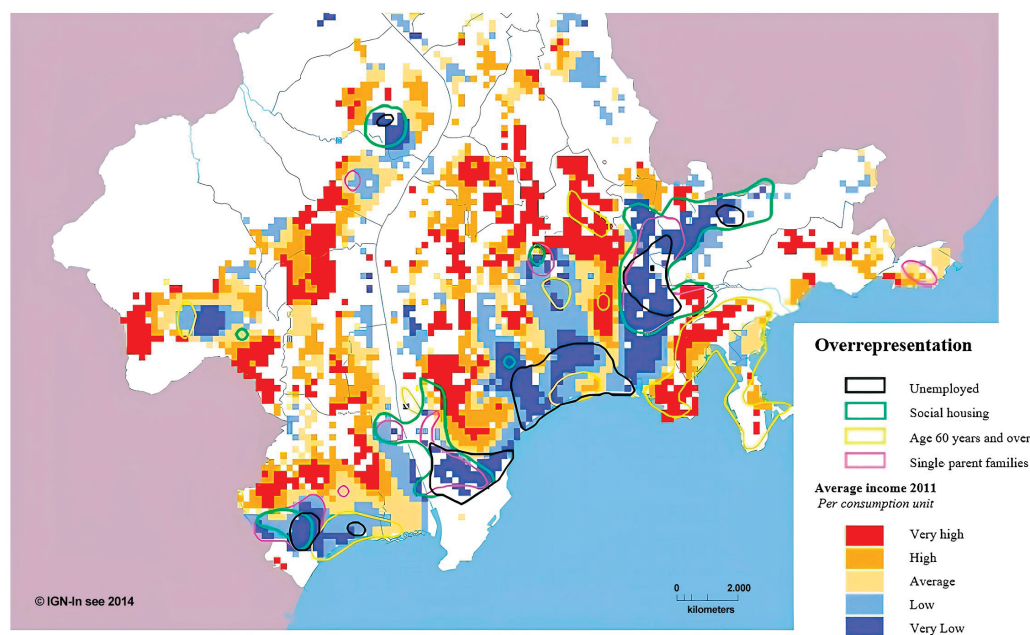


Figure 4. Grid-based sociodemographic synthesis map. Source: IGN, INSEE. Translation of the legend by the author.

1.3.3. Touristification of the Residential Space in Nice: A Trend Towards Secondary Residences with High Housing Vacancy

The urban landscape of the Nice Côte d'Azur metropolitan area, especially its coastal part, is influenced, like many other territories in the Mediterranean basin, by the tourist economy dating back to the 18th century, based on heliotropism (Christofle and Hélon 2018; Centi 1993; Goujard 2002). This is evidenced by a pronounced overrepresentation of secondary residences in the housing stock. In 2017, the municipality of Nice counted 31,344 secondary residences, representing 51% of the 61,949 secondary residences in the

Nice Côte d’Azur metropolis. These secondary residences are concentrated along the coast, particularly in the collective housing stock of the municipality of Nice, where their condition is better than in the rest of the territory (Christofle and Hélon 2018; Conseil Communautaire 2010; Métropole Nice Côte d’Azur 2016a, 2016b; Métropole Nice Côte d’Azur 2023). They constitute 14% of the housing stock in the city center, compared to 9.5% nationally and between 3% and 5% in other comparable territories¹. The competition between the primary and secondary uses of housing in downtown Nice can create tensions in the real estate market, potentially reducing or blocking the availability of primary residences for the local population and likely increasing property prices (Fusco and Scarella 2008a; Scarella 2014; Conseil Communautaire 2010; Métropole Nice Côte d’Azur 2016a). Therefore, it is conceivable that socially disadvantaged populations face difficulties in finding housing in a tight real estate market.

In 2017, the vacancy rate of housing in the municipality of Nice reached 14%, exceeding the national average (8.3%) and that of other central cities in the major provincial metropolises (ranging from 7% to 9%). This abundance suggests a mismatch between residential and tourist demand and supply (Arrighi 2018). In 2013, 24% of the vacant dwellings in Nice were considered to be in poor condition, largely due to their age (Métropole Nice Côte d’Azur 2016a, 2016b). Despite the General Interest Programs (PIG) from 2008 to 2023 aimed at combating substandard housing, vacancies persisted in 2017 (Figure 5). The high presence of small apartments in downtown Nice can lead to high turnover rates and frictional vacancies (Métropole Nice Côte d’Azur 2016b; Conseil Communautaire 2010). The significant aging of the population in Nice also contributes to the high vacancy rate; in 2013, 56% of the owners of unoccupied homes were over 60 years old (Métropole Nice Côte d’Azur 2016a, 2016b). Thus, in 2017, a vacancy could result from the owner moving to a retirement home. Vacancies may also occur due to the death of the owner, complicating the property’s return to the market by heirs. The complexity and duration of settling estates can lead to varying periods of vacancy before properties are put up for sale, rented out, or occupied by heirs (Conseil Communautaire 2010). Additionally, some of these vacant properties may be used as second homes (Métropole Nice Côte d’Azur 2016a, 2016b). The particularly high vacancy rate also suggests the potential for gentrification, but the deterioration of some of these properties, often associated with their original popular character in certain neighborhoods (Ter Minassian 2009), makes their renovation costly and complex. Therefore, it is possible that some of the vacant properties in poor condition will eventually be offered for rent, contributing to the maintenance of populations with modest resources. This could further foster socio-economic polarization within certain neighborhoods of Nice, potentially leading to their impoverishment.

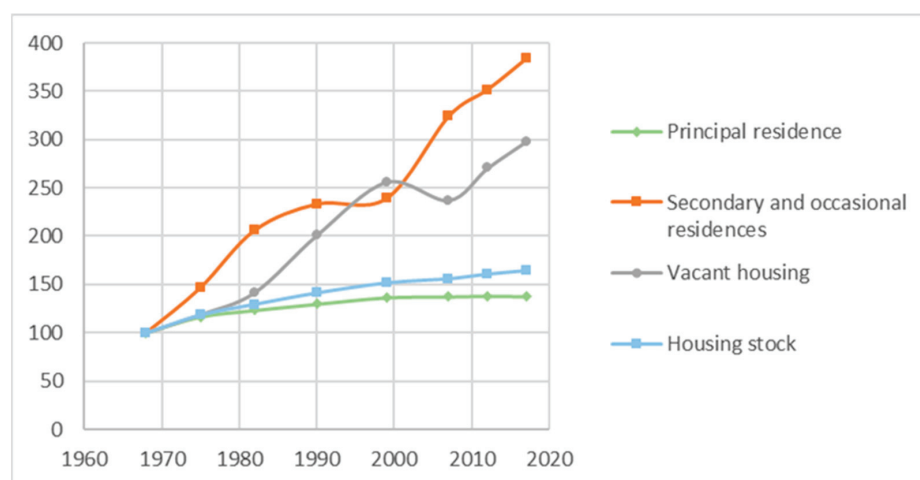


Figure 5. Evolution of the housing stock in the municipality of Nice between 1968 and 2017 (with a base 100 in 1968). Source: INSEE Population Censuses; own elaboration.

2. Materials and Methods

The methodology used to classify neighborhoods into 4 categories (“poor”, “rich”, “polarized”, or “other”) is based on the wealth and poverty indexes calculated for each IRIS² INSEE of the city. This calculation is carried out for the years 2012 and 2017 using the income deciles derived from the FiLoSoFi file (a system on localized fiscal and social incomes), which provides information on the distribution of populations in all the IRIS of France based on their disposable income per consumption unit. The construction method for these poverty and wealth indexes, their theoretical and empirical justification, and their application are presented in a text systematically addressing all French provincial big metropolitan areas (Gripsiou and Bergouignan 2022). The poverty index is obtained through a linear combination of the relative differences using the lower values between the first three deciles of disposable income per consumption unit for each IRIS and the first three deciles of disposable income per consumption unit for all of metropolitan France (Gripsiou and Bergouignan 2022). The wealth index is obtained through a linear combination of the relative differences using the higher values between the last three deciles of disposable income per consumption unit for each IRIS and the last three deciles of disposable income per consumption unit for all of metropolitan France (Gripsiou and Bergouignan 2022). The classification of the IRIS into “poor”, “rich”, or “polarized” is determined based on whether their “poverty” and “wealth” indexes exceed certain thresholds (Gripsiou and Bergouignan 2022). An IRIS is considered “poor” if its poverty index is greater than 4% and its wealth index is less than 4%. This 4% threshold for the poverty index statistically corresponds to an IRIS whose poverty rate is equal to the poverty rate of all of metropolitan France. In other words, an IRIS with a poverty index exceeding 4% has a probability greater than 95% of having a poverty rate higher than that of all of metropolitan France. An IRIS is considered “rich” if its poverty index is less than 4% and its wealth index is greater than 4%. An IRIS is considered socio-economically “polarized” if its poverty index is greater than 4% and its wealth index is also greater than 4%. An IRIS with both poverty and wealth indexes below 4% forms a residual category where the socio-economic situation of its inhabitants closely resembles that observed for all of metropolitan France.

The use of census data (a synthesis of the 2017 population census) allows for the more detailed characterization of a socio-economically “polarized” IRIS in Nice compared to other categories of IRIS in the municipality. The sociodemographic variables utilized primarily characterize residents in terms of their age, number of children, educational attainment, employment status, residential and daily mobility. They also describe housing in terms of type (apartment or house), size, age of the building they belong to, and the status of their occupants (owner, social housing tenant, or private tenant). These characterizations will be considered from a bivariate perspective and then through a multivariate approach using principal component analysis to better reveal the potential factors of internal social polarization within the IRIS areas.

To identify trends in the income distribution within the “polarized” IRIS of Nice, we examine the evolution of wealth and poverty indexes between 2012 and 2017 for the IRIS identified as “polarized” in either of these two years. An increase in the wealth indexes accompanied by a decrease in the poverty index could indicate potential gentrification, with the growth of high-income populations in a neighborhood originally occupied by low-income populations, some of whom may still reside there. Conversely, an increase in the poverty index alongside a decrease in the wealth index could signify a trend towards impoverishment, with a reduction in high-income populations. We may also observe varying levels of internal socio-economic polarization, potentially increasing with the coexistence of populations with diametrically opposite economic resources within the same IRIS, often associated with socio-urban characteristics and heterogeneous buildings.

Regarding the data used in this study, derived from the FiLoSoFi system and the population census, they present certain limitations that should be noted before analyzing the results obtained. One of the main limitations of the fiscal data is that students who are fiscally attached to their parental household, as well as the majority of secondary residents³

and temporary tenants, do not appear in the files for the distribution of disposable income per consumption unit. This may potentially introduce a bias in the interpretation of the internal socio-economic polarization of the neighborhoods. Another limitation of the data mobilized in this study is the absence of micro-data linking income and residential mobility, which would allow for a more in-depth analysis of gentrification. Indeed, for confidentiality reasons, the FiLoSoFi system does not provide this type of data. Furthermore, the proportions of households recently settled in their homes derived from the population census pose interpretative challenges, since these data do not reveal whether the new residents already lived in the same neighborhood or whether they came from another neighborhood within the same municipality. The lack of information regarding the duration of housing vacancies presents another challenge for interpreting the evolution of internal polarization in the studied urban neighborhoods. After this brief overview of the limitations of the data mobilized here, our attention will turn to the constraints associated with the variables and the characteristics linked to the internal socio-economic polarization of the neighborhoods in Nice, which we will address through the discussion in this article.

3. Results

3.1. A City with Pronounced Polarization at Its Core

In 2017, the majority (75%) of the IRIS in the metropolitan area of Nice Côte d'Azur are classified into the "rich" and "poor" categories. Nearly 17% of the IRIS areas exhibit a socio-economic profile similar to that of metropolitan France, with an income distribution slightly more concentrated around the central values. Internal polarization affects only 8% of the IRIS areas, primarily located in the city of Nice, especially in the downtown area and along the coast, forming a continuous area encompassing almost the entire city center (Figure 6).

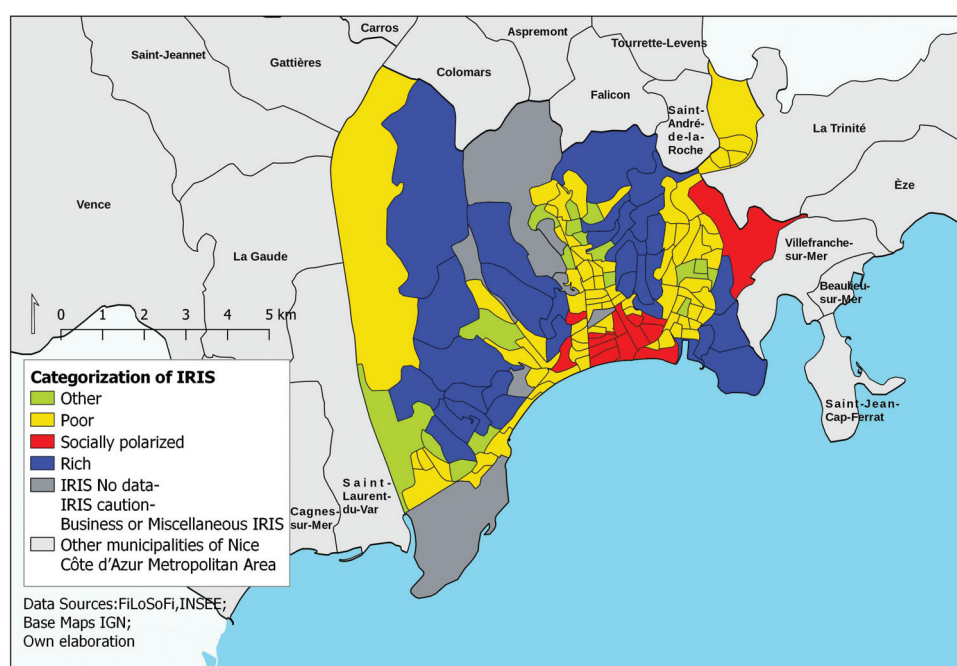


Figure 6. Categorization of the 139 IRIS in the municipality of Nice in 2017. Data sources: Filosofi file, INSEE, and IGN. Own elaboration.

The "poor" IRIS, representing 46%, are mainly concentrated within the municipality of Nice, forming pockets of poverty. These areas of poverty are particularly pronounced in the IRIS areas bordering the west and east of the municipality of Nice, as well as around the central sector of the municipality, where poverty indexes reach very high levels (Figure 7). A very small portion of the "poor" IRIS (5% of the "poor" IRIS areas) are located in the

peripheral municipalities, such as Cagnes-sur-Mer, Carros, Saint-Laurent-du-Var, or Vence.

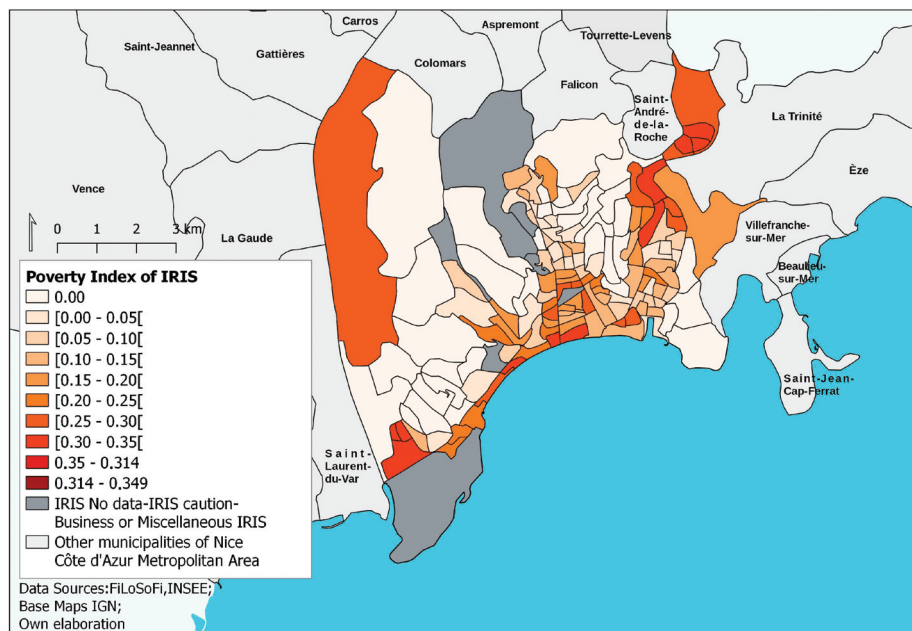


Figure 7. Poverty index of the 139 IRIS of the municipality of Nice in 2017. Data sources: Filosofi file, INSEE, and IGN. Own elaboration.

However, the IRIS considered “rich”, representing 28% of all IRIS, show a more scattered distribution within the metropolitan area of Nice. They dominate in the peripheral municipalities characterized by a low density, such as Carros, Cagnes-sur-Mer, Saint-Laurent-du-Var, or Vence. Within the municipality of Nice, they cluster into four main sectors alternating mainly with the “poor” IRIS from the west to the southeast of the municipality, where the wealth index reaches its maximum level (Figure 8).

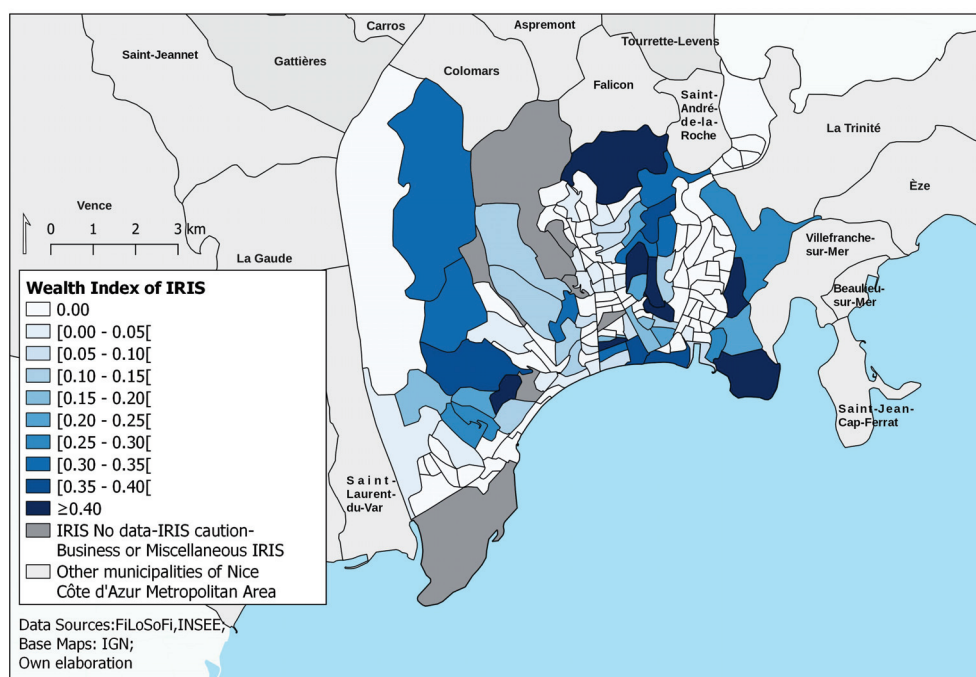


Figure 8. Wealth index of the 139 IRIS of the municipality of Nice in 2017. Data sources: Filosofi file, INSEE, and IGN. Own elaboration.

The IRIS classified as “other” are fewer in number compared to the “poor” and “rich” IRIS, and they are scattered throughout the metropolitan area, with a particularly marked concentration in the east and west. The municipality of La Trinité is exclusively composed of “other” IRIS, making it the most homogeneous municipality in terms of income distribution, both between neighborhoods and within neighborhoods.

Due to the relative uniformity of the peripheral space, mainly occupied by “rich” and “other” IRIS, and the absence of “polarized” IRIS within the peri-urban municipalities, our study focuses on the IRIS of the municipality of Nice. The municipality of Nice encompasses all “polarized” IRIS, totaling 14 out of 139 IRIS in 2017.

3.2. Neighborhoods of the Municipality of Nice with Pronounced Internal Socio-Economic Polarization

Although “polarized” IRIS are not very frequent, their geographical distribution shows a marked concentration around Old Nice, near the coastline, with the exception of one IRIS on the outskirts of the city forming the border between Nice and La Trinité. This concentration of “polarized” IRIS fits into the pattern of the other two categories, “poor” and “rich” IRIS, which themselves also form “blocks” within the urban space of the city of Nice. It can be observed that the distribution of wealthy and poor households follows the topography of the area, with the affluent households located on the hills where the density is lower and the low-income households situated along the valleys with a higher density. Thus, the socio-economic geography of Nice is characterized by large areas of socio-economic coherence that repeat regularly, except in the city center, due to significant income disparities within its neighborhoods. The existence of this pattern confirms the hypothesis that the neighborhoods with strong internal socio-economic polarization are located in the urban core of cities and often raises questions about possible ongoing gentrification.

Some characteristics of the housing stock and its residents are closely linked to the internal socio-economic polarization observed in the 14 “polarized” IRIS of Nice in 2017. This correlation is measured using the Cramér’s V coefficient (the V of Cramér⁴). In the city of Nice, four proportions expressing binary qualitative variables show a correlation with the four categories of IRIS, defined based on the original indexes of wealth and poverty, with a Cramér’s V of 0.20 or higher (Figure 9). These are as follows:

- The proportion of flats belonging to buildings completed before 1945;
- The proportion of secondary and occasional residences;
- The proportion of households renting in social housing;
- The proportion of employed people walking to work.

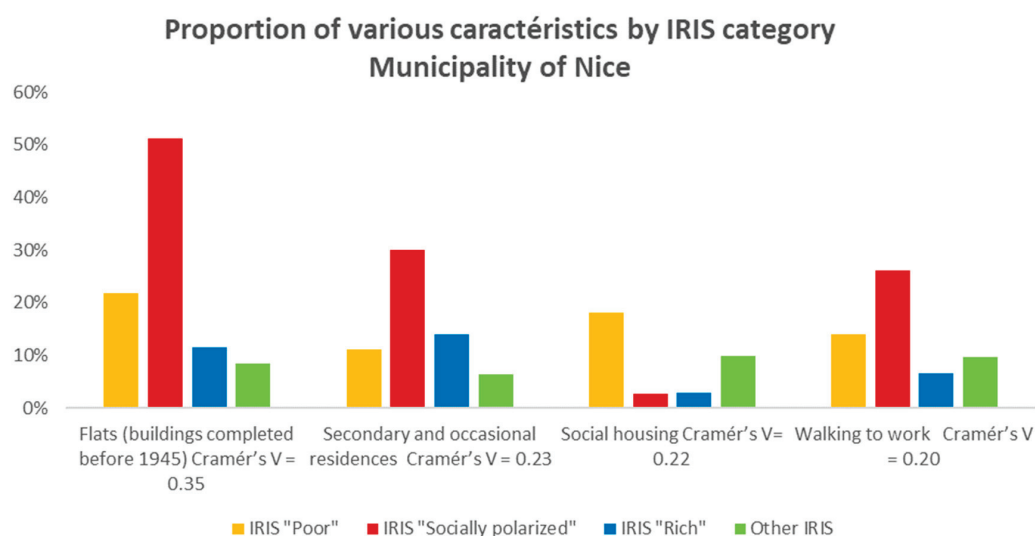


Figure 9. Proportion of various characteristics within the different IRIS categories in the municipality of Nice. Source: INSEE Population Censuses; own elaboration.

Among these four variables, three are closely related to the “polarized” IRIS, highlighting specific characteristics of these IRIS with high internal socio-economic polarization. On average, the “polarized” IRIS show higher proportions of flats belonging to buildings completed before 1945, exceeding by 29 percentage points the average measured in “poor” IRIS and nearly 40 percentage points higher than the average in the other two categories of IRIS. Similarly, the “polarized” IRIS exhibit higher proportions of secondary and occasional residences on average, emphasizing their tourist character compared to the other three categories of IRIS. Furthermore, an IRIS with strong internal socio-economic polarization also include higher proportions of employed people walking to work on average, indicating their central location within the municipality. This proximity to the city’s central functions sets them apart from the other three categories of IRIS.

The proportions of households renting in social housing contrast the “poor” IRIS, where this proportion is relatively high on average, with other categories of IRIS. In fact, the proportions of households renting in social housing within “polarized” and “rich” IRIS are equal and significantly lower than the average observed in a “poor” IRIS. The very limited presence of social housing in a “rich” IRIS can be easily explained by the criteria for allocating such housing, which primarily depend on low-income levels. Regarding “polarized” IRIS, the scarcity of social housing reflects more their central geographic position within the municipality, where there are no major social housing complexes. In other words, the coexistence of low-income and high-income populations in a “polarized” IRIS is not due to isolated social housing buildings forming “poor” enclaves amidst relative material affluence. More generally, “polarized” IRIS distinguish themselves from both “rich” and “poor” IRIS without necessarily constituting an intermediate category, but rather delineate their own specificity as urban central areas with older buildings primarily oriented towards tourism.

The principal component analysis (PCA) allows for a multivariate perspective, not just a bivariate one (as previously discussed), to capture the specificities of the population and housing characteristics across different categories of IRIS. This PCA is applied to the wealth and poverty indexes as well as to the full set of proportions of population and housing characteristics in 2017 across the 139 IRIS of the municipality of Nice⁵.

The histogram of the eigenvalues from the PCA reveals that the first two axes summarize 56% of the statistical information (Figure 10). The first axis, encompassing around 33% of the information, contrasts an IRIS with the characteristics of poor populations, with overrepresentations of inhabitants without diplomas, inactive individuals, workers, immigrants, overcrowded housing, and high poverty index values, against an IRIS with the characteristics of rather affluent populations, with overrepresentations of inhabitants with higher education degrees, managers, intermediate professions, homeowners, and high wealth index values. In other words, it highlights the socio-economic contrasts between urban areas.

The second axis, summarizing 23% of the initial information, is mainly correlated with characteristics related to housing, the daily home-to-work mobility of employed individuals, and residential mobility. It contrasts a central IRIS, characterized by an overrepresentation of small, older dwellings occupied by small households, high residential mobility, a higher frequency of soft daily mobility, and a greater presence of secondary residences, with IRIS areas further from the city center characterized by family-oriented populations and an overrepresentation of large dwellings. This confirms the singularity of downtown Nice and the overrepresentation of secondary and occasional residences within it, a consequence of two centuries of tourist fame. Other variables have relatively high coordinates in the first factorial plane without being specifically associated with either axis, occupying an intermediate position between the two dimensions. In one quadrant of this first factorial plane, the characteristics often relate to precariousness, particularly among young adults (the frequency of unemployment or part-time work and the proportion of 18–24-year-olds) or adults of parental age (proportion of single parent families). In another quadrant of this first factorial plane, the characteristics are more associated with large

families occupying social housing (the proportion of families with four children, proportion of social housing, and proportion of those under 18).

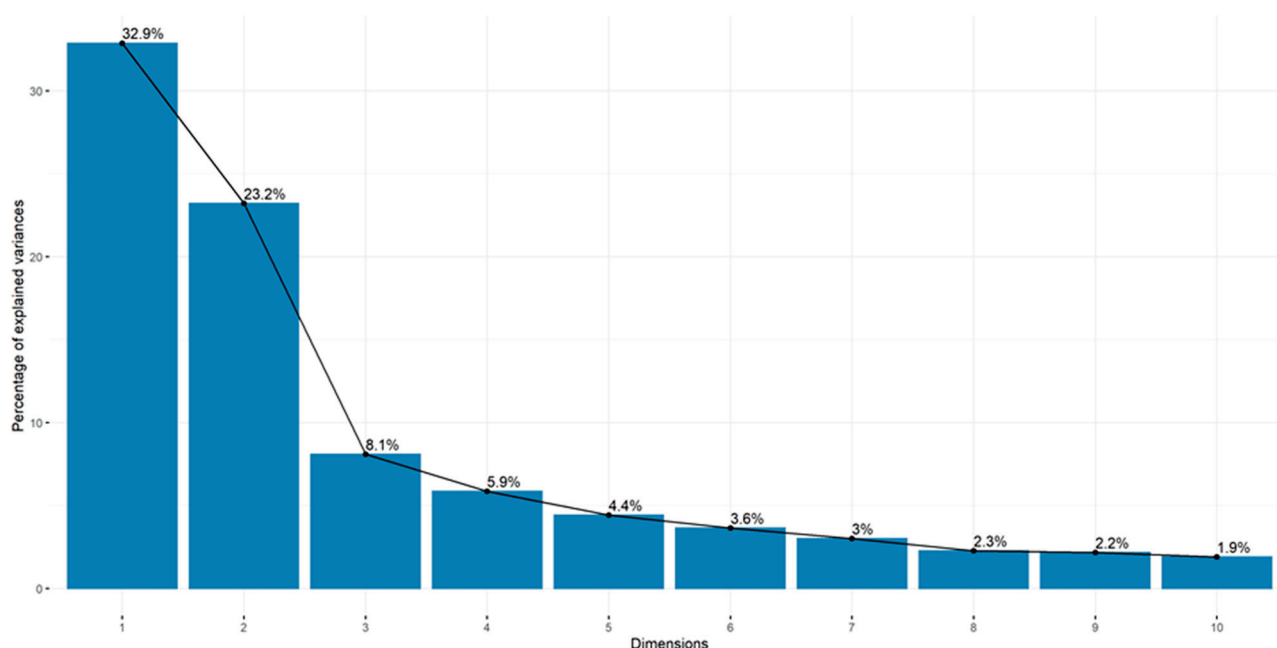


Figure 10. Percentage of variance explained by the dimensions of the principal component analysis. Source: INSEE Population Censuses; own elaboration.

When examining the projection of the 139 IRIS on the first factorial plane, it is observed that the “poor” IRIS form a vast cloud extending from the central part of the first factorial plane to the entire area corresponding to the positive coordinates on the first axis (Figure 11). Conversely, the “rich” IRIS are concentrated in the area corresponding to the negative coordinates on the first axis, forming a more restricted cloud. The “polarized” IRIS and the “other” IRIS are arranged along a “band” positioned between the “poor” and “rich” IRIS. The “polarized” IRIS are located exclusively at the level of the positive coordinates on the second axis. The “other” IRIS primarily occupy the part of the cloud corresponding to the negative coordinates on the second axis. Thus, the correlation of sociodemographic characteristics and the indexes of wealth and poverty used to form the four categories of IRIS is confirmed by the relatively distinct positioning of these categories on the first factorial plane.

Analyzing the distribution of the “polarized” IRIS on the first factorial plane (Figure 11), we observe a relatively compact and less extensive cloud compared to the other IRIS categories, indicating a significant correlation with the characteristics related to centrality and tourist function (the overrepresentation⁶ of small households, small and old apartments, secondary residences, soft daily mobility, and high residential mobility). The “polarized” IRIS exhibit seemingly contradictory traits, a logical consequence of their internal polarization, such as social status (the overrepresentation of higher education graduates) and precarious employment (the overrepresentation of part-time contracts). While the position of the “polarized” IRIS on the first factorial plane shows some homogeneity, one IRIS clearly deviates from the cluster of “polarized” IRIS (Figure 12). This is the “Vinaigrier” IRIS, which stands out due to a very low proportion of secondary residences and, conversely, a significant proportion of social housing. This is particularly notable, because, in the majority of “polarized” IRIS, social housing is under-represented while secondary residences are highly overrepresented. This is evidenced by its position on the first factorial plane but also by its geographical position on the outskirts of the city of Nice, far from the “cluster” of “polarized” IRIS.

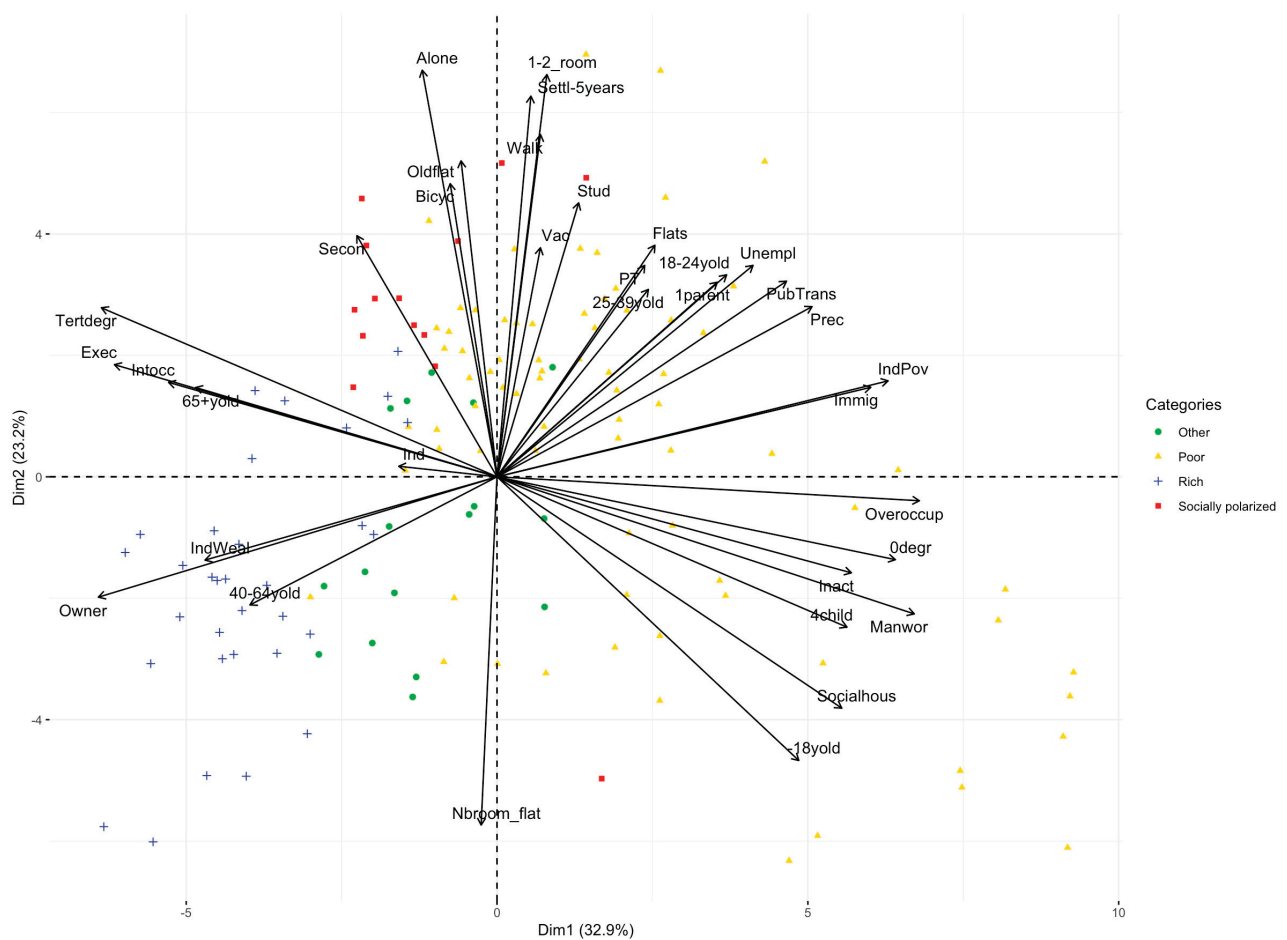


Figure 11. Simultaneous representation of the variables and the 139 IRIS of Nice on the first factorial plane of the principal component analysis. Source: INSEE Population Censuses; own elaboration.

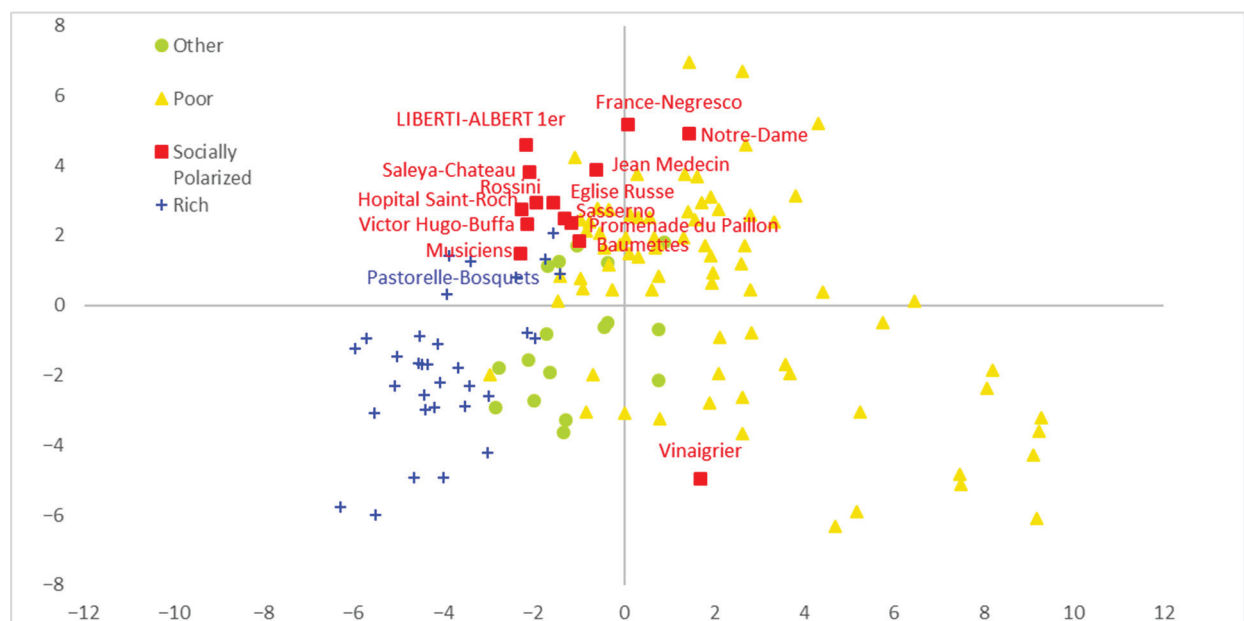


Figure 12. Representation of the 139 IRIS of Nice on the first factorial plane of the principal component analysis. Source: INSEE Population Censuses; own elaboration.

Because of its singular character, which may seem contradictory to the trends prevailing during the 2010s in terms of housing costs, socio-economic polarization could be considered a priori as a transitional stage in gentrification, which in the case of Nice could also come under the heading of touristification. With regard to gentrification, we can attempt to verify whether Nice's "polarized" IRIS are moving in this direction by examining the levels and trends between 2012 and 2017 in the poverty and wealth indexes of "polarized" IRIS in 2017.

3.3. Internal Socio-Economic Polarization and the Gentrification Process

Examining the changes in the poverty and wealth indexes between 2012 and 2017 for the "polarized" IRIS in the municipality of Nice in 2017, we find that none of them experienced a simultaneous decrease in both the wealth and poverty indexes. Although the poverty and wealth indexes of the "polarized" IRIS do not necessarily follow identical trends over time and do not start from the same levels of poverty and wealth, this observation suggests that, from 2012 to 2017, the inhabitants of the "polarized" IRISs did not tend to economically homogenize.

It is notable that only two out of the fourteen "polarized" IRIS in 2017 saw their wealth index decrease between these two years. This observation might suggest that the internal socio-economic polarizations observed in most of the affected IRISs in Nice actually constitute a stage in the gentrification process of the city center. While an increase in the frequency of high-income populations in many of these IRIS is an undeniable reality, it is not certain that these developments will lead to a massive replacement of low-income populations by socio-economically advantaged populations.

In certain IRIS, the increase in the wealth index, even reaching very high levels, does not accompany a decrease in the poverty index or the poverty rate. For example, the "Saleya-Château" IRIS saw its wealth index rise from 0.26 to 0.37 between 2012 and 2017, which in 2017 corresponded to the income per consumption unit of the top 10% of wealthiest individuals, being over 50% higher than the income per consumption unit of the top 10% of the wealthiest individuals in the entirety of metropolitan France. However, alongside this significant growth in the upper end of the income distribution, the poverty index in this IRIS increased from 0.07 to 0.15, which in 2017 corresponded to the income per consumption unit of the bottom 10% of poorest individuals, being more than 20% lower than the income per consumption unit of the bottom 10% of the poorest individuals in metropolitan France, also corresponding to a poverty rate of 21% (compared to 14.1% for the entirety of metropolitan France). In this "Saleya-Château" IRIS, it appears that, instead of gradually transforming into a "wealthy" IRIS, the sociodemographic changes are exacerbating the internal socio-economic polarization.

Two other IRIS ("Victor-Hugo-Buffera" and "Musiciens") experience similar trends with very high wealth indexes in 2017 (0.32 and 0.47, corresponding to the income per consumption unit of the top 10% of wealthiest individuals, being, respectively, 50% and nearly 60% higher than that of the top 10% of the wealthiest individuals in metropolitan France). At the same time, the poverty indexes also increased in these two IRIS, reaching significant levels in 2017 (0.18 and 0.10, corresponding to poverty rates of 22% and 18%, respectively). Thus, like the "Saleya-Château" IRIS, the "Musiciens" and "Victor-Hugo-Buffera" IRIS are characterized both by the highest internal socio-economic polarizations and by an increase in these polarizations, primarily driven by the upper end of the income distribution but with a poverty frequency that tends to increase.

In some respects, the "Liberti-Albert 1er" IRIS shows some similarities with these IRIS ("Victor-Hugo-Buffera", "Musiciens", and "Saleya-Château") characterized in 2017 by the highest levels of internal socio-economic polarization. The wealth index there is very high (0.39 in 2017, indicating a median income per consumption unit of the top 10% of wealthiest individuals, being over 50% higher than that in metropolitan France). However, unlike the three other highly polarized IRIS, it is distinguished by a decrease in the poverty index between 2012 and 2017, which suggests possible gentrification, although this remains

a distant prospect given the persistence of poverty in this IRIS (in 2017, the poverty index was still 0.13, with a poverty rate slightly above 20%). These four IRIS are also characterized by a high frequency of secondary or occasional residences, accounting for around 40% of the housing stock, which could increase pressures on the housing market and favor the replacement of low-income populations by affluent populations. However, the situation is more nuanced, as, even when the frequency of poor populations slightly decreases, it remains at a very high level. This apparent paradox might stem from an old, or even very old, housing stock (e.g., the “Saleya-Château” IRIS), which includes a substantial portion of mediocre-quality apartments with a much dispersed ownership structure, making major urban renewal projects difficult. The very high housing vacancy rates (between 11% and 21%) observed in these four IRIS could indirectly and partially indicate a significant portion of poor-quality⁷ housing. Ultimately, these four IRISs, characterized by a significant and growing presence of high, even very high, income populations, also maintain a substantial proportion of very low-income populations. While this does not constitute an insurmountable barrier to gentrification, this persistence of poverty, reflecting the peculiarities of the housing stock, delays its completion and maintains a very high internal socio-economic polarization that could endure.

Three other IRIS (“Sasserno”, “Jean Médecin”, and “Rossini”) share some similarities with the previous four, notably the persistence of significant poverty (poverty indexes above 0.10 in 2017, corresponding to poverty rates just below 20%, reflecting a slight decline between 2012 and 2017). However, they differ by having lower levels of wealth indexes (around 0.16 in 2017, which corresponds to a consumption unit income for the top 10% that is about 20% higher than that for the entirety of Metropolitan France). Although, in one of these three IRIS, the wealth index significantly increased between 2012 and 2017, the gentrification process, if confirmed, remained at a moderately advanced stage, and the lesser internal socio-economic polarization compared to the four previously analyzed IRIS mainly reflects a lesser skewing towards the upper end of the income distribution. Ultimately, for these three IRIS (“Sasserno”, “Jean Médecin”, and “Rossini”), gentrification does not appear to be an obvious process and is still far from complete. This is likely also the case for the IRIS “Promenade du Paillon”. This IRIS is somewhat of a hybrid between the IRIS “Saleya-Château”, “Musiciens”, “Victor-Hugo-Buffa”, and “Liberti-Albert 1er” and the IRISs “Sasserno”, “Jean Médecin”, and “Rossini”. The level of poverty there is quite comparable and significant (a poverty index of 0.09 in 2017 for a poverty rate of 18%) and the level of wealth is intermediate (a wealth index of 0.24 in 2017, corresponding to a consumption unit income for the top 10% that is more than 30% higher than that for the entirety of Metropolitan France). Here again, gentrification does not appear to be a very dynamic process, despite the skewing towards the upper end of the income distribution, because not only does the level of poverty remain significant but it tends to increase between 2012 and 2017 while the wealth index slightly decreases.

The IRIS “Hôpital-Saint-Roch”, “Baumettes”, and “Eglise-Russe” are those for which the internal socio-economic polarization is least marked, with, in 2017, poverty indexes all between 0.04 and 0.12 (corresponding to poverty rates between 16% and 18% and incomes per consumption unit for the richest 10% of people that are 9% to 15% higher than for the entirety of Metropolitan France). Despite significant increases in the wealth indexes between 2012 and 2017, their still moderate level after this increase seems to indicate that the gentrification process, if it continues, is still far from being complete in these areas.

For most of the IRIS in Nice characterized by strong internal socio-economic polarization, this results from a double distortion of income distribution, significant downward but even more pronounced upward. This stronger upward distortion in income distribution and its tendency to intensify between 2012 and 2017 provide an argument for assuming that gentrification processes are currently under development, while noting that they are still far from being completed due to a significant persistence of poverty, although sometimes slightly decreasing. However, there are two IRIS (“Notre-Dame” and “France-Negresco”) where the strong internal socio-economic polarization primarily results from a downward

distortion of income distribution, with poverty indices in 2017 around 0.30 (corresponding to poverty rates of approximately 30%) and wealth indices of 0.06 and 0.07 (which means that the income per consumption unit of the wealthiest 10% is 12% higher than the national average in mainland France). In these two IRIS, more so than in other "polarized" IRIS, any potential gentrification (the "Notre-Dame" IRIS, categorized as "poor" in 2012, is classified as "polarized" in 2017 after an increase in the wealth index) would take a long time to unfold given the persistence of significant poverty.

Finally, the IRIS "Vinaigrier" stands out clearly from other "polarized" IRIS both in terms of its geographical position within the city of Nice and its sociodemographic characteristics and housing stock, as evidenced by its position on the first factorial plane. This IRIS is one of those with the most significant internal socio-economic polarization, with considerable distortions at both the lower and upper ends of the income distribution (in 2017, the poverty index was 0.19, corresponding to a poverty rate of over 26%, and the wealth index reached 0.28, indicating that the income per consumption unit of the wealthiest 10% was nearly 35% higher than the average for Metropolitan France). This strong internal socio-economic polarization, which increased between 2012 and 2017 with rising poverty and wealth indexes, is structured by the existence of two distinct housing poles within this peripheral family housing IRIS. The internal socio-economic polarization of other "polarized" IRIS located in the heart of the historic city seems to result mainly from the heterogeneous quality of a stock of very old small apartments in a complex urban fabric, where buildings in visibly varying states of repair coexist. In contrast, within the "Vinaigrier" IRIS, the buildings are much newer and include houses (nearly 50% of the housing) that are relatively large and mostly owner-occupied, as well as medium or large apartments occupied by social housing tenants (about one-third of households). These two types of housing structure the socio-economic differences among their residents and generate the internal socio-economic polarization of the IRIS "Vinaigrier". In this IRIS, perhaps even more so than in the "polarized" IRIS in the heart of the historic city, the nature of the housing stock, with its strong social component, makes it difficult to achieve gentrification, which would lead to the replacement of low-income populations with high-income populations. On the contrary, it is very likely that this very uncommon form of internal socio-economic polarization will persist for a long time. Depending on the available land and the orientation of housing programs, this lasting polarization of income distribution could nevertheless shift upwards or downwards.

Overall, it seems very clear that gentrification processes are unfolding in the historic urban core of Nice and that the internal socio-economic polarization of many IRISs within this urban core is partly caused by this unfolding. However, it seems that, while these gentrification processes may be favored by the tension in the real estate market, likely exacerbated by the secondary residence status of a significant portion of the housing stock, other aspects of the structure of this housing stock limit gentrification. In the historic urban core, the existence of old or very old buildings, whose state of maintenance or renovation can vary considerably and whose ownership structure is very dispersed, appears to result in the retention of low- or very low-income populations, even in the neighborhoods where the housing market is tight. More marginally, in a less central part of the city, the socio-economic polarization of an IRIS in Nice results from the coexistence of social housing and affluent suburban areas whose expansion depends on available land. In any case, it seems that, despite the increase in the proportion of high-income populations, low- or very low-income populations are far from disappearing, leading to unfinished gentrification and an internal socio-economic polarization that is likely to persist.

4. Discussion

The coexistence of high-income populations and low- or very low-income populations within the same neighborhood is quite common in the city center of Nice, confirming the reality of the internal socio-economic polarization of certain central urban areas. This relatively high frequency, compared to other major French cities and their socio-urban

forms, partly reflects the unique context of Nice, with its historic urban core comprising buildings of highly variable quality, secondary residences, and vacant housing. Although gentrification processes are unfolding in most of these socially polarized neighborhoods, there is no indication that they will fully displace low- or even very low-income populations. On the contrary, it seems that these poorer populations remain in these neighborhoods, likely due to the persistence of mediocre-quality old housing, sometimes referred to as “de facto social housing”, whose very dispersed ownership structures limit redevelopment efforts. In some of these central areas, there is even a simultaneous increase in both poverty and wealth, or, more rarely, only an increase in poverty. In all cases, the level of poverty remains significant, with a few rare areas in this urban core of Nice still showing modest wealth levels, indicating the beginning of gentrification, whose future remains uncertain. Therefore, there are good reasons to consider that in most areas of downtown Nice, variously affected by gentrification processes, internal socio-economic polarization is likely to persist, at least in the medium term. This result, which questions the continuation of sociodemographic trends in the hearts of major cities, also raises other concerns in terms of both the extent of the observed internal socio-economic polarizations and the social consequences experienced by residents.

As the presentation of the sociodemographic context of Nice has shown, the age composition of the municipality differs significantly from that observed in other major provincial cities in France. A lower proportion of young adults primarily distinguishes it, notably students aged 18–24 and a higher proportion of people aged 60 and over. This under-representation of resident student populations is much less pronounced in Nice than in other major French cities, such as Marseille, and can be partly explained by the density of the PACA region, which encourages students to stay in their parental homes and commute daily to higher education sites. The higher proportion of people aged 60 and over largely reflects the attractiveness of the Côte d’Azur coastline and, in particular, the city of Nice for retirees. In central neighborhoods with a high internal socio-economic polarization, this high proportion of seniors is often even more pronounced than in the rest of the municipality, raising the question of the role of these retired populations in this social polarization. Are they overrepresented at one of the extreme poles of the income distribution, thereby playing a significant role in internal socio-economic polarization? Or, conversely, are these people aged 60 and over themselves subject to this social polarization within these neighborhoods?

Beyond the fact that the age of individuals contributing to the neighborhood’s internal socio-economic polarization is likely to strongly influence how residents experience their urban environment, this age also impacts the potential for population renewal in the neighborhood. Indeed, the life cycle determines residential choices and influences the social structure of the urban space through the mobilities associated with these choices. The residential strategies of elderly people, at the end of their residential trajectory, differ from those of young adults and families (Scarella 2014; Fusco and Scarella 2011). These specific residential mobilities of elderly people, particularly upon retirement or later, when possibly moving to a retirement home, combine with their mortality to affect neighborhood demographics (Scarella 2014) and thus potentially the social composition of polarized areas. The fate of homes initially occupied by elderly people who have moved or passed away depends on many factors (including the standard of living of these elderly people, property ownership status, and potential inheritance). Depending on the situation, these vacated homes may contribute to vacancy, gentrification, or pauperization. Similarly, the freeing up of homes due to the departure or death of elderly people could lead to the rejuvenation of the neighborhood or contribute to maintaining the overrepresentation of those aged 60 and over. In other major cities, such as Bordeaux, the replacement of elderly populations who have died or moved to retirement homes often with affluent families has significantly contributed to the gentrification of certain neighborhoods. However, this usually occurs in neighborhoods relatively close to the historic urban core rather than in neighborhoods that

are part of this historic urban core, whose urban form and housing structure are not the most sought after by families with children.

The high vacancy rate observed in the socially polarized neighborhoods of Nice is also a factor to consider when examining the future prospects of these areas. This significant vacancy within the housing stock of neighborhoods with strong internal socio-economic polarization likely results from a combination of three factors. This is undoubtedly partly due to the frictional vacancy associated with small dwellings with a high turnover rate, since socially polarized neighborhoods are, as we have seen, characterized by an overrepresentation of households that have recently moved into their dwellings, which reflects this turnover. It is also very likely to be the case of a structural vacancy, corresponding to obsolete and depreciated housing, with some of the latter constituting the vacancies and being outside the market and the others nevertheless being occupied and constituting a 'de facto social stock', which seems to play an important role in the internal socio-economic polarization of the neighborhoods. The existence of such a structural vacancy in the housing stock of Nice's urban core raises the question of how to renovate and improve the comfort of these areas for the future of the internal socio-economic polarization of Nice's city center neighborhoods. Such transformations, which are likely to revive or accelerate the gentrification process in the city center, would require a strong commitment on the part of property owners, who are currently partly hampered by various obstacles such as financial constraints or multiple ownership. Vacancy is not always an indirect consequence of poor quality, but it can be more nominal than real, with some furnished flats being rented out on a short-term seasonal basis. For example, the increase in the proportion of vacant homes over the last ten years could be correlated with the development of this type of temporary rental.

Having data on the length of time that dwellings remain vacant, in particular via the activity of meters associated with energy or water consumption, would make it possible to answer some of the questions raised by the high proportion of vacant dwellings observed in neighborhoods with a high degree of internal socio-economic polarization. Given the current state of information, the vacancy rate remains difficult to interpret, as it could result in two opposing trends in the future. This high vacancy rate could lead to the impoverishment of "polarized" neighborhoods if vacant housing continues to deteriorate (through the letting of deteriorated vacant housing or persistent vacancy). It could also lead to an increase in the residential value of "polarized" neighborhoods, with more affluent people moving into renovated housing or turning it into second homes, which could accentuate the "touristification" of Nice's urban landscape. These two opposing trends would not necessarily be mutually exclusive but could coexist and thus reinforce the internal polarization of these central neighborhoods.

In the municipality of Nice, with its strong tourist and hospitality economy, the significant presence of secondary residences is emerging as one of the important characteristics of neighborhoods with strong internal socio-economic polarization. The temporary use of part of the housing stock tends to reduce the availability of housing on the local property market, accentuating pressure on the land market. These potential imbalances in the housing market in high-tourism areas could lead to increasing discrimination in access to property and rental supply for the local population. This situation could lead to a decline in the permanent population and, in some neighborhoods with a strong identity, a possible loss of that identity (Lopez-Gay et al. 2021; Fusco and Scarella 2008b). In tourist areas such as the municipality of Nice, online temporary rental platforms may also have contributed, through their increased profitability, to reinforcing the secondary destination of some of the accommodation and played a decisive role in the shortage of small flats available for long-term rental (Christofle and Hélon 2018; DREAL Provence-Alpes Côte d'Azur 2018). The significant proportion of secondary residences in "polarized" neighborhoods and their possible effect on housing market tension further reinforces the idea that, in these neighborhoods, there is a segmentation of the rental stock, leading to the retention of a large proportion of low-income households. It is also conceivable that the over-frequentation

of some of these neighborhoods by tourists reduces their residential appeal for affluent populations and ultimately acts as a brake on gentrification.

In any case, while secondary residences are an important component of “polarized” neighborhoods, most of the income of their owners (some of whom nevertheless declare their income at the place of their secondary residence) and the income of their temporary tenants are not included in the localized tax data for these neighborhoods. This means that the social polarization measured by the poverty and wealth indexes of the households occupying the main residences in the neighborhoods of Nice’s urban core is potentially underestimated from the point of view of the populations actually present. In fact, the high proportion of secondary residences in these neighborhoods could be reflected, in terms of the population present, by an even higher weighting of high-income households, since the vast majority of secondary residence owners are people with high economic resources and, to a lesser degree, must be temporary tenants. In other words, in terms of the populations actually present, the “polarized” neighborhoods of Nice’s urban core are probably even more so during certain seasons, with an even more marked overrepresentation of affluent populations. Similarly, certain areas of the city center or seafront, considered “poor” from the point of view of the incomes of permanent residents, are, perhaps temporarily, areas of strong internal socio-economic polarization if we consider the population actually present. In order to gain a more in-depth understanding of the role of secondary residences in the internal socio-economic polarization of these neighborhoods, it would be desirable to gain a better understanding of the nature of the dwellings in question (the size, age of construction, condition, length of occupancy during the year⁸, etc.) and the sociology of their owners (Scarella 2014) and temporary tenants. The geographical coexistence of “temporary” and “permanent” populations also raises questions about the dynamics of the temporal relations between neighbors, the local roots of dual residents, and the involvement of local people in the tourism sector (staff, tourist services, parallel accommodation trade, tourist agencies, etc.) (Christofle and Hélon 2018).

More generally, the socio-economic heterogeneity observed in “polarized” neighborhoods does not make it possible to fully understand neighborhood relations and the degree to which residents participate in neighborhood life. Physical proximity does not necessarily imply social proximity (Park 2004; Lehman-Frisch 2008; Chabrol and Launay 2016). It can attenuate social distances, but it can also “stage the differences” of neighboring populations (Bozon 1984; Simon 1995; Giroud 2015; Jeanmougin and Bouillon 2016). In socially polarized neighborhoods, various types of sociability emerge, ranging from deep social relationships between similar residents to mutual avoidance and even conflict. This mutual avoidance behavior between heterogeneous populations takes place by dividing the space into different uses and visibilities, as several case studies have shown (Chamboredon and Lemaire 1970; Bacqué and Fijalkow 2006; Simon 1997; Jeanmougin and Bouillon 2016; Lehman-Frisch 2008; Tissot 2010). Even if some residents appreciate social diversity in principle, their practices may not go beyond these intentions in principle and result in completely different everyday uses of space (Grafmeyer and Authier 2019; Lehman-Frisch 2003). The appropriation of neighborhood life is manifested through a multiplicity of socio-economic and cultural factors, such as participation in neighborhood associations, the occupation of public space, visibility / presence in the public sphere and residential homes, and, finally, the schooling of children and adolescents in educational establishments. It is mainly in the school sphere that several studies have noted the ambivalence of social mixing and avoidance strategies (Van Zanten 2009; Giroud 2015; Launay 2016; Maurin 2004; Audren et al. 2016; Préteceille 2006b). Despite the various forms of distancing and intermingling observed, this coexistence can nevertheless have positive effects on neighborhood social life (Oberti and Préteceille 2016; Pinçon and Pinçon-Charlot 2014).

5. Conclusions

Among large French cities, Nice is one of those where neighborhoods displaying strong internal socio-economic polarization are the least common. In Nice, these socially polarized neighborhoods are concentrated in the municipality's dense urban core. As in other cities, the age of buildings is a characteristic that is highly correlated with the internal socio-economic polarization of neighborhoods. However, the specificity of Nice's socially polarized neighborhoods lies in the age composition of the population in these neighborhoods, where, unlike many other large cities, very young adult students are not really overrepresented, whereas retirees and secondary residences are very strongly overrepresented. The tension and high prices prevailing on the housing market caused by this high proportion of secondary residences or temporary residences do not, however, seem to be reducing the internal socio-economic polarization of these neighborhoods, since the poverty of a significant proportion of permanent residents remains high or very high. This does not mean, however, that gentrification processes are absent from these "polarized" neighborhoods, but simply that they are hampered by the poor quality of some of the older housing, the ownership structure of which is undoubtedly very dispersed. Thus, in the urban heart of Nice, even when the proportion of high-income residents increases, this does not automatically result in the poorest residents being driven out, probably because of the highly segmented nature of the rental market. This coexistence of populations with very different incomes, undoubtedly reinforced during certain seasons by people living in secondary residences, does not necessarily imply a great diversity of experience of the city, as geographical proximity only translates into social proximity in very limited areas.

In a broader perspective, this article highlights the coexistence of populations with diametrically opposed economic resources, characterized by more or less sustainable situations. The evolution of income distribution in these neighborhoods, particularly in central areas, shows that this socio-economic polarization does not follow the uniform model of the socio-urban transformations often observed in metropolitan city centers. Contrary to a significant portion of the literature that describes gentrification as an inevitable and nearly complete process in city centers, this study nuances this view by revealing more complex realities. In particular, the case of Nice illustrates the limits of the gentrification process and sheds light on the internal socio-economic polarization of urban neighborhoods as another aspect of socio-urban dynamics that is rarely studied. Analyzing these dynamics in different urban contexts could provide a broader understanding of the factors associated with the socio-economic evolution of urban neighborhoods.

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Notes

- ¹ The comparable territories selected are municipalities with populations ranging from 200,000 to 500,000 inhabitants in 2017. These include the municipalities of Lille, Rennes, Bordeaux, Toulouse, Nantes, Strasbourg, and Montpellier.
- ² Aggregated units for statistical information (IRIS) are a set of contiguous units populated by approximately 2000 inhabitants (the least populated IRISs have 1800 inhabitants and the most populated have 5000 inhabitants).
- ³ Some households file their tax returns in the department where their secondary residence is located.

- ⁴ Cramér's V is a measure of correlation between two qualitative variables. In the absence of correlation, Cramér's V is 0, and, in the case of absolute correlation, it is 1. Generally, a Cramér's V below 0.1 indicates a very weak correlation, while a Cramér's V above 0.3 indicates a strong correlation.
- ⁵ For reasons of statistical validity and data interpretation, only the residential IRIS of municipalities with at least 10,000 inhabitants, for which INSEE does not mention any particular caution, are included in the analysis. Activity IRIS are not considered as they do not correspond to the objective of this analysis.
- ⁶ In all the results presented in Section 3, any overrepresentations or under-representations observed for certain categories of populations or housing refer to other IRIS in the municipality of Nice (the PCA results) or to the average of the entire municipality (the results of the trend analysis of the poverty and wealth indexes between 2012 and 2017).
- ⁷ Clearly, the vacancy rate is only an indirect and imperfect indicator of the effect of the poor quality of part of the housing stock on the presence of low-income populations, since, by definition, these populations do not occupy vacant dwellings. Furthermore, in the context of the touristification of these IRIS, reflected in the high proportion of second homes, it is not impossible that some of the vacant dwellings are in fact dwellings intended for occasional rental.
- ⁸ With respect to the current state of the available data, only the age of buildings containing secondary or occasional residences can be known at the scale of entire municipalities via the detailed "housing" file from the updated population census.

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Article

Ethnic Residential Segregation: Evidence from Two Italian Functional Urban Areas

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Abstract: This article aims to update the analysis of the residential segregation of the foreign population in European cities by considering the most recent 2021 census data for two different Italian metropolitan areas, Milan and Bologna. The diachronic analysis (2001–2021) of several indices of residential segregation (i.e., dissimilarity index, two group and multigroup; location quotient; and kernel density estimation) at the metropolitan scale (i.e., functional urban area) will contribute to the debate on the residential settlement patterns of foreign populations, highlighting the specificities of Southern European cities. Despite the significant differences between the two cities considered, the same desegregation trends (i.e., reduction in segregation indices) are identified in both cases. The results show a decrease in residential segregation over time in both core and commuting areas. Furthermore, phenomena of peripheralisation related to overrepresentation in metropolitan municipalities emerge, although core areas remain where the foreign population is most concentrated. The complexity and ambivalence of residential dynamics in the two cases suggest that residential segregation can also take “unusual forms” in Southern European cities that are not always related to the macro-concentration phenomena. In this sense, the “urban diaspora” hypothesis seems to be a suitable concept for capturing the new distributional trend of the foreign population in the Southern European context.

Keywords: ethnic residential segregation; functional urban area; Southern European cities; Italy

1. Introduction

Ethnic residential segregation in European cities has gained prominence in public and academic debate in recent decades. Several studies have focused on the analysis of segregation indices, and a broad debate exists on the criteria for measuring the phenomenon quantitatively, as well as on the causes, forms, and trends of ethnic residential segregation, which, in European cities, seem to differ from those in North America due to the specificities of local contexts. However, the debate is limited by dated data and does not consider the metropolitan dimension of segregation processes, except for a few studies (Martori and Apparicio 2011; Arbaci 2019; Benassi et al. 2020a, 2020b; Pratschke and Benassi 2024). The present work contributes to this debate in at least two directions: firstly, by updating the analysis to include the data of the Italian permanent census of 2021; and, secondly, by showing the results of a comparative analysis between two Italian FUAs (Bologna and Milan) to investigate similar trends in the distribution of the foreign population in two very different contexts. This paper is organised as follows. After a review of the debate on the different instruments for measuring segregation, attention is paid to the critical segregation debate developed in Southern European cities. In the second part, the research design, the choice of case studies, the methodology, and the research techniques are presented. Finally, the results of the analysis are illustrated and discussed, together with future research directions.

2. Measuring Residential Segregation

Residential segregation, as a social phenomenon, was first investigated in North America in the 1920s. In that context, segregation was mainly conceived as a form of isolation in which social distance is based upon physical separation (Park 1928). The approach and conceptualisation developed by the Chicago School have steered the subsequent debate. Human ecology theorised racial segregation as a temporary phenomenon in the integration process of immigrant groups with the urban fabric. The academic debate, following the trajectory of the assimilationist approach, soon shifted to the criteria for measuring physical and social distance.

Between the 1950s and 1980s, the North American literature focused on identifying the most appropriate methods to measure residential segregation. First, Duncan and Duncan (1955) demonstrated that the index of dissimilarity (ID) is the most useful tool for measuring residential segregation. The index of dissimilarity measures the degree of dissimilarity between the distribution of one group and another, i.e., the reference group. Accordingly, a few years later, Taeuber and Taeuber (1965, 1976) reached the same conclusion with respect to the ID index, although there is still no full agreement on a single tool to measure the phenomenon mathematically. Other scholars argue that the most appropriate indices are the exposure ones, which observe the possibilities of interaction within a neighbourhood. For example, the isolation index measures the probability of people meeting a member of the same social group in a specific territorial unit (Bell 1954; Lieberman and Carter 1982a, 1982b).

A further contribution to the debate on the criteria for measuring segregation is provided by James and Taeuber (1985), who identify four different dimensions to assess the distribution of social groups across urban areas. Building on James and Taeuber's analysis, Massey and Denton (1988) include a higher number of indices, namely 20. The authors argue that it is necessary to take five different dimensions of segregation into account simultaneously, and, through an analytical comparison, they identify for each of these dimensions—*isolation, concentration, exposure, centralisation, and spatial clustering*—the most accurate index. Despite the thoroughness of the analysis, the method identified by Massey and Denton failed to establish itself as the only way of measuring the phenomenon, even though it is still recognised as one of the most rigorous. Following a similar criterion, Reardon and O'Sullivan (2004) put forward an alternative proposal, condensing the five dimensions previously identified by Massey and Denton into two: *spatial exposure (or spatial isolation) and spatial evenness (or spatial clustering)*. Some analyses have identified measurement criteria in relation to the analysis of the generative causes of the phenomenon (Clark 1986; Dawkins 2004), while others have attempted to identify how levels of segregation vary internationally in English-speaking countries and beyond (Poulsen et al. 2002; Johnston et al. 2007).

3. Ethnic Residential Segregation in European Cities

The academic debate has emphasised that levels of residential segregation in Europe are relatively low compared to those of US cities. Some analyses have shown how the different ethnic-national compositions and the role of the state have generated distinct forms of segregation: in the US context, the racial dimension is more pronounced, while in the European context, it is the socioeconomic and class dimensions that have a greater impact (Wacquant 2007). Moreover, the presence of the welfare state in Europe has been a “moderating factor”, both at the national and local levels, limiting the development of ethnically and socially homogeneous residential areas, although not without contradictions (Andreotti et al. 2012). In this regard, it is interesting to mention the “state-market-family nexus”, which represents an adaptation of the Esping-Anderson model to explain welfare regimes (state, market, and family are understood as welfare providers) (Arbaci 2019). Moreover, several empirical studies have shown that immigrants in Europe seem to follow socioeconomic rather than ethnic logic in the processes of settlement in a new urban context (Musterd 2005; Bergamaschi 2012; Consolazio et al. 2023).

The dissonance in the conceptualisation of segregation between the North American and European schools of thought also has ideological and historical roots. According to Maloutas (2012) and Ruiz-Tagle (2013), there are two key differences. The first concerns the history of urban space in the two contexts. Suburbanisation processes in Southern European cities have not been as strong and intense as in American cities. The European elites have not radically abandoned the historic city centres, and residential mobility is significantly lower. In addition, welfare policies have partially mitigated the effects of social and spatial inequalities, while this has not happened in North American metropolises, where segregation processes have been much more intense. The second argument is related to the different understandings of segregation as a political and social problem. As shown by the spatial assimilation theory and Schelling's preference theory (Schelling 1971), in the American context, segregation is still substantially perceived as the limitation of individual opportunities and as the aggregate result of individual choices. Conversely, in Europe, segregation is conceived as a social and structural problem to the extent that governments have partially attempted to address the problem by mitigating inequalities in the housing and labour markets.

Nevertheless, the approach developed by US scholars has largely influenced the subsequent debate worldwide (Montesano 2023). Segregation has been investigated as an ecological category, strictly related to US-based theories (Maloutas 2004; Arbaci 2019). Segregation has been mainly conceived in terms of concentration, directly associated with the image of the Black American ghettos and urban underclass (Wilson 1987). Concentration, which is just one of the dimensions related to segregation dynamics (Massey and Denton 1988), is still perceived as crucial in segregation studies and is viewed as generating negative social effects. For these reasons, it represents a major issue in policies and public debate (Oberti and Préteceille 2017). However, other approaches have been developed to analyse residential segregation mechanisms, with a specific focus on the Southern European context.

4. Segregation between Concentration and "Urban Diaspora"

In the 1990s, starting with the thesis of social polarisation and global cities, the idea that social inequality growth corresponds to segregation growth at the urban level has spread in the academic debate (Sassen 1997; Borja and Castells 2002). Moreover, although, in some contexts, the two phenomena—i.e., social polarisation and spatial segregation—have grown simultaneously, the same evidence cannot be found in all cities; the relationship between social and spatial inequalities has materialised at the territorial level in different forms and intensities (Maloutas and Fujita 2012; Arbaci 2019). More generally, it has emerged that levels of ethnic segregation are lower in European countries than in US cities, and neighbourhoods with more significant levels of ethnic concentration in Europe remain *de facto* heterogeneous, presenting a certain socio-ethnic mix (Hamnett 1994; van Kempen 1994). Moreover, in Southern European countries, and particularly within the Italian context, the affluent, high-income classes have historically segregated themselves from the broader urban population (Barbagli and Pisati 2012). In Italy, analyses highlight significant processes of both peri-urbanisation (Martinotti 1993) and gentrification (Semi 2015) causing the outflow of low-income groups to suburban or peri-urban areas. The effect in the short and medium terms, however, has been to decrease overall segregation, particularly due to the lower residential isolation of the middle class and the greater social mix in peripheral areas (Barbagli and Pisati 2012).

According to Fujita (2012), the dual-city thesis is appropriate for reading the spatialisation dynamics of social inequalities affecting some Anglo-Saxon cities, while applying the same scheme to European cities is complex. In many Southern European countries, a high level of social inequalities and a low level of segregation coexist because social polarisation is not empirically reflected in the phenomena of spatial segregation and ghettoisation. In fact, by adopting a wider definition, residential segregation can also take "unusual forms" that diverge from an ethnically and socially homogeneous neighbourhood. Different con-

cepts and images have been introduced to investigate segregation dynamics, such as the categories of micro-segregation (e.g., interstices or vertical segregation), marginalisation (e.g., discrimination in the access to the housing market), and peripheralisation (e.g., the process of expulsion from the central to the peripheral areas of the city).

In particular, the literature on interstices (i.e., micro-areas with an overrepresentation of the foreign population in which different nationalities overlap) sheds light on the importance of the scale of analysis: the mechanisms of segregation and marginalisation are visible only by focusing on small territorial units (Bergamaschi 2012). Another example of micro-segregation concerns vertical segregation (i.e., people unevenly distributed according to their social group across the floors of a building), which has been used to describe residential dynamics in the Athenian case (Maloutas and Spyrellis 2016). More generally, these approaches emphasise that forms of spatial segregation can also exist in contexts marked by social heterogeneity, where different social and ethnic groups live in spatial proximity (Maloutas and Karadimitriou 2022).

Beginning in the 2000s, some European scholars questioned the idea that a linear and direct relationship between social and urban inequalities exists (Maloutas 2007; Maloutas and Fujita 2012; Pfirsch and Semi 2016). When considering the local and social context, this relationship can be more complex: an inverse relationship between social polarisation and residential segregation can indeed be found. The mechanisms of dispersal and desegregation (i.e., a reduction in segregation indices) can also be associated with increasing marginalisation dynamics and expulsion rather than upward social or residential mobility. In this regard, Arbaci (2019) elaborated the concept of “urban diaspora” to read those processes of expulsion of immigrant groups from the central areas to the outer boundaries of the metropolitan area. In this sense, the concept of urban diaspora allows us to understand how the increase in inequalities and decrease in spatial segregation are not paradoxical. Notably, recent studies have detected peripheralisation processes in several cities in Italy (Costarelli and Mugnano 2017; Bergamaschi et al. 2021).

Furthermore, several studies in Europe have highlighted the key role played by the metropolitan scale, noting that the spatial patterns of foreign populations in urban areas go beyond administrative limits and include peri-urban and suburban area scales (Martori and Apparicio 2011; Arbaci 2019; Benassi et al. 2020a). This process of expulsion of marginal social groups from the core municipality is also accelerated by the growing importance of gentrification in shaping the suburbanisation of poverty (Hochstenbach and Musterd 2017). Despite this evidence, only a few analyses have assessed residential segregation at the metropolitan scale, even more so in Italy (Guerzoni 2018; Daconto and Montesano 2022), and, to a large extent, studies have been carried out considering urban poles and core municipalities. Moreover, it has been demonstrated that no single European model can be identified, not even for Southern European cities (Arbaci 2019; Benassi et al. 2020b). With rare exceptions (Pratschke and Benassi 2024), another feature of residential segregation studies in Italy is the use of relatively old data, such as those from the 2011 censuses (so far, the latest available), which do not allow for an analysis of the impact on segregation of the significant urban transformation processes that have taken place since 2011.

5. Materials and Methods

5.1. Data and Units of Analysis

Two main types of data were used for the present analysis. First of all, data on the citizenship (Italians, EU foreigners, and non-EU foreigners) of the resident population were used. In particular, data from the 2001 and 2011 population and housing censuses and the 2021 permanent population census refer to census sections, the minimum territorial unit in Italy.

The use of this type of unit has its limitations, given the variability of the population and geometries of the census sections, as well as the presence of empty areas. A recent trend to overcome this limitation is carrying out rezoning and interpolation operations capable of generating homogeneous grids or zones (Pratschke and Benassi 2024; De Falco and

Irpino 2024). In this article, a microscale, that of census sections, was adopted to match the geography of the social process under scrutiny, as the phenomenon of segregation in Italy manifests itself at the microscale. Furthermore, we wanted to observe the phenomenon from a different perspective from other studies, which have used other types of units, to contribute new evidence to the debate on the issue.

To limit the impact of the eccentricity of the census sections on the results, the 2011 and 2021 data were applied to the same spatial unit, and only inhabited sections with a residential density greater than or equal to 100 were selected (18,481 sections selected out of 22,146 total in the Milan FUA and 3587 sections selected out of 4790 total in the Bologna FUA). Secondly, geodata relating to the boundaries of the spatial units necessary for the selection of the ecological units and spatial analysis were used:

- Shapefiles of the 2001 and 2011 census sections to which data from the respective population censuses were joined;
- Shapefile borders of administrative units were used for statistical purposes to obtain the boundaries of the municipalities;
- Shapefile functional urban areas by country, created by the OECD and European Commission, were used to determine the boundaries of the cores and commuting zones of the selected metropolitan areas.

5.2. Selection of Cases

For the analysis, we used the OECD and the European Commission's harmonised definition of urban and metropolitan areas (Dijkstra et al. 2019). The choice was justified by the fact that this definition has already been applied in numerous studies focusing on residential segregation analyses (Benassi et al. 2020a, 2020b). Moreover, unlike the administrative definition, it allowed us to accurately capture the functional and economic connections among cities. The OECD and the European Commission have jointly developed a methodology to define functional urban areas (FUAs) consistently across countries using population density and travel-to-work flows as key information: an FUA consists of a densely inhabited city and a surrounding area whose labour market is highly integrated with the city (Dijkstra et al. 2019). In particular, the method allows us to identify the urban core, with a density of more than 1500 residents per square kilometre and a population of more than 50,000 inhabitants, and the commuting zone, which are the contiguous municipalities where at least 15% of employed residents work in the urban core. Each FUA is then classified according to its population size into four categories: small urban areas, with a population below 200,000 inhabitants; medium-sized urban areas, with a population between 200,000 and 500,000 inhabitants; metropolitan areas, with a population between 500,000 and 1.5 million inhabitants; and large metropolitan areas, with a population of 1.5 million or more inhabitants.

The functional urban areas of Bologna and Milan were the case studies for the analysis. Although they share some common characteristics—being metropolitan areas in Northern Italy with relatively generous and structured welfare systems and important migration hubs belonging to the same “metropolitan” model of socioeconomic integration (Ambrosini 2013)—their diversity, in terms of size, morphology, urban history, and position in national and international urban hierarchies, makes them heterogeneous cases. In this sense, this comparison aims to explore whether there is similarity or diversity in ethnic residential segregation trends in two different Italian metropolitan areas.

Milan and Bologna are both important destinations of the international migration flows in Italy that began in the 1990s and are now stable throughout the country, as demonstrated by the data on naturalisations and immigrant presence in the labour market. The incidence of foreign residents in the total population is 12.6% in the FUA of Milan and 12.4% in the FUA of Bologna, while the national average is 8.7%. Among the foreign resident population, in Bologna, the most numerous nationalities come from Romania (20,239), Morocco (7468), Pakistan (6982), Ukraine (6007), Albania (5966), Bangladesh (5822), Philippines (5685), China (5586), Moldova (5035), and Tunisia (2382), while in Milan, the

most represented nationalities are from Romania (81,949), Egypt (76,570), China (49,036), Philippines (48,054), Peru (36,680), Albania (35,763), Morocco (32,818), Ukraine (30,365), Ecuador (25,174), and Sri Lanka (25,055). In both metropolitan areas, there are more than 155 nationalities, indicating a great heterogeneity of migratory profiles and flows.

In both cases, no direct de/segregation urban policies can be identified, and settlement patterns are mainly influenced by three factors: the integration into the local metropolitan economy, public housing policies characterised by tenure conversion for the middle class, and the concentration of migrants in some public-housing sectors. These dynamics, combined with the broader processes of gentrification, touristification, and studentification, have produced a greater social mix in peripheral areas and peri- and suburbanisation phenomena, particularly for households wishing to access property, with marked ethnic differentiation due to divergent purchasing behaviours (Costarelli 2023).

In terms of the spatial distribution of the foreign population, the two cities exhibit some common and some dissimilar patterns. Several studies have revealed the phenomena of micro-segregation and interstices in both cities, i.e., forms of territorial concentration of foreigners visible on a very fine scale (Bergamaschi 2012; Costarelli and Mugnano 2017). In addition, the relevance of public housing in shaping the spatial distribution of the migrant population on the city territory has been highlighted in both cases (Bergamaschi and Maggio 2020; Costarelli 2023). Nevertheless, peripheralisation processes at the municipal scale were identified in both cities, affecting the migrant population as a whole, albeit with some differences between the two cities (Bergamaschi et al. 2021; Costarelli and Mugnano 2017). Consistent with the urban-planning history and social morphology of the urban fabric, Bologna shows a clear north–south demarcation where, traditionally, more popular neighbourhoods are concentrated in the north, while Milan shows a more evident centre–periphery pattern. In this context, recent studies have also analysed the growing importance of the metropolitan dimension in the residential distribution patterns of the foreign population in both cities (Guerzoni 2018; Daconto and Montesano 2022). For this reason, our contribution aims to go further by adopting a comparative perspective on the dynamics of ethnic residential segregation in the FUAs of Bologna and Milan.

5.3. Methods

To analyse the evolution of residential segregation, several indices have been devised to detect different dimensions of segregation (Massey and Denton 1988).

Firstly, the dissimilarity index can detect the evenness or uniformity of group distribution within the units of analysis. In particular, both the two-group, which considers the segregation of one population with respect to another, and the multigroup, which simultaneously analyses the segregation of several groups, dissimilarity indexes were calculated. As anticipated, the indices were created using, as units of analysis, the census sections of the FUAs of Milan and Bologna for the 3 census rounds (2001, 2011, and 2021), taking into consideration 3 populations (residents with Italian citizenship, with EU citizenship, or with non-EU citizenship).

Secondly, the location quotient (Benassi et al. 2022) was considered, i.e., a local segregation index that measures the group concentration in a given territorial unit with respect to the average incidence of the same group as a whole and that allowed us to identify and represent the units where there is an over- or underrepresentation of the group. The location quotient was calculated for the resident population with foreign citizenship only and referred to the core and commuting areas in the years 2001, 2011, and 2021 to test the peripheralisation hypothesis.

Finally, to understand the evolution of foreigners' residential patterns between 2011 and 2021, we also calculated the variation in the density distribution of foreign residents using the Kernel Density Estimation (KDE) and Map Algebra GIS tools. The KDE is considered a local index of segregation, which makes it possible to identify areas of concentration of population groups and to overcome certain analytic limitations based on polygonal census sections. The analysis is based on the points (centroids) of the sections

and is therefore not influenced by the shapes of the spatial units. The KDE also allows the influence of proximity between spatial units to be considered, since high/low values in spatial units within the threshold produce corresponding high/low KDE values. Finally, the KDE allows for an easier analysis of changes over time, as density values are associated with a continuous grid of cells of the same size and position over the different periods. In particular, the weighted KDE was calculated by counting the number of residents with foreign nationality for the years 2011 and 2021. Then, using the Map Algebra tool, the KDE raster of 2021 was subtracted from that of 2011 to obtain the change in density.

6. Results

In Table 1, it is possible to observe the variation in the segregation indices at the FUA-, core-, and commuting-area levels.

Table 1. The evolution of dissimilarity indices in the core and commuting areas in Bologna and Milan FUAs. Source: authors' elaboration on ISTAT data (2001–2021).

Spatial Units	2001	2011	2021	Var. 01-21	Var. 11-21
FUA (Milan)					
Multigroup D index	0.45	0.38	0.38	−0.07	−0.01
Two-group D index					
UE–Extra UE	0.49	0.42	0.40	−0.09	−0.02
UE–Italian	0.43	0.34	0.36	−0.08	0.02
Extra UE–Italian	0.49	0.45	0.40	−0.09	−0.04
Core areas (Milan)					
Multigroup D index	0.4	0.38	0.38	−0.02	0.00
Two-group D index					
UE–Extra UE	0.46	0.39	0.39	−0.07	0.00
UE–Italian	0.41	0.33	0.34	−0.07	0.01
Extra UE–Italian	0.43	0.41	0.40	−0.03	−0.01
Commuting areas (Milan)					
Multigroup D index	0.41	0.36	0.35	−0.06	−0.01
Two-group D index					
UE–Extra UE	0.48	0.36	0.34	−0.14	−0.02
UE–Italian	0.43	0.34	0.37	−0.06	0.03
Extra UE–Italian	0.45	0.41	0.37	−0.08	−0.04
FUA (Bologna)					
Multigroup D index	0.41	0.33	0.32	−0.09	−0.01
Two-group D index					
UE–Extra UE	0.50	0.35	0.32	−0.19	−0.04
UE–Italian	0.44	0.29	0.32	−0.12	0.02
Extra UE–Italian	0.44	0.40	0.34	−0.10	−0.06
Core areas (Bologna)					
Multigroup D index	0.39	0.3	0.3	−0.09	0.00
Two-group D index					
UE–Extra UE	0.48	0.33	0.3	−0.18	−0.03
UE–Italian	0.42	0.28	0.32	−0.10	0.04
Extra UE–Italian	0.41	0.36	0.31	−0.10	−0.05
Commuting areas (Bologna)					
Multigroup D index	0.45	0.35	0.32	−0.13	−0.03
Two-group D index					
UE–Extra UE	0.57	0.39	0.33	−0.24	−0.06
UE–Italian	0.49	0.32	0.33	−0.16	0.01
Extra UE–Italian	0.49	0.43	0.35	−0.14	−0.08

At the FUA level, the multigroup dissimilarity index shows low values in both metropolitan areas, with a slight downward trend, especially between 2001 and 2021. Indeed, between 2011 and 2021, the situation remains almost unchanged. At the core area level in the case of Milan, the decrease is even smaller, while in Bologna, the decrease is the same as in the FUA, with a (slight) decrease, especially between 2001 and 2021. In Milan,

no deviation emerges even if the commuting areas are taken into consideration, but in Bologna, it is in these areas that a greater, albeit slight, decrease is found.

The analysis of the two-group dissimilarity index allows additional elements to be highlighted. First of all, residential segregation is greater among the foreign population of non-European nationality at the metropolitan-area level, especially in Milan. Also, in this case, there is a decrease in the DI two-group values over time. Moreover, segregation is relatively higher in the core areas of Milan, even though the commuting areas were the most segregated at the beginning of the period. In Bologna, on the other hand, there are no significant differences between cores and commuting areas. In general, the analysis indicates that, in the 2001–2021 time span, the residential distribution of foreigners changed slightly, especially in the first decade, with a more widespread orientation over the territory, as shown by the reductions in dissimilarity indices.

Subsequently, to analyse residential segregation, we considered the change in the location quotient of the foreign resident population in the same reference years (2011–2021) for the FUA census sections of Bologna and Milan. When distinguishing between urban cores and commuting areas, some trends are evident (Table 2).

Table 2. The evolution of the location quotient in the cores and commuting areas in Bologna and Milan FUAs. Source: authors' elaboration on ISTAT data (2001–2021).

FUA	Year	Spatial Units	Census Sections LQ > 2	Census Sections Total	% LQ > 2
Milan	2021	Core areas	1412	7086	19.93
		Commuting areas	977	11,395	8.57
	2011	Core areas	1505	7078	21.26
		Commuting areas	1064	11,358	9.37
	2001	Core areas	2094	7084	29.56
		Commuting areas	867	10,675	8.12
Bologna	2021	Core areas	282	1936	14.57
		Commuting areas	112	1651	6.78
	2011	Core areas	282	1929	14.62
		Commuting areas	150	1637	9.16
	2001	Core areas	286	1885	15.17
		Commuting areas	867	10,675	8.12

In both cases and types of area, there is at least double the share of sections with an overrepresentation of the foreign resident population. In 2021, the percentage in Bologna is higher in the core area (14.57%) than in the commuting area (6.78%), as well as in Milan (19.93% and 8.57%, respectively).

Looking at the change in values over time, in Bologna, there is a stronger decrease in census sections, with QL values above 2, especially in the commuting areas. On the other hand, in Milan, the decrease affects the cores, while in the commuting areas, the situation remains almost unchanged.

The cartographic representation of the location quotient makes it possible to identify areas characterised by under- or overrepresentation of the foreign resident population. As seen in Figure 1, the sections in Milan with the highest LQ are found in the peripheral areas of the metropolitan area's core and in the belt municipalities in the FUA of Milan. Other areas of overrepresentation are found in more peripheral areas of the metropolitan area.

In Bologna (Figure 2), the sections with the highest LQ values are found in the northern area of the core and other municipalities of the FUA, in particular, the municipalities along the borders of the central municipality, with a distribution that seems to follow the mobility axes of commuting flows. Other areas of concentration are distributed in the unions of the small municipalities of Reno Galliera and Terre di Pianura in the northern part of the Bologna FUA.

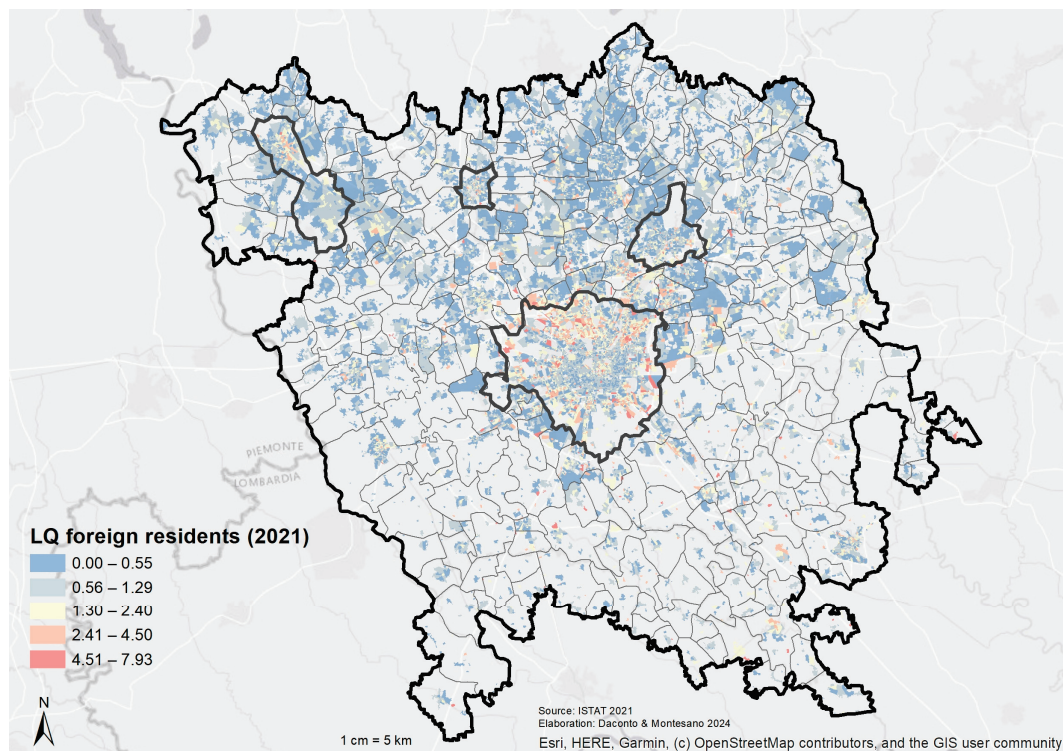


Figure 1. The location quotient of foreign residents in Milan in 2021. Source: authors' elaboration on ISTAT data (2021).

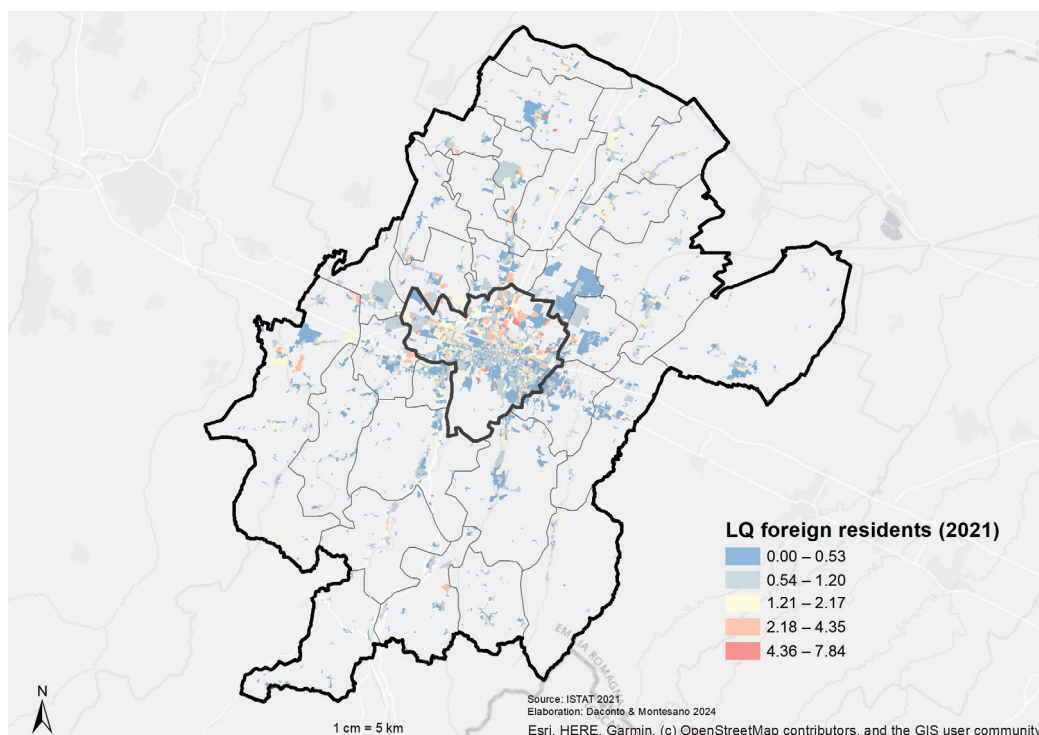


Figure 2. The location quotient of foreign residents in Bologna in 2021. Source: authors' elaboration on ISTAT data (2021).

The characteristics of the residential settlement pattern of the foreign resident population in the metropolitan areas of Milan and Bologna are even more evident when analysing the variation in the density of foreign residents between 2011 and 2021 (Figures 3 and 4).

In short, concentrations in core areas—with different demarcations (concentric in Milan and north/south in Bologna)—have persisted and strengthened over time. This trend is also accompanied by an increase in the foreign population in the commuting areas, where concentrations also emerge.

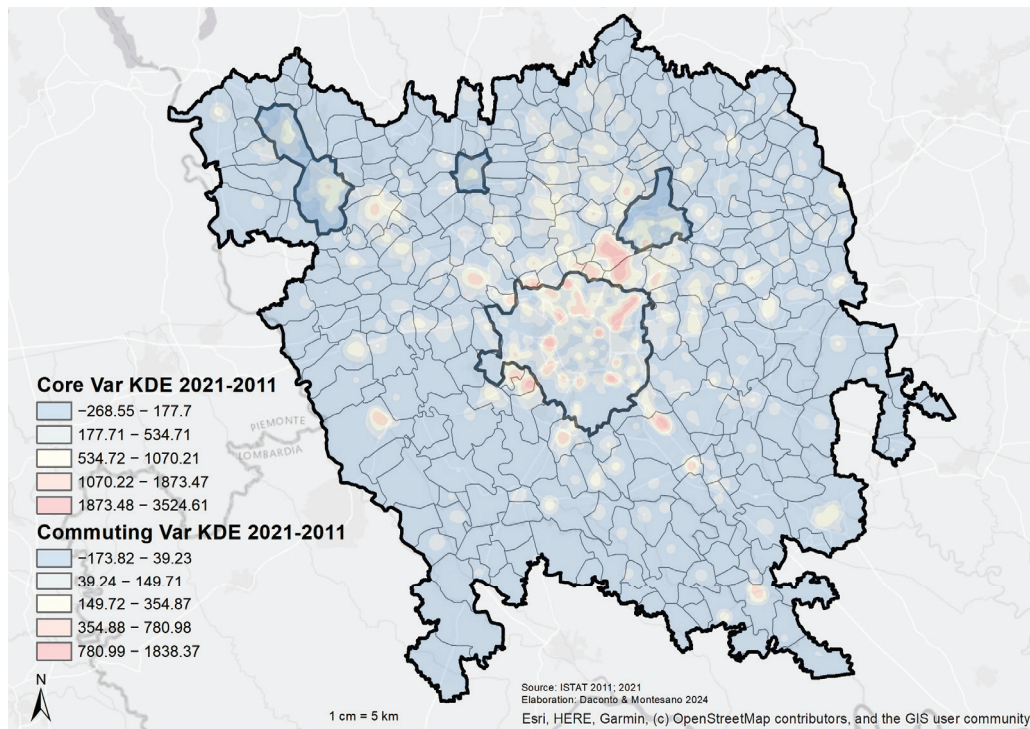


Figure 3. Change in foreign resident population density in Milan between 2011 and 2021. Source: authors' elaboration on ISTAT data (2011–2021).

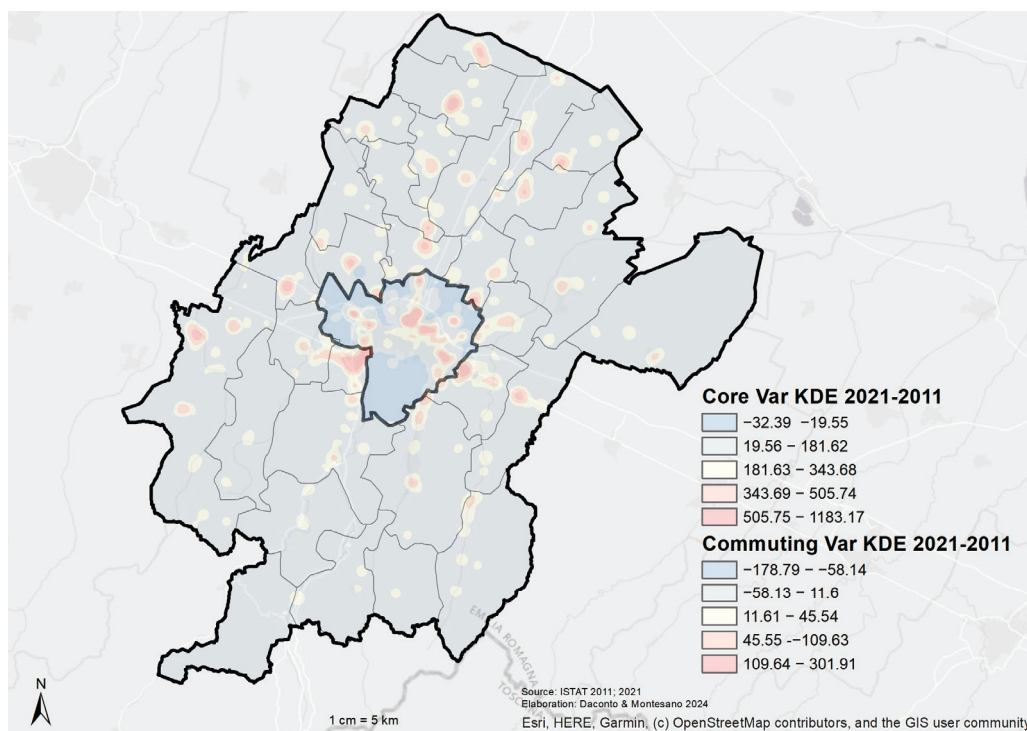


Figure 4. Change in foreign resident population density in Bologna between 2011 and 2021. Source: authors' elaboration on ISTAT data (2011–2021).

7. Discussion and Conclusions

The analysis presented here indicates that, over the last twenty years (2001–2021), the levels of segregation, according to the indices used, have slightly decreased for the EU and non-EU foreign population in both Milan and Bologna FUAs. As the trend of de-segregation is observed in the two different cases, the results confirm the specificity of the Northern Italian metropolitan model found in previous studies (Pratschke and Benassi 2024; Guerzoni 2018). Within this desegregation framework, our analysis shows some significant differences that have occurred over the time period considered (2011–2021). Different areas of concentration have emerged in the two cities, particularly in commuting areas, although the central municipalities remain an important attractive force in the settlement processes of the foreign population. Nevertheless, considering the importance of the housing system in shaping the distribution of social groups in the urban space, it is necessary to consider further studies on additional segregation mechanisms that will allow us to understand the specific residential patterns of the foreign population on different scales. By adopting the territorialist perspective emphasising the specificities of territories, several investigations have illustrated the roles of public housing and the public-housing privatisation process in determining micro-segregation mechanisms in the cases of both Bologna and Milan (Bergamaschi and Maggio 2020; Costarelli 2023). Moreover, many surveys have shown that the foreign population is characterised by poor housing conditions (housing deprivation, overcrowding, higher rents, limited ownership rates, etc.) (Cafora et al. 2023). Thus, it can be argued that the “de-segregative” trend (understood as the reduction in segregation indices) and the increasing spread in the metropolitan area are associated with the marginality of foreigners relative to housing tenure and quality; dispersion may be accompanied by a downward rather than an upward movement in the housing and residential trajectory of the foreign population. From this point of view, the category of urban diaspora serves to explain the segregation dynamics that characterise the foreign population in these two Italian contexts.

This paper has several limitations, primarily related to the selection of two very different cases and of very small spatial units, such as census sections, which hinder the generalisation of results. From this perspective, further research is desirable to interpret the relationship between the dispersion trends described in this paper and the dynamics of micro-segregation and housing marginality to test the urban diaspora hypothesis at the metropolitan scale in an Italian context. The spatial analysis can instead be deepened by considering the socioeconomic status of resident populations, in addition to nationality, to verify the intersectionality of the ethnic and socioeconomic dimensions in residential segregation. Finally, further research must focus on factors related to the housing market, urban policies, residential paths, preferences, etc., to explain the spatial dynamics of ethnic residential segregation.

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Article

Individual Attitudes and Settlement Perspectives of Refugees in Greece: The Case of Samos Island

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Abstract: Expanding refugee influxes have involved a rising number of European countries in recent years. In this context, our study investigates attitudes of international protection seekers regarding their prospects of staying permanently in a transit country such as Greece. This research was based on primary statistical data collected through the dissemination of structured questionnaires from a sample of refugees from the Closed Controlled Facility of Samos island, Eastern Greece, one of the most attended gates allowing access to Europe from Turkey and the Middle East. Descriptive and non-parametric statistics and results from a logistic regression contributed to the examination of factors that simultaneously determine the will of the refugees to stay in Greece instead of moving to another country. The main reasons they want to stay in Greece are primarily for employment opportunities and a better quality of life. They aspire to learn Greek to integrate better into the local society, actively seeking this skill from their initial arrival. However, their social integration into the local host community cannot be achieved effectively at the current time due to the absence of appropriate strategies at the local/regional levels. The need for employment (expressed by attempts to find work), the quality of life (access to public and private services), the country of origin, marital status and, finally, the sense of safety based on the existence (or, conversely, lack) of xenophobic and racist incidents are the main reasons that simultaneously determine their decision to stay permanently in Greece.

Keywords: social integration; refugees' settlement; third-country nationals; closed controlled facility

1. Introduction

The issue of migration has emerged in recent years as a matter of major importance worldwide. The phenomenon of migration has been particularly familiar in Greek society from ancient times to the present. The Greek population has been forced to migrate to other countries several times due to economic, social, and political conditions of different times. However, in the early 1990s, Greece became a receiving country for migrants from countries such as Albania, Bulgaria, Philippines, Pakistan, Bangladesh, Russia, Ukraine, Armenia, Serbia, and Egypt. The social integration of refugees and national policies facing migration patterns and trends may clearly benefit from a thorough assessment of refugee migration, since immigration influences not only the total population of a country but also the spatial distribution of the regional population, as most immigrants and refugees settle within urban areas (Schmidt et al. 2020; Fent 1989). In Greece, according to the 2001 population census, 324,167 immigrants out of 413,201 (78.5%) settled in urban areas. Additionally, 60.6% (196,392 immigrants) concentrated in metropolitan Athens. The same data source revealed that a total of 2920 migrants self-declared as refugees, of whom 2764 (94.6%) settled in urban areas. The population census of 2011 gave the same background picture. Out of 329,556 foreigners settled in Greece during 2006–2011, 244,410 (74.2%) concentrated in urban areas. The redistribution of the regional population that immigration movements

cause is obvious from the above statistical data concerning Greece. Nevertheless, over the last decade, especially since 2015, Greece has once again experienced a significant arrival of refugees, primarily on the islands of the Eastern Aegean and in the Evros region, because their geographical locations are at the border with Turkey. Due to civil conflicts and wars in Syria, Iraq, and Afghanistan, among others, thousands of people have attempted to cross the borders from Turkey to Greece. The ongoing increase in movements to Western societies has led to political conflicts both within each country and among European Union countries regarding the policies to be implemented (European Commission 2020). The agreement among member states for the effective management of migration movements can contribute to the benefit of the states, provided it ensures their successful integration (Wolleggem 2017, p. 2).

The social integration of immigrants refers to a process associated with inclusion into institutional and social frameworks of the host countries and concerns both the social recognition of different population groups and their equal treatment during their temporary or permanent settlement in the host society (Sarris Nikos and Tsakiridis 2012). The national social integration policy in Greece is in line with the “Common Basic Principles for the Social Integration” of the EU towards a dynamic and two-way process (European Commission 2020). This includes a mutual compromise between migrants and refugees based on the observance of the fundamental values of an intercultural society, with emphasis on different policy measures required by the specificity of a given country (Korac 2003; Stavrinoudi 2007; Scholten et al. 2015). On this basis of common values, the axes of a common policy of social integration of migrants and refugees, from which the degree of success is judged, are their inclusion into the labor market and the education system, the acquisition of a basic knowledge of the Greek language, the history and institutions of the country, their access to institutions, intercultural dialogue, and the practice of various cultural and religious practices (Moisisidis and Papadopoulou 2011; Leontitsis et al. 2020). The existence of integration policies and measures into all relevant policies at all levels of administration and public services is a key element for political decision making and its implementation. Also, the development of clear objectives, indicators, and evaluation mechanisms is foreseen as necessary to adjust policies, measure progress in the field of integration, and improve effectiveness in information exchange (Nagopoulos et al. 2022).

The achievement of the above objectives encounters administrative issues for the treatment of migrants and refugees by the Greek state, as the relevant measures taken are incomplete and are checked for their quality. They concern overall terms of institutional recognition, which is judged by the extent of the existing bureaucracy, the absence of reliable data, and the difficulties of adaptation and compliance of immigrants with the prevailing standards set. As a result of the aforementioned difficulties, refugees spent on average two years obtaining legal recognition (Casalis et al. 2023). All the above, with the absence of necessary measures and institutional linkages in terms of promoting and consolidating social cohesion, often result in the limited and fragmented scope of interventions and the weakening of any objectives set in the context of effectively addressing problems.

The main conclusion of a recent contribution is similar, as shown by the analysis of a focus group with professionals in the field (Nagopoulos et al. 2022). It indicates that the lack of coordination bodies/reference points from the state complicates all the long-term prospects for the integration of refugees and immigrants and complicates the conditions for coexistence with the local communities, often creating unnecessary tensions and disputes on both sides. The absence of a holistic intervention with individualized characteristics in reference groups is expressed through a series of problems in the daily lives of asylum seekers and refugees (Savvakis et al. 2022). The problem needs immediate measures following an integrated strategy, as the number of refugees and asylum seekers in Greece’s UNHCR progress database rose to 98,014 individuals in November 2021 (Casalis et al. 2023, p. 4; European Union Asylum Agency “EUAA” 2022).

Based on these premises, our study examines attitudes of international protection seekers regarding their prospects of staying in Greece. The factors that simultaneously

determine the intention of the refugees to stay in Greece are examined using an appropriate statistical method. The analysis is based on primary statistical data, involving the collection and processing of structured questionnaires from the population residing in the Closed Controlled Structure of Samos island (CCS). The CCS of Samos was inaugurated in September 2021, with a capacity of 3000 residents, located approximately 10 km from the town of Samos. In previous years, asylum seekers were hosted at the Reception and Identification Center located near the town of Samos, with a capacity of about 650 individuals, which, during a specific period (2018–2019), was forced to accommodate over 7000 refugees. The recorded population of the island's residents, according to the 2021 census, was estimated at 32,642 inhabitants, with the town of Samos having only 5951, i.e., fewer than the population of the above-mentioned foreign residents. When compared with the other Greek islands, Samos is the closest to Turkey (less than two kilometers), facilitating the easy passage of irregular incoming migrants and refugees. Samos and the other Greek islands of the Eastern Aegean Sea have received, since 2015, a great number of refugees and migrants from Turkey's shores, living in CCSs in several places on the islands under difficult conditions and experiencing ghettoization. After calls from the Greek Government, UNHCR's Accommodation Plan, which is part of the ESTIA (Emergency Support to Integration and Accommodation) Program of the Asylum, Migration, and Integration Fund of the European Union, forwarded refugees to the continental country, to specific buildings of common living (e.g., hotels) or to autonomous apartments, improving their living conditions and reducing the phenomenon of ghettoization. By the end of August 2019, 25,404 accommodation points had been set up under the ESTIA program. These were located in 4442 apartments and 15 buildings, in 14 cities and 7 islands throughout Greece. The major cities of Athens, Ioannina, and Iraklio (Crete), participated in the program. In total, since November 2015, 60,175 people have benefited from this housing program (Nagopoulos et al. 2022).

Regarding the concept of attitude, which constitutes a central point of study in this work, it refers to an individual's perceptions and beliefs about social phenomena. In other words, it is how one can perceive and adapt one's behavior to the current environment and society. Attitudes are the way we evaluate an object, a person, or a group of people. They are formed from an early age, primarily through family, school, friends, and society, influencing the social thinking and behavior of individuals. This is achieved through reactions that can involve changes in behavior, emotions, and beliefs. The three elements that constitute attitude are emotional, cognitive, and behavioral (Mavtomati 2020).

The factors influencing people's attitudes are based on the theory of real (realistic) conflict and the theory of social identity (Rontos et al. 2022b). The theory of real conflict has as its basic principle the competition between different groups (Smith and Bond 2011, p. 65). This can result in social inequality, tension, exploitation, and marginalization (mostly economic and social). The theory of social identity refers to individuals who (compared with other groups) choose to belong only to the group with positive social identity (cultural and social). Smith and Bond (2011) argue that an individual's social identity is determined by the group to which he/she belongs. The individual adopts the behavioral pattern of the respective group. Expectation is defined as the fulfillment of each person's future goals, which may vary in each period depending on the specific situation (Koutelekos and Haliasos 2014, p. 134). Expectations can have positive or negative outcomes.

From the perspective of host societies, the personality of each individual and external environmental factors can influence attitudes toward migration. Studying whether migration would be an economic burden on their society, the results of an empirical research carried out in Denmark (Dinesen et al. 2016) showed that residents with higher conscientiousness believe that their society is economically burdened by immigrants with low skills. They pay more attention to the skills possessed by immigrants than to their country of origin. People evaluate migration issues according to their perceptions of the impact on their country's economy (Hainmueller and Hopkins 2014). Studies developed around the level of education of native residents in relation to attitudes toward the immigrant

population showed a positive correlation among them, but they are not supported by the theoretical framework. The level of university education of residents is a strong factor in generating positive feelings toward migration (Chandler and Tsai 2001). People with university degrees have a more positive attitude toward immigrants than those with low education. The personality traits of each individual influence attitudes toward immigrants (Gallego and Pardos-Prado 2014).

The way migratory influxes have been initially addressed created negative feedback in the majority of the population, manifested by intense fear and prejudices. The distribution of refugees, only in specific areas, created tensions and various reactions due to different perceptions and attitudes of local community residents (Rontos et al. 2022a). Opinions such as the elimination of the national identity of Greeks and the alteration of morals and customs of local communities dominated in relation to the view of the contribution of refugees and immigrants to the development of the country. Local authorities should participate in the design and organization of strategies coping with migrants/refugees in collaboration with policy makers of central administrations and non-governmental organizations. From this perspective, the activation of local authorities to enhance interaction between the indigenous and migrant population and to combat xenophobia, isolation, and urban segregation of migrants in deprived neighborhoods is mandatory. The effective activation and involvement of local actors (civil society organizations and local and regional authorities and public services) is desirable and, in some cases, necessary to establish and implement, at both institutional and social levels, good and sustainable integration practices (Rontos et al. 2017, 2019; Glorius and Doornik 2020; Arvanitidis et al. 2021).

The mitigation of the above negative attitudes, at least on the part of local communities, depends on the corresponding attitudes of refugees/migrants regarding their prospects for integration into Greek society to achieve harmonious coexistence within the framework of an intercultural society (Dianeosis 2020; Maragoudakis Manousos et al. 2022a). For this reason, and also because research on the attitudes of incoming populations is basically occasional, the contribution of this research is considered meaningful to both science and policy. According to the international literature, especially a qualitative study on young refugees from Sudan and Somalia (Tlhabano and Schweitzer 2007), refugees had high professional ambitions despite the difficulties they faced. Difficulties included not completing all educational levels in their country and language difficulties (learning English to integrate into the new country (namely Australia)). The war situation in their countries resulted in the interruption of their school education and their move to safer countries.

The results of the research by Nunn et al. (2014) on adults (18–27 years old) who were refugees since adolescence showed the strong interaction between family obligations, educational opportunities, and social networks in their professional restoration. These factors can influence individuals' decisions and hinder their realization. Family and education are among the most important factors influencing the achievement of professional goals. It is concluded that there is a great need to support both adolescents and their families in educational processes to fulfill their ambitions. Strengthening language skills can yield positive results. However, the main reason for the movement of all refugees is for a better quality of life.

Dimitriadi's study (2017) on refugees from Afghanistan revealed that the primary reason for their movement to other countries was the need for security and, secondly, education and employment. According to Zacher (2019), education and employment were the key factors for the successful integration of refugees. A survey of a sample of 500 refugees in Greece concerning their professional status revealed that most of them were unemployed and looking for work (39.4%), while 7.2% were attending school (Skleparis 2018). Most respondents aimed to go to Sweden, Germany (Nanette 2016), or England, with a smaller percentage declaring to be directed to Austria, Denmark, and the Netherlands. However, Greece remains the gateway to Europe for refugees. A large number of refugee arrivals to Greece had the ultimate goal of a secondary move. In the following sections, the methodology of the survey is described (Section 2), the results are presented in detail (Section 3),

followed by an extensive discussion and policy conclusions (Section 4). Additionally, we formulated a proposal for the continuation of the research related to the overall structures providing hospitality in the country. This aims at drawing more general conclusions about demographic and socioeconomic characteristics, as well as the attitudes and expectations of the populations entering the country.

2. Materials and Methods

2.1. Reference Population

The study was conducted in the Closed Controlled Facility in Samos, Greece, from 21 November 2022 to 4 December 2022. Respondents were limited to adults, both women and men of all nationalities, who had reached the age of 18. Unaccompanied minors (non-separated) and separated minors were excluded from the study. The population in the Closed Controlled Facility changed daily due to new arrivals from the Turkish shores and their organized or unorganized movements inland.

2.2. Data Collection

This is a quantitative study using a structured questionnaire and on-site observation. On-site observation emphasizes body language, which can reveal more than a simple written response. Most questions are closed-ended, but there are some open-ended questions for a better approach to certain answers. The questionnaires are anonymous, and responses are confidential. To conduct the research, a letter was sent, along with the questionnaire, to the administrator of the Closed Controlled Facility in Samos to obtain the necessary permission for the research and the collection of questionnaires. Individual meetings were held with each male and female respondent separately to complete the questionnaire. The communication language was English, and in cases where there was a communication problem, someone who spoke the refugee's language assisted. The questionnaire was written in Greek, English, and Arabic. It was not translated into other languages for several reasons as follows: (a) the majority of the population speaks Arabic, (b) many speak English beyond their native language, and (c) some individuals do not know how to read and write. The questionnaire was not extensive, consisting of 25 questions, to avoid overwhelming respondents and to maintain their interest throughout. Demographic information was placed in the first section to establish greater familiarity between the respondent and the researcher, creating an atmosphere of mutual trust. Knowing the respondent better (through personal information) allows the researcher to anticipate any questions that might provoke refusal, anger, sadness, or even falsehood. The sequence of questions in a questionnaire is crucial for the better response of the surveyed population (Rontos and Papanis 2006).

2.3. Sampling

The 21st of November 2022 was set as the reference date to calculate the total population of the Closed Controlled Facility (CCF) in Samos. At that time, the population of third-country nationals residing in the facility was 1092. Of this population, 74.9% were men, 15.7% were women, and 9.4% were minors. Stratified random sampling was employed for a more accurate estimate of population parameters and precise results for subpopulations to ensure the representativeness of each sample. Specifically, proportional stratified sampling was used because the proportion of each subpopulation in the total population was known in advance. The sample was randomly selected from two different points within the CCF in Samos.

Each stratum consisted of homogeneous groups with the general characteristics of the country of origin. The first subpopulation included applicants from Palestine, Syria, and Iraq, while the second subpopulation included individuals from Somalia, Eritrea, Sierra Leone, Gambia, Democratic Republic of the Congo, Cameroon, Ghana, and other African countries. A total of 140 international protection applicants (aged 18 and above), representing 12.8% of the population, participated in the research. The number of sample units to be taken from each stratum amounted to 75 individuals from Syria, Palestine,

and Iraq, and 65 individuals from African countries (Table 1). Finally, the number of respondents in the survey from stratum 1 was seventy-eight, and from stratum 2 was sixty-two. Our sample cannot constitute a statistically significant sample to generalize that the results below apply to all international protection applicants in Greece; however, it serves as a data source for the attitudes and opinions of refugees who seek refuge in Greece, data that are scarce in the international literature. For the entire population of the Closed Controlled Structure of Samos, the sampling error in estimating their prospects of staying in Greece with a 95% probability was approximately 6.8%.

Table 1. Table of proportional stratified sampling.

Layer	Number of People	Sample
1	N1 = 581	n1 = 75
2	N2 = 511	n2 = 65
Sum	N = 1092	n = 140

2.4. Data Processing and Analysis

After completing all meetings and the primary collection of statistical data (completion of questionnaires), data were entered into the statistical package SPSS for processing. Initially, for continuous variables, the mean, standard deviation, and variance were examined. For discrete variables, Pearson's chi-square correlation was performed with a significance level of $p < 0.05$ ($\alpha = 5\%$). For categorical variables, additional cross-tabulation tables were created, and the Chi-square test was applied to investigate statistically significant differences in the individual characteristics of refugees.

To examine the factors that simultaneously determined the intention of the refugees to stay permanently in Greece, a binary logistic regression was employed. The maximum likelihood approach and the Wald forward stepwise procedure were adopted (Bishop et al. 1975; Nerlove and Press 1973; Cox and Snell 1989). The statistical significance of "b" coefficients was tested using the Wald statistic, which is equal to the square of the well-known Student "t-statistic", as it is preferred in the case of logistic analysis. Omnibus X^2 tests of model coefficients were run. The model's overall goodness of fit was tested using (i) -2LL ratio test statistic, (ii) Cox and Snell R^2 , and (iii) Nagelkerke R^2 . The model's goodness-of-fit was also tested by the non-significance of the Hosmer and Lemeshow statistical test.

By applying logistic regression models, which provided a significant relationship between the intention of the refugees to stay permanently in Greece with certain explanatory factors, we can predict the probability of a holder of certain characteristics to answer that he/she intends to stay in Greece using Equation (1).

$$P(Y = 1) = F(b) = \frac{1}{1 + e^{-(b_0 + b_1 X_1 + b_2 X_2 + \dots + b_n X_n)}} \quad (1)$$

The predicted probability was estimated for the sample as a total and for some of them with specific characteristics.

2.5. Research Limitations

When carrying out the survey, no major problems arose between researchers and the respondents. This particular population of respondents exhibited many peculiarities due to the unfortunate events that occurred in their home country or even to themselves. Initially, most of them were very cautious and somewhat hesitant to participate in this research. The reason they hesitated to participate and tell the truth in the survey was solely to avoid influencing the process of their asylum case with the asylum service. Some felt more comfortable completing the questionnaires themselves and answering open-ended questions while writing in the Arabic language.

A pilot survey was conducted with five international protection applicants to determine whether the questionnaire was properly designed and whether the translation into Arabic and English was understandable. Testing the questionnaire on a small number of respondents (namely the “pre-test” phase of any survey) can help avoid any error and deficiency in both the questions and the investigated topic (Rontos and Papanis 2006). A significant difficulty was encountered in question 17 (where in Greece would they like to go to find work), which was then removed from the questionnaire, since the only place in Greece they were familiar with was Athens, based on information from their friends living there. Also, in question 24 (suggestions for their customs and traditions), it was observed that they struggled to think about and propose what they would like to happen to preserve their traditions upon entering a foreign country while simultaneously coming to know them in other cultures.

3. Results

3.1. Socio-Demographic Characteristics of Refugees

In the present study, a total of 140 applicants for international protection participated, specifically 106 (75.7%) males and 34 (24.3%) females. The youngest respondent was 18 years old, while the oldest was 55 years old. The mean age was 26.1 years, the standard deviation was 6.3 years, and the median was 25 years. Half of the respondents were aged up to 25 years, while 62.1% of the sample was aged 18–26 years, and 30.7% was aged 27–35 years, indicating a youthful population. The normality checks of this variable showed that the sample did not come from a population that follows a normal distribution, according to the Kolmogorov–Smirnov test (K-S statistic = 0.15, $df = 140$, $p < 0.001$) and Shapiro–Wilk test (S-W statistic = 0.89, $df = 140$, $p < 0.001$). However, the order of observations of the “Age” variable above and below the median was demonstrated to be randomly distributed, according to the relevant test ($Z = -0.254$, $p = 0.8$).

Most of them were unmarried, accounting for 64.3%, which can be linked to their young age. Only 33.6% of the respondents were married. To the question “how many children do you have”, respondents answered for all the children they had and not just for the children living with them (Table 2). Only 35% of the respondents had children (minors). Nevertheless, due to the high fertility of these populations, there were a total of 118 children in the sample. It should be noted that, during the survey period in the Reception and Identification Center (KEΔ) of Samos, there were few children, constituting only 9.4% of the total population.

Table 2. Number of refugee children.

	Frequency	Frequency %	Accumulative Frequency %
0	91	65.0	65.0
1	13	9.3	74.3
2	15	10.7	85.0
3	15	10.7	95.7
4	2	1.4	97.1
5	3	2.1	99.3
6	1	0.7	100
Total	140	100	

3.1.1. Education and Employment

The educational level of the surveyed population was not particularly high. A significant proportion of applicants, approximately 60%, attended school for up to 6 years. Palestinians and Syrians attended school for more years compared with nationals from African countries. There was differentiation between the countries of origin and the level of education ($\chi^2 = 46.8$, $df = 6$, $p = 0.001$). The majority (56%) of respondents were not employed before coming to Greece. The reasons may vary as follows: (i) either the war started, and they lost their jobs; (ii) due to their young age, they did not have the oppor-

tunity to find employment; (iii) there were no job opportunities in their home country; (iv) finally, due to discrimination and persecution, they could not find work. There was no differentiation between the variables “country of origin” and “employment in their home country” after independence testing ($\chi^2 = 2.96$, $df = 1$, $p = 0.085$). Of course, the reason for foreigners’ movement to another country differs between economic migrants and refugees/asylum seekers, but integration in the host country concerns both, especially those of the latter category who want to settle permanently in the host country. Economic integration is a crucial dimension for refugees and asylum seekers, playing a serious role in the decision about their final destination. Our analysis reveals that these people considered their employment situation as a very important factor regarding their decision to permanently settle in Greece. Additionally, other studies highlight the low levels of employment within this group, suggesting the appropriateness of more effective and impactful policy actions (Casalis et al. 2023).

3.1.2. Origin and Motivation Underlying Migration

The majority of the total population of the Reception and Identification Center (CCF) in Samos consisted of Palestinian nationals. This was reflected in the sample, with 47.9% from Palestine, 13.6% from Sierra Leone, and 12.9% from Eritrea (Figure 1).

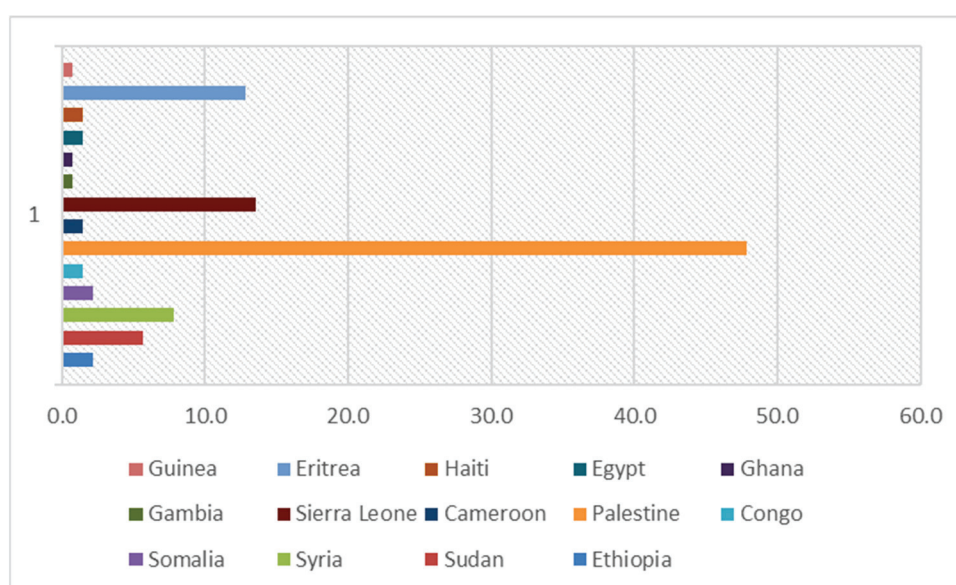


Figure 1. Refugees’ country of origin (percent share in total population).

War was the primary reason for moving from their country, reported by 40% of the respondents. This was followed by 32.9% citing persecution (racial, religious, political, etc.), 16.4% internal conflicts, and, finally, 10.7% economic problems. By converting the variable “country of origin” into two categories, where the first included Syria and Palestine and the second included African countries, a significant differentiation was observed in the independence test for the “reason for migration”, indicating a variation between the countries ($\chi^2 = 46.1$, $df = 3$, $p = 0.001$). Most applicants from African countries were displaced due to racial, religious, and political beliefs, compared with Palestinians who moved because of the war (Table 3).

In the case that conditions improved, and there was no well-founded fear, 82.1% of the respondents did not want to return to their country. Specifically, among the 25 respondents who would like to return to their country when the danger subsided, 22 were Palestinians, and only three were from African countries. There was a significant differentiation between the countries of origin regarding their potential return ($\chi^2 = 12.85$, $df = 1$, $p = 0.001$). However, there was no differentiation between genders on this question ($\chi^2 = 0.304$, $df = 1$, $p = 0.581$).

Table 3. Reason for leaving their country of origin by group.

Countries of Origin	War	Internal Conflicts/Riots	Economic Problems/ Employment Search	Persecutions Racial/ Religious/Political	Total
Syria/Palestine	50	10	2	16	78
African countries	6	13	13	30	62
Total	56	23	15	46	140

3.1.3. The State of the Refugees Today

More than six out of ten respondents expected a decision from the asylum service, a fact that is due to the 65.7% residing in the CCS (Closed Controlled Structure) of Samos for less than three months. They had recently arrived and had not managed to finish all their administrative procedures. They mostly received refugee status, the Palestinians being the majority of CCS population. They were followed by Eritreans, Syrians, and people from other countries. There was also a small percentage, 3.5%, of respondents who had been in CCS for over a year. This usually happens when they receive negative decisions.

3.1.4. Attitude of Refugees towards Permanent Residence in Greece

One hundred and four refugees who participated in survey, approximately 74.3%, wanted to stay in Greece, while the other thirty-six (25.7%) wanted to move to another European country, mainly Germany. There was intention for secondary movement, but the majority of the refugees wanted to stay in Greece (Table 4).

Table 4. Intention to stay in Greece.

	Frequency	Frequency %	Accumulative Frequency %
Yes	104	74.3	74.3
No	36	25.7	100.0
Total	140	100.0	

By grouping countries into two categories (Syria/Palestine and African countries) and conducting an independence check with the variable “intention to stay in Greece”, it was observed that there was differentiation between the responses given by the first group and the second group ($\chi^2 = 5.35$, $df = 1$, $p = 0.021$). The first category showed a greater desire to move to another European country (Table 5).

Table 5. Intention to stay in Greece and countries of origin by group.

Countries of Origin	Want to Stay in Greece		Total
	Yes	No	
Syria/Palestine	52	26	78
African countries	52	10	62
Total	104	36	140

It was observed that there was no differentiation between the responses given by women and men regarding their intention to stay in Greece ($\chi^2 = 1.53$, $df = 1$, $p = 0.216$). Respondents who stated that they did not want to stay in Greece preferred, to a large extent, to move to Germany. Other countries they would like to stay in included Belgium, Sweden, and the Netherlands. Finally, out of the 36 individuals who answered that they did not want to stay in Greece, 47% wanted to leave to find work, 42% had relatives/acquaintances in other countries, 8% sought a better life, and 3% cited economic reasons. In contrast, the primary reason for staying for those who wanted to remain in Greece was finding work/improving their finances (69.3%), protection/security (18.6%), a better quality of life (6.4%), and education (5.7%).

More than half of the sample was not actively seeking work in Samos, while 48.6% were looking for employment. Typically, those who stay on the island for an extended period until their decision is made want to work mainly for economic reasons to cope with the new living conditions. It has been observed that individuals from African countries find employment more easily in tourist accommodations during the summer months, while Arabic speakers (Syrians, Palestinians) find employment in the agricultural sector. “Language” is a significant factor that can determine their work in the first few years. Regarding the professional orientation of respondents regarding the type of work they would like to find (whether they were searching during this period or plan to search in the future), 20.7% would like to engage in agriculture or animal husbandry, 23.6% in construction work, 8.6% in education, and 11.4% to start their own business.

In response to the question of whether they wanted to continue their education (secondary) or studies, 57.1% answered positively (Table 6). Equally important for their prospect of staying in Greece was their willingness to learn the Greek language. A significant percentage (62.1%) of respondents had started learning Greek. In a previous question, it was stated that only 34.3% had been in CCF for over three months, meaning that applicants who wanted to stay permanently in Greece were trying to learn Greek for better social integration from the first months of their arrival, without knowing whether they would be accepted in this country or not.

Table 6. Intention to continue education/studies in Greece.

	Frequency	Percentage	Accumulated Percentage
Yes	80	57.1	57.1
No	60	42.9	100.0
Total	140	100.0	

Prospects for continuing their education or studies, and the initiation of learning the Greek language, differed (there was statistically significant difference) among the countries of origin in these questions ($\chi^2 = 8.68$, $df = 1$, $p = 0.003$) and ($\chi^2 = 6.86$, $df = 1$, $p = 0.009$), respectively. From Tables 7 and 8, it was observed that respondents from African countries showed a greater intention to continue their education and had already started learning the Greek language.

Table 7. Countries of origin and continuation of education.

		Countries		Total
		Syria/Palestine	African Countries	
Want to continue	Yes	36	44	80
your education	No	42	18	60
Total		78	62	140

Table 8. Countries of origin and learning the Greek language.

		Countries		Total
Question		Syria/Palestine	African Countries	
Do you learn	Yes	41	46	87
Greek?	No	37	16	53
Total		78	62	140

Additionally, the continuation of education differed (there was a statistically significant difference) between genders ($\chi^2 = 11.6$, $df = 1$, $p = 0.001$). According to the above Table 9, women, at a higher percentage, expressed a desire to continue their education.

Table 9. Countries of origin and continuing education.

		Gender		Total
		Man	Woman	
Want to continue	Yes	52	28	80
your education?	No	54	6	60
Total		106	34	140

3.1.5. Interaction with the Local Community

More than half of the respondents answered that they have friendly relationships with individuals from the local community (Table 10).

Table 10. Friendly relationships with people from the local community.

	Frequency	Frequency %	Cumulated Frequency %
Yes	77	55.0	55.0
No	63	45.0	100
Total	140	100	

Additionally, a Chi-square test was conducted on the variables “trying to find a job” and “having friendly relationships with individuals from the local community” regarding the grouped variable “country of origin”. It was found that there was no differentiation in the responses between the first (Syria/Palestine) and second (African countries) groups ($\chi^2 = 1.962$, $df = 1$, $p = 0.161$) and ($\chi^2 = 1.966$, $df = 1$, $p = 0.161$), respectively. However, the majority of respondents (59.3%) did not feel that they belonged or were connected in any way to the local community. They argued that the local community did not support them (65.7%) through actions during their stay. Regarding the question “Do you have any suggestions regarding your customs and traditions”, a large percentage of respondents did not answer. Those who responded suggested the organization of events in which everyone, regardless of origin, can participate, and a place where they can taste traditional foods from their homeland. The responses to the question about the existence of xenophobia and racism indicated that third-country nationals mostly had not experienced acts of racism and xenophobia (Table 11). By constructing a crosstabulation between contact/no contact and racism/no racism, we found that the association was close to statistical significance ($\chi^2 = 3.5$, $df = 1$, $p = 0.061$), with the majority of those who had no contact with the local community had not faced racism and xenophobia (77.1%).

Table 11. Existence of xenophobia and racism in the local host community.

Answer	Frequency	Frequency %	Cumulated Frequency %
Yes	25	17.9	17.9
No	115	82.1	100.0
Total	140	100.0	

3.1.6. Satisfaction Level with Their Interaction with Private and Public Services

As part of the research, respondents evaluated their satisfaction with access to and service in stores, public transportation (buses), public services, offices/methods of job search, private doctors, public hospitals, and public education (Figure 2). The satisfaction level was measured on the following scale:

1. Not satisfied at all;
2. Slightly satisfied;
3. Moderately satisfied;

4. Quite satisfied;
5. Very satisfied.

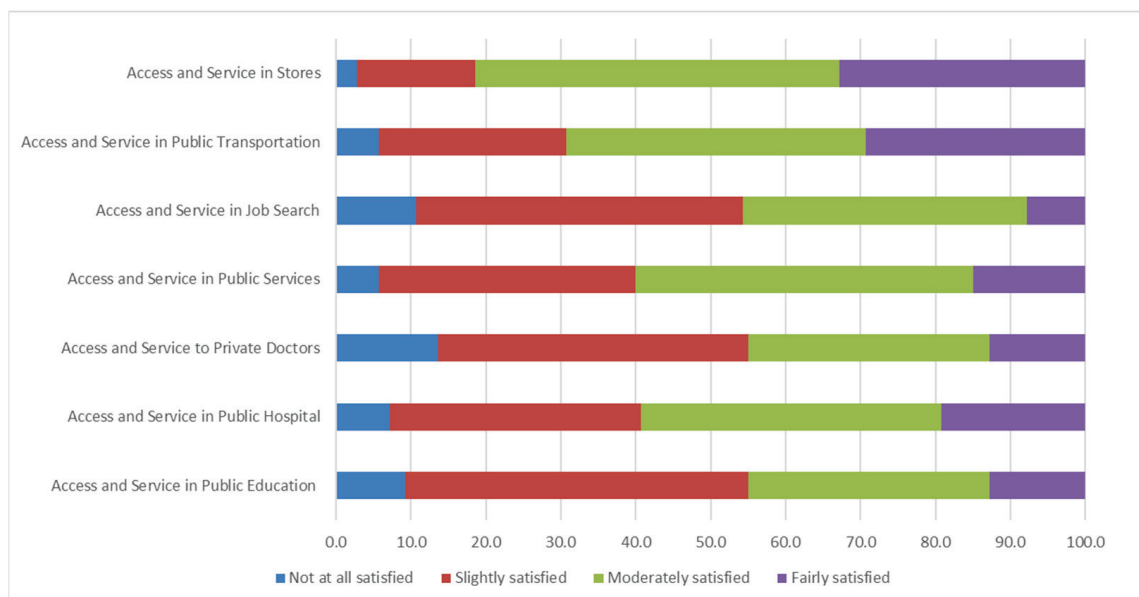


Figure 2. Daily access and service utilization in services.

Value 5 did not receive any response from the respondents because, according to their opinion, none of them were very satisfied.

Regarding public education, private doctors, and job search, the majority responded that they were slightly satisfied. Stores (32.9%) and buses (29.3%) had the highest percentage of positive service and access (quite satisfied) among all. Many tended towards moderate satisfaction in all of the above. The above results were verified by the calculation of median value for the services in concern. The respondents presented median value 2 (slightly satisfied) for public education, private doctors, and job search, while the satisfaction regarding services in public hospitals, public agencies, public transportation, and stores was higher (median = 3; moderately satisfied).

Table 12 presents the satisfaction level regarding access and service in relation to gender and origin (by group). Men seemed to be less satisfied regarding public hospital services in relation to women, as 47.1% of the former were not satisfied at all or were slightly satisfied, while 20.6% of the latter declared this satisfactory. Furthermore, the median value of the two genders was not different concerning this service. Similar were the comparison of genders concerning satisfaction from private doctors; 61.3% of the men were not satisfied at all or were slightly satisfied, with the corresponding percentage of women being 35.3%. Additionally, the median value of satisfaction regarding private doctors was 2 for men and 3 for women. Concerning the satisfaction regarding public transportation, Syrians and Palestinians were more dissatisfied (41% were not satisfied at all or were slightly satisfied) than Africans (17.7% in the same categories). The median was also 3 for both groups of origin. Public hospitals and private doctors differed (there was a statistically significant difference) between genders, while public transportation differed between the two different groups of origin. In the remaining questions, there was no differentiation between the responses given by men/women and Palestinians/Syrians/Africans.

Table 12. Refugees' satisfaction differences for the quality of services by gender and country of origin; Chi-square tests; bold indicates statistical significance.

Kind of Service	Gender			Origin/Groups		
Public Education	$\chi^2 = 5.51$	df = 3	$p = 0.138$	$\chi^2 = 5.99$	df = 3	$p = 0.112$
Public Hospitals	$\chi^2 = 7.94$	df = 3	$p = 0.047$	$\chi^2 = 6.68$	df = 3	$p = 0.083$
Private Doctors	$\chi^2 = 8.29$	df = 3	$p = 0.040$	$\chi^2 = 2.12$	df = 3	$p = 0.54$
Public Services	$\chi^2 = 2.36$	df = 3	$p = 0.502$	$\chi^2 = 1.64$	df = 3	$p = 0.65$
Job Search	$\chi^2 = 4.00$	df = 3	$p = 0.261$	$\chi^2 = 1.86$	df = 3	$p = 0.601$
Public Transportation	$\chi^2 = 2.65$	df = 3	$p = 0.449$	$\chi^2 = 8.85$	df = 3	$p = 0.031$
Stores	$\chi^2 = 5.77$	df = 3	$p = 0.123$	$\chi^2 = 6.79$	df = 3	$p = 0.079$

3.2. Factors Determining the Permanent Settlement of Refugees in Greece Using Logistic Regression

The dependent variable in the logistic regression models was the “intention of the refugees to stay in Greece (exact question in the questionnaire: do you want to stay in Greece?)” with the dichotomous response “Yes = 1/No = 0”. The categorical independent variables tested in the model and their values are presented in Table 13. Observing the values here, in comparison with the previous analysis, we noticed that they were reduced in order for frequencies to be higher in each value and thus the model to be more reliable. In addition, a continuous variable expressing the satisfaction of the refugees from (a) the access they had to several public and private agencies and (b) the quality of the services they had in these agencies was employed. In this model, the above variable represented the quality of life that the refugees experienced in Greece according to their opinion. The values of that variable resulted from the sum of the values to the seven agencies/services mentioned in Table 12. In each of these agencies, the satisfaction was measured by a Likert scale, with values as mentioned in Section 3.1.6.

Table 13. Categorical variable coding.

			Parameter Coding			
			Frequency	(1)	(2)	(3)
Education level	Illiterate	11	1.000	0.000	0.000	
	Attended or completed elementary school	72	0.000	1.000	0.000	
	Attended or completed high school	43	0.000	0.000	1.000	
	University graduate	13	0.000	0.000	0.000	
Number of children	0	91	1.000	0.000	0.000	
	1	13	0.000	1.000	0.000	
	2	14	0.000	0.000	1.000	
	3+	21	0.000	0.000	0.000	
Age group	18–26	87	1.000	0.000		
	27–35	42	0.000	1.000		
	36+	10	0.000	0.000		
Marital status	Single	48	1.000			
	Married	91	0.000			
Exposure to xenophobia and racism in Greece ¹	No	115	1.000			
	Yes	24	0.000			
Trying to find work in Greece ²	Yes	68	1.000			
	No	71	0.000			

Table 13. *Cont.*

		Frequency	Parameter Coding		
			(1)	(2)	(3)
Feeling that they belong or have some connection to the local community	Yes	57	1.000		
	No	82	0.000		
Existence of friendly relations with people from the local community	Yes	77	1.000		
	No	62	0.000		
Desire to continue education (in Greece) ³	Yes	79	1.000		
	No	60	0.000		
Region of origin	African countries	61	1.000		
	Syria/Palestine	78	0.000		

¹ Question in the questionnaire: have you been exposed to incidents of xenophobia and racism in Greece?

² Question in the questionnaire: are you trying to find a job in Greece? ³ Question in the questionnaire: do you want to continue your education/studies?

The goodness-of-fit tests and general elements of each model are presented in Tables 14 and 15. First, the forward stepwise procedure needed 1–5 steps for the final results. Also, the model was highly significant (p -value = 0.0) at all steps, particularly the last one, as indicated by the omnibus test of model coefficients (Table 14).

Table 14. Omnibus test of model coefficients.

		Chi-Square	Df	Sig
Step 1	Step	13.299	1	0.000
	Block	13.299	1	0.000
	Model	13.299	1	0.000
Step 2	Step	10.680	1	0.001
	Block	23.978	2	0.000
	Model	23.978	2	0.000
Step 3	Step	9.788	1	0.002
	Block	33.767	3	0.000
	Model	33.767	3	0.000
Step 4	Step	8.180	1	0.004
	Block	41.946	4	0.000
	Model	41.946	4	0.000
Step 5	Step	3.804	1	0.051
	Block	45.750	5	0.000
	Model	45.750	5	0.000

Table 15. Model summary.

Step	−2 Log Likelihood	Cox and Snell R Square	Nagelkerke R Square
1	143.577 ^a	0.091	0.135
2	132.898 ^a	0.158	0.234
3	123.109 ^a	0.216	0.319
4	114.930 ^b	0.260	0.385
5	111.126 ^b	0.280	0.415

^a Estimation terminated at iteration number 5 because parameter estimates changed by less than 0.001. ^b Estimation terminated at iteration number 6 because parameter estimates changed by less than 0.001.

According to the model's step 0 (constant: $b = 1.089$, $df = 1$, $p < 0.001$, $\text{Exp}(b) = 2.971$), the sample as a whole was three times more likely to stay in Greece than to not stay, according to the above $\text{Exp}(\text{Bo})$ value.

In the last step, the model explained a moderate amount of the trust's variance among the sample, according to the Cox and Snell R^2 and Nagelkerke R^2 (Table 15). This value indicates a moderately strong relationship between the predictors and the dependent variable, but pseudo- R^2 in logistic regression does not have the power it does in linear one and it should not be overly emphasized. The goodness-of-fit for the model was also reflected in the non-significance of the statistical test of Hosmer and Lemeshow (1989) at all steps, especially the last one, as presented in Table 16.

Table 16. Hosmer and Lemeshow test.

Step	Chi-Square	df	Sig.
1	0.000	0	-
2	12.319	8	0.138
3	9.862	8	0.275
4	6.047	8	0.642
5	4.430	8	0.816

−2 LL fell from step 1 to the last step 5 (Table 15), a fact indicating that the last step model fit the data better than those of the previous steps. Summarizing the evaluation tests, we could conclude that the model had a good performance, and we can move on to the main results indicating the factors that influenced the intension of the recent foreigners to stay (permanently) in Greece than to be moved towards another country after their recognition as refugees (obtaining asylum).

The quest for α job (Wald = 16.661, df = 1, $p = 0.00$), the quality of life as expressed by their satisfaction from the services providing to them by several bodies (Wald = 5.8, df = 1, $p = 0.016$), the country of origin (Wald = 8.7, df = 1, $p = 0.003$), the marital status (Wald = 5.9, df = 1, $p = 0.015$), and, finally, the sense of safety based on the existence or absence of xenophobic and racist incidents (Wald = 3.8, df = 1, $p = 0.052$) seemed to be the significant determinants of the foreigners' intention to stay in Greece at the final step 5 of the model (Table 17). The variables were entered in the model with the above order.

Table 17. Variables in the equation.

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 ^a	You are trying to find a job in Greece (1)	1.527	0.449	11.569	1	0.001	4.602
	Constant	0.488	0.244	3.990	1	0.046	1.630
	Access to services—sum	0.156	0.051	9.359	1	0.002	1.169
Step 2 ^b	You are trying to find a job in Greece (1)	1.617	0.468	11.939	1	0.001	5.038
	Constant	−2.395	0.963	6.181	1	0.013	0.091
	Region of origin (country grouping) (1)	1.492	0.508	8.605	1	0.003	4.444
Step 3 ^c	Access to services—sum	0.163	0.054	9.309	1	0.002	1.178
	Trying to find a job in Greece (1)	2.025	0.520	15.188	1	0.000	7.579
	Constant	−3.219	1.074	8.979	1	0.003	0.040
Step 4 ^d	Country of origin—grouping (1)	1.585	0.532	8.882	1	0.003	4.882
	Marital status in groups (1)	1.535	0.584	6.903	1	0.009	4.642
	Access to services—sum	0.143	0.057	6.279	1	0.012	1.154
Step 5 ^e	You are trying to find a job in Greece (1)	2.179	0.550	15.692	1	0.000	8.836
	Constant	−3.360	1.144	8.626	1	0.003	0.035
	Country of origin grouping (1)	1.607	0.545	8.701	1	0.003	4.990
	Marital status in groups (1)	1.441	0.595	5.866	1	0.015	4.223
	Access to services—quality of services	0.140	0.058	5.805	1	0.016	1.150
	You are trying to find a job in Greece (1)	2.383	0.584	16.661	1	0.000	10.839
	Xenophobia and racism from local community (1)	1.178	0.608	3.762	1	0.052	3.249
	Constant	−4.301	1.303	10.892	1	0.001	0.014

^a Variable(s) entered on step 1: you are trying to find a job in Greece. ^b Variable(s) entered on step 2: access to services—quality of services. ^c Variable(s) entered on step 3: country of origin. ^d Variable(s) entered on step 4: marital status in groups. ^e Variable(s) entered on step 5: xenophobia and racism from the local community.

All independent variables were positively associated with the dependent one, as indicated by the positive value of *b* coefficients (Table 17). According to that, persons with higher satisfaction from the services provided to them in public and private bodies were more likely to stay in Greece. Also, those who had the actual intention (quest) to find work, were from African countries, were not married, and felt safe in Greece (had no incident of xenophobia or racism) were more likely to stay in Greece. More precisely, according to the odds ratio [(Exp(*b*) column] of Table 17, those who

- (i) Had the actual intention (quest) to find work were 10.8 times more likely to stay in Greece in comparison with those who had no quest to find a job;
- (ii) Were from African countries were 4.990 times more likely to stay in Greece in comparison with those from Syria/Palestine;
- (iii) Were not married were 4.223 times more likely to stay in Greece in comparison with those who were married;
- (iv) Felt safe in Greece were 3.249 times more likely to stay in Greece in comparison with those who did not feel safe.

We should mention that, according to the logistic regression properties, the above factors simultaneously influence the intention of foreigners to Greece and provide the opportunity to predict the probability of a sample unit (refugee) to stay in Greece. First, the total sample has a probability of 98.6% to stay in Greece. Then, using formula (1) we can predict the intention of a refugee having certain values (characteristics) of the significant variables to stay in Greece after obtaining international protection from the Greek authorities. In Table 18, we can see the characteristics of a refugee who had a very low probability to stay in Greece against a middle or high probability of this kind.

Table 18. Probabilities of a refugee with certain characteristics to stay in Greece according to the predicted logistic regression model.

Refugee Characteristics	Probability %		
	99.5	51.0	6.8
Marital status	single	married	married
Exposure to xenophobia and racism in Greece	no	yes	yes
Trying to find work in Greece	yes	yes	no
Quality of life (access to agencies and quality of services)	22	14	12
Region of origin	African countries	Syria/Palestine	Syria/Palestine

According to the results of the model, marital status, safety, and quality of life distinguished refugees with a very high probability of staying in Greece from those with a medium or low probability of this kind. Finally, the age, education level, intention to continue studies, and (inter)connection with the local community seemed not to be significant for the refugees to stay in Greece in this model.

4. Discussion

The aim of the study was to explore the expectations and attitudes of irregular immigrants towards their permanent residence and social integration. A total of 140 asylum seekers were investigated in November 2022, residing at the time in the Closed Controlled Structure (CCS) in Samos. For the first time, information was collected about their attitudes and expectations regarding the prospect of permanent residence in Greece. According to the research results, the majority of respondents (three or four) wished to stay in Greece. This finding was particularly evident when compared with those found by the results of a survey (Casalis et al. 2023) published in December 2023 (one or two of the respondents).

Specifically, while residing in the facility and awaiting asylum decisions, they tried to build friendly relationships with people from the local community, learn Greek, and

continue their education or studies. However, their social integration at the current time could not be achieved properly because suitable strategies were lacking at the local level. The majority of respondents felt that they were not adequately supported by the local community, and their satisfaction with access to services, transportation, hospitals, and stores was considered moderate. Nevertheless, they mostly did not feel racist or xenophobic tendencies from the local community. The low xenophobic attitude in society was attributed to the overall positive stance towards refugees, a fact that holds true in Greece (Chtouris et al. 2014). The information gathered about the employment sector can provide specifications for appropriate education and training, even for specific geographic locations where they should be settled. For example, agricultural workers should not be relocated to urban centers for accommodation.

The respondents who were present during the research period at CCS Samos had left their countries due to wars, persecutions, discrimination, and acts of violence occurring in their home countries. Economic problems and finding employment were not among the main reasons that had led them to go to Greece. Most in the general population, as well as in the sample, were men, unmarried, and under 27 years old. Most women left due to acts of violence they had suffered in their countries. Palestinians moved primarily due to the war situation in their country, while citizens of African countries moved due to persecutions (political, religious, racial).

Of the 25 respondents who stated that they would like to return to their countries, 22 were Palestinians. The relative statistical analysis showed differentiation among refugees from different countries of origin regarding the desire to return to their home country. More than two-thirds of third-country nationals applying for asylum in Greece stated that they wanted to stay in the country. Regarding this question, Palestinians showed a greater intention to move to another country compared with respondents from African countries. Those who answered that they did not want to stay in Greece preferred, to a large extent, to move to Germany. Other countries they would like to stay in included Belgium, Sweden, and the Netherlands. In Dimitriadi's research (2017), most respondents aimed to go to Sweden, Germany, and England, showing compatible results in both studies. Answers to this question might change significantly if the research were conducted outside the confines of the CCS in Samos due to fear and concern about the asylum application process in Greece. It was observed that some did not answer based on their real intentions and goals. In general, the decisions of immigrants/refugees regarding the choice of settlement and successful social integration are closely linked to the education and employment prospects provided to them, in accordance with the relevant studies presented in the introduction (Chandler and Tsai 2001; Tlhabano and Schweitzer 2007; Jacobs and Rea 2007; Gallego and Pardos-Prado 2014; Zacher 2019; Maragoudakis et al. 2022b; Nagopoulos et al. 2022).

Their intention for secondary movement was not related (there was no statistically significant relationship) to their waiting time in the CCS Samos. If this specific study had been conducted three years ago in the previous facilities of the center and under the conditions prevailing at that time, their intention for secondary movement might have been different and possibly connected to the waiting time for their decision. There were several during that period who decided to return to their homeland (voluntary return) due to the long wait at the center. Gender and age demographic characteristics did not show a statistically significant relationship with their intention to stay in Greece. The same was observed with the social characteristics of the respondents (family status, country of origin, and education), meaning there was no statistically significant differentiation with their intention.

The learning of the Greek language, finding employment, continuing education, and the relationships they built with individuals in the local community indicated their intentions to integrate into the local community. Out of the sample of 140 individuals, only 43 received refugee status. Several individuals with a refugee profile were not included because they voluntarily left the center once they made the decision. More than 50% of the recognized refugees in the survey started learning Greek, were seeking employment,

and had friendly relationships with people in the society. The continuation of education and the learning of the Greek language varied depending on the country of origin, with respondents from African countries showing a greater intention to continue their education.

The perceptions of most regarding the local community were assessed with moderate satisfaction regarding their access to and service from public services, public hospitals, transportation, and stores. Less satisfaction was recorded regarding job search, private healthcare, and public education. Access to public hospitals and private doctors varied between men and women, while satisfaction regarding access to and service from public transportation differed between the two categories of different origins. They felt a sense of connection with the local community and had not been exposed to incidents of xenophobia or racism.

According to the research results, their stay in Greece did not depend on their perceptions of the local society in Samos. However, their attitude towards the local society in Samos did not imply that it would be the same for local societies in the rest of Greece. Gender and age, for the most part, did not influence their attitudes towards local society. The only statistical significance appeared in the variables “gender” and access to “public hospitals” and “private doctors”. There was a statistically significant differentiation between men and women in terms of access to and service from doctors in both the public and private sectors.

The logistic regression model indicated that marital status, the need for employment, the experience regarding the quality of services they received, and the need for security were the positive reasons for their intention to stay in Greece that were compatible with previous surveys (Nunn et al. 2014; Zacher 2019). However, other surveys do not confirm most refugees’ intent to stay in Greece but that they have in mind to move towards other European countries, mostly in central and northern Europe (Dimitriadi 2017). Single Africans who had experienced a good and safe life up to now in Greece seemed to have a high intention to stay (permanently) in Greece.

The reception societies are tasked with the stage of receiving international protection applicants. Specifically, closed controlled structures ensure that everyone receives special care and protection, providing shelter, food, medical care, psychosocial support, access to public health facilities, access to public schools, and financial aid during the completion of their procedures. The completion procedures are carried out in a short period for those who will receive refugee status. This implies that they do not have time to be transferred to mainland Greece. For this reason, the local reception society must also be a society of integration. There should be special offices (one-stop-shops) guiding these people correctly, providing all the services they need, and ensuring job and housing placement. Psychological support is deemed necessary for a long period. As in other European countries, there should be specific integration programs that must be mandatory for them to follow. However, there should not only be rights but also obligations that need to be implemented to avoid negative consequences in the harmonious coexistence of the two sides.

Equally important is their settlement in specific areas determined by local authorities throughout the country. After the decision is issued, everyone gathers in major urban centers because there is better networking among them. Noteworthy is the action by local authorities to sensitize the indigenous population through various actions and programs for their immediate social integration. They should not perceive them as a threat to their place (Maragoudakis et al. 2022b). Therefore, social integration can only be achieved if integration strategies are determined and implemented by both local communities and central authorities. The Greek integration model seeks to maintain an inclusive society that respects diversity and supports acceptance and social cohesion through interculturalism.

In conclusion, population movements, whether migratory or refugee, create significant disruptions worldwide. The ongoing increase in arrivals in Western societies can positively contribute to the challenges faced by the European Union, especially regarding the aging population, which is one of the major issues in Western societies. The percentage of retirees

in EU countries is increasing at a faster rate than the growth of its labor force. Migration can also yield positive economic results for the European Union by effectively utilizing the new workforce. The efficient management of migration arrivals can contribute to the benefit of states, as long as successful integration is ensured (Wollegghem 2017; Huddleston et al. 2013). Social sciences can shape integration processes and formulate new governmental policy strategies. Social research contributes by providing measurements to assess the situation over different periods.

5. Conclusions

The characteristics, attitudes, and opinions not only of local communities regarding refugees but also of foreigners regarding their prospects of staying in Greece are considered crucial for the best possible handling of the refugee/migration issue and the implementation of policies for their social integration. For this reason, primary research in populations residing in all closed controlled structures and in reception and identification centers should be expanded to capture the views, attitudes, and problems faced by populations in these different areas. It is also important to conduct primary research in controlled structures within the country to explore their level of integration and their perceptions of these societies. Their perceptions vary significantly from the moment of their arrival (in closed controlled structures) until their movement to the inland (controlled structures).

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Article

Exploring Neighbourhood Integration Dynamics of Sri Lankan Entrepreneurs in Rione Sanità, Naples

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Abstract: Integration is always at the core of migration studies and is examined from various theoretical perspectives. While integration models are valuable for understanding how national political systems influence the integration of foreigners into society, the real challenge of integration manifests at the local level. From a neighbourhood-based approach, this article addresses the integration trajectories of Sri Lankan entrepreneurs in Rione Sanità, Naples, which is a socio-economically deprived neighbourhood hosting a substantial segment of foreign populations and has been the target of significant urban regeneration initiatives over the past decade. Sri Lankans established travel agencies, fiscal assistance centres, restaurants, takeaways, and retailers in a transformative context. This article highlights how entrepreneurial initiatives are shaped by the mutual connection linking immigrants with the place where they found economic and relational opportunities. The results serve as a crucial starting point for better understanding the long-term outcomes of the socio-economic integration at the neighbourhood level.

Keywords: neighbourhood integration; Sri Lankan entrepreneurs; social capital; social network analysis

1. Introduction

Immigrant integration is a challenge from both political and scientific sides. In the European scenario, while the governance of states aims to regulate migration flows through entry control mechanisms, it also formulates policies that influence the effective integration of immigrants. Integration policies that include legal status, family reunification, access to health services, education, the housing system, and the labour market suffer from fragmentation at the level of individual Member States due to the gradual decentralisation of responsibilities to other subnational institutions (Passalacqua and Grossio 2023; Huddleston and Scholten 2022; Xhardez 2020). On the scientific side, integration has been examined from different fields, seeking to shed light on how it manifests itself in host societies (Huddleston and Scholten 2022; Ahmed et al. 2021; Villa 2018; Joppke 2014), its conceptual dimensions, and how it can be measured (Goñda et al. 2021; Coşciug 2018; Harder et al. 2018; Caselli 2015).

While national regulations have influenced ethnic integration outcomes, shaping policies ranging from mere tolerance to the valorisation of cultural diversity, interest in observing immigrant integration at the local level have grown over time. In particular, the local level shift in immigrant integration occurred in the past two decades due to the increased responsibility attributed to municipal governments in the implementation of migration policies besides the top institutional level, as well as the prominent role of the social third sector and other non-public actors in addressing the needs of immigrants in the host society (Caponio and Borkert 2010; Campomori and Caponio 2017; Scholten et al. 2017).

Also, the OECD emphasised the importance of integration policies by considering various characteristics of immigrants, including age, gender, and educational level, as well as considering factors related to the host city, such as housing availability and employment

rates (OECD 2018). Hence, immigrant integration should be conceived as an urban phenomenon. As a result, integration trajectories emerge from a two-way process involving both immigrants and the local context, encompassing inhabitants, institutions, cultures, and relationships.

The present study employed a neighbourhood-based approach to examine the integration trajectories of the Sri Lankan community in Naples within the context of Mediterranean Europe. Specifically, it delved into the socioeconomic dimension of integration, focusing on recent entrepreneurial initiatives in Rione Sanità, which is a neighbourhood characterised by a higher concentration of Sri Lankan residents.

It is worth clarifying that immigrant entrepreneurship presents ambivalent aspects regarding integration outcomes. There is a broad consensus that inclusion in the local labour market, including forms of self-employment, is a fundamental aspect of the integration process, as it can make immigrants independent from national welfare systems (Joppke 2007; Huddleston 2020; De Coninck and Solano 2023). Furthermore, employment can impact income; consumption; access to better housing standards; and, generally, enhance the overall quality of life. However, transitioning to self-employment should be approached with prudence as an indicator of social and economic integration because it might represent more of a sign of apparent integration (Ambrosini 2013; Bellesi 2016; Solano et al. 2022). In such cases, immigrants might resort to self-employment due to challenges accessing salaried employment markets or overcoming unemployment (Cruickshank and Dupuis 2015; Brzozowski and Lasek 2019).

The main assumption of this study was that entrepreneurial initiatives are shaped by the mutual connection linking immigrants with the place where they found economic and relational opportunities. The latter are considered closely linked with the family, relations with the ethnic group and the neighbourhood, and relations with local institutions and stakeholders.

This study addressed the following research question: what role do locally nurtured personal networks play in shaping entrepreneurial initiatives?

The results reveal how the entrepreneurial paths of Sri Lankans developed within an ambivalent *opportunity structure* (Kloosterman and Rath 2006). Although favourable conditions for starting trades and services arose in Rione Sanità, these face several vulnerabilities.

Such vulnerabilities refer to both the business profile and the agencies or institutions of the metropolitan area, which are inadequate to support and enhance economic initiatives with specialised services. Overall, the results highlight evolving integration paths in an urban context, such as Naples, where immigration is stabilising in the territory. Focusing on these processes is fundamental to contributing to a relatively unexplored field within the specific territory under examination and directing urban integration policies.

This article is structured into five sections. Section 2 frames the study within the framework of neighbourhood integration. Section 3 provides a brief overview of Sri Lankan migration to Naples. Section 4 introduces the research method, focusing on the ego-network approach. Sections 5 and 6 discuss the results, contextualising the neighbourhood settlement patterns and business opportunities, as well as the reliance on social networks as a potential resource for enterprises. Section 7 concludes the article.

2. The Neighbourhood Integration Framework

Immigrant integration must be analysed by considering the mutual interactions between individuals and social groups and the specific features of the urban territories.

Space plays a dual explanatory function: it influences social integration processes and acts simultaneously as a container for relationships of social proximity or distance between different groups. It is argued that the integration question coincides with the problem of the socio-physical location of the foreigner. As Simmel writes in *Sociology* (1908), the foreigner is the *person who comes today and stays tomorrow*, settling in a physical and relational context to which, however, they do not belong basically from the beginning. This

position makes them both close to and distant from the members of the social body as the holder of different values and cultural elements. The generated tension between inclusion and exclusion makes the foreigner the boundary of the community, forcing society into a continuous process of redefinition (Simmel [1908] 1998). Though avoiding explanations based on all spatial determinism, this perspective recognises the importance of territorial specificities and their influences on social phenomena (Ciaffi et al. 2020), including the integration processes of immigrants. Indeed, the weight of “alterity” is most evident in cities, and urban spaces function as devices to include or exclude minorities (Sennett 2018).

Consequently, the volume of foreign presence in the territories—differentiated by arrival times, reasons for migration, origin, cultures, identities, and expressions of faith—indicates the need for diversified readings of integration pathways. Cities play a pivotal role in the governance of migration since it is within these borders that the “problem” of daily coexistence between old and new inhabitants is measured. Building on the contributions of the Chicago School (Park and Burgess 1921), a rich corpus of studies focused on analysing the close connection between migration and place on various territorial scales (Barberis and Pavolini 2015; Çağlar and Glick Schiller 2015). This study aligned with the neighbourhood integration framework, identifying the neighbourhood as a strategic place to observe how immigrant communities organise their settlement patterns, stabilise socioeconomic positions, and foster relationships both within and outside the ethnic group (Phillips and Robinson 2015; Hanhörster and Wessendorf 2020; Miranda 2020; Lin et al. 2020, 2023; Liu 2023). Consequently, urban forms and the built environment determine the settlement character of immigrants, affecting various aspects of integration, such as health, individual well-being, access to services, and a range of life opportunities (Chetty et al. 2016; Galster 2019; Miranda 2020). Two main strands of study stand out in this framework. The first focuses on the role played by ethnic enclaves in host cities as the immigrants’ preferred initial settlement. Following the approach of several classic studies, the choice to settle in an enclave does not inhibit pathways of ascending social mobility, which, however, occur over time with a gradual dispersion into less ethnically defined neighbourhoods (Portes 1987; Logan et al. 2002). As observed in some communities, the enclave represents an advantage in socio-economic affirmation, with many immigrants setting up thriving businesses in enclave economies and even creating self-sufficient communities (Dikici 2021). The second strand of studies focuses on the role of mixed neighbourhoods and the controversial outcomes of integration pathways (Zapatka and Tran 2023; Galster and Sharkey 2017; Bolt and van Kempen 2013). On the one hand, physical proximity in contexts mixed by origin and class background fosters the creation of transversal relationships between different social groups, accelerating the social inclusion processes (Joseph et al. 2007; Echenique and Fryer 2007; Reardon et al. 2009).

On the other hand, living in mixed and more deprived neighbourhoods leads to “contextual effects”, resulting in a lack of social cohesion; limited access to services; a weak sense of place attachment; and, more generally, significant repercussions on ascending social mobility (Bailey et al. 2012; van Ham and Manley 2012; Hanhörster and Wessendorf 2020; Méreiné-Berki et al. 2021).

However, contemporary integration processes may not develop along a linear, ascending trajectory due to the considerable discretion generated by place-specific circumstances. For example, immigrants, despite having achieved a decent economic situation, may choose to stay in neighbourhoods to preserve social relations, easily acquire housing, benefit from proximity to workplaces, take advantage of opportunities to start a business, or simply because they do not perceive those neighbourhoods as disadvantaged (Hanhörster and Wessendorf 2020). In other cases, the immigrants’ willingness to embark on socio-spatial mobility may be impeded by broader urban transformation processes, such as urban policies, commercial gentrification, over-tourism impact, and real estate market dynamics that make other urban areas unaffordable.

Against this background, the neighbourhood-based approach proves valuable not only to closely examine migrant integration trajectories but also to identify the peculiarities and dynamics that uniquely characterise each locality.

3. Brief Overview of Sri Lankan Migrations to Naples

The reasons for Sri Lankan migration stem from the long history of conflict between the LTTE and the Sri Lankan government, which started in 1983 and lasted about three decades (Chattoraj 2017, 2022). The escalation of the war with severe forms of poverty caused large numbers of displaced persons, both in the internal areas and in Western countries (*ibid.*).

The arrivals from Sri Lanka to Naples occurred around the 1980s through various migratory strategies: religious channels, work permits, and family reunifications (Fraudatario 2021). Initially, this phenomenon displayed the temporary nature of their stay and combined with emigration from southern regions to other regions in northern Italy that offered better job opportunities. This dynamic, defined as *migrations within immigration* (Calvanese and Pugliese 1991), reflects how the specificities of Italian regions structured opportunities for immigrants and natives alike. Immigration from Sri Lanka took place gradually. Initially, men mainly came and found employment in the domestic care and catering sectors. Later, other family members joined them. These factors highlight the long period spent before the ethnic group assumed its current configuration. However, this process is not yet over. Many broken families are pursuing reunification nowadays, while others have formed households within the host city. Children have been born in these unions, which will pose a challenge for second-generation integration in the near future.

As mentioned above, most Sri Lankans have integrated into the domestic care sector, working as housekeepers and caregivers for Neapolitan families. Several advantages resulted from this. For example, the opportunity to easily engage with the local population, learn Italian, secure employment guarantees, supplement income by providing services to the employers' friends (word-of-mouth), initiate procedures for family reunifications, and live in the houses where they work (Bitonti et al. 2023; Benassi et al. 2022; Mazza et al. 2018). However, job placement has also influenced the choice of where to live, such that there were 14,627 Sri Lankan residents in Naples in 2023.¹

As observed in a recent study on the residential segregation of the Sri Lankan community in Italy, in Naples, as in other southern realities, the Sri Lankan community concentrates in many central neighbourhoods, unlike in northern cities, where the community is more scattered throughout the urban areas (Bitonti et al. 2023). Consistent with these findings, 82.6%² of Sri Lankans reside in the I, II, and III districts of Naples, particularly in the neighbourhoods of Stella (26.6%), Avvocata (18.9%), Montecalvario (9.7%), and San Carlo all'Arena (9%). Meanwhile, the presence of Sri Lankans in wealthy neighbourhoods, such as Chiaia (6.5%), San Ferdinando (3.6%), and Posillipo (5.6%), are strictly related to their employment in the domestic care sector, where the place of residence coincides with the workplace.

The city's infrastructural conditions may also explain the residential patterns in the central neighbourhoods. The housing stock, often old and poorly preserved, has attracted greater demand from immigrants with different backgrounds. In addition, these neighbourhoods are strategic for travel by foot or local public transportation to easily reach workplaces and meeting places during leisure time.

4. Research Methods

This article discusses the main findings of research conducted between 2019 and 2020,³ addressing the following research question: what role do locally nurtured personal networks play in shaping entrepreneurial initiatives?

The assumption of this study was that entrepreneurial initiatives were shaped by the mutual connection linking immigrants with the neighbourhood that as a place of proximity, fostered social interactions, encouraged economic practices, and facilitated the mixing of

different social groups. The research adopted a qualitative methodology grounded in the urban context of Rione Sanità. The first approach to the fieldwork was through urban exploration and conversations. In this way, it was possible to obtain the characteristics of the neighbourhood, the prevailing settlement pattern for Sri Lankans, the social gathering places, and the economic fabric of the area. The direct approach to the neighbourhood was instrumental in involving Sri Lankans who own shops and service activities in Rione Sanità; convenience sampling resulted in a total of 18 interview participants (comprising 15 men and 3 women).

The interview guide was structured into two sections. The first section explored the motivations behind starting a business, personal resources, initial and acquired professional skills, former work experiences, leisure time, relationships with the neighbourhood, and whether the neighbourhood they launched their business in coincided with their residence. These aspects were fundamental to understanding the entrepreneurial dynamics and considering the contextual and transformational factors that have affected Rione Sanità over the past decade. The findings are presented and discussed in the following section.

A form for ego-network (or personal network) was structured to analyse which actors and resources were indispensable in the foundation of the business for the second section.

The perspective adopted was multilevel ego-networks. This is a research method specific to social network analysis. The ego-network approach enables taking the viewpoint of a focal individual to investigate the relationships (ties) and exchange content within its social environment (Campbell and Lee 1991; Crossley et al. 2015). Multilevel analysis is a variant of this research that considers networks as nested hierarchical structures, as social systems are inherently multilevel (Lazega et al. 2008; Snijders 2016; Lomi et al. 2016; Vacca et al. 2022). Assuming that multilevel networks are types of nodes operating at distinct levels, such as groups and individuals, with possible connections between all nodes, both within each level and across them (Lomi et al. 2016), the aim was to grasp the social support in the business creation process.

Hence, the entrepreneurs indicated the individuals or groups they had interacted with, the types of existing relationships, and the content conveyed during the setting-up phase. The ego-network levels were (a) family, friends, and acquaintances; (b) local institutions, offices, associations, and trade unions; and (c) other businesses. For each subject (individuals or groups), the interviewees explained why they were involved and how these individuals or groups provided practical support for the enterprise venture.

5. The Neighbourhood Integration of Sri Lankan

Rione Sanità, which is close to downtown Naples, assumed a popular vocation from its origins based on a simple economic fabric related to retail trade and handicrafts engaged in leather processing (tailors, tanneries, dressmakers, and shoemakers). Since the 1980s, Rione Sanità has been an area of settlement of different ethnic groups, among which the consistency of the Sri Lankan group stands out today. The old and low-standard housing has offered the opportunity for immediate residential settlement for immigrants arriving in the city. As emerged in this research, and in line with previous studies, immigrants found initial accommodation in street-level rooms arranged in a few square meters (Pugliese and Sabatino 2006; Fraudatario 2018). The segregation of ethnic groups is moderate, as the neighbourhoods remain inhabited by natives, as in the rest of the city.

During various urban explorations in Rione Sanità, it was observed that families of different social backgrounds coexisted within the same building. Other apartments were converted into rental accommodations for off-site students or B&Bs for tourists. Sri Lankans, other migrant groups, and Neapolitan families belonging to the underclass usually occupied the ground-floor premises. Vertical segregation represents an ancient *modus habitandi*, according to which each building floor matches families of different social classes, and still characterises the modern city of Naples (Barbagli and Pisati 2012). The proximity helped to bridge the social distance and created a dense network of relationships and mutual support. Today, some of these relational constructs continue to shape spontaneous

strategies of social mixing that facilitate multi-ethnic coexistence. As evidence of this residential settlement, several interviewees reported that once they achieved economic stability and their school-aged children's needs required a larger dwelling, they either rented or purchased apartments on the upper floors of the buildings where they already lived. This phenomenon indicates that residential mobility has mainly followed a vertical trajectory, rather than a horizontal one, towards other neighbourhoods in the city. Various territorial practices are a sign of the presence of the Sri Lankan community within the neighbourhood and the pattern of their settlement within it. For example, some churches have repurposed liturgical celebrations being held every Sunday in their language, along with catechesis activities and mutual aid. Other practices refer to the economic activities prompted by Sri Lankans. The signs of grocery shops, takeaways, restaurants, barbershops, travel agencies, tax assistance centres, consultancy offices, telecommunication services, and money transfers are evident while walking through Rione Sanità. At times, multilingualism serves as a commercial strategy for Neapolitan businesses targeting the most consistent ethnic group of the neighbourhood (an example being the translation of food offers or services, such as gold exchange, in Sinhala). Despite the immigrant entrepreneurship often passing quietly, it is undeniable that their enterprises are continuously growing. Rione Sanità is an emblematic case, recalling what Park and Burgess (1921) defined as *ecological integration*, which is a way of living and moving in the neighbourhood without affecting one's lifestyle or that of locals.

5.1. The Entrepreneurial Vocation

Several substantial changes that have taken place over the past decade emerged during fieldwork in Rione Sanità. The regenerative push promoted by local associations, citizens, and businesses culminated in the recovery and reopening of archaeological sites, the organisation of cultural events, and a diverse range of facilities and opportunities for expanding tourism, thereby creating profits for the entire commercial industry in the district.

The Sri Lankan enterprises integrate into this fabric, although their businesses only partially target mixed customers. Apart from grocery shops and fast food, most activities aim to meet the needs of the ethnic group. These include businesses such as tax assistance centres, money transfer services, and travel agencies. The motivations in starting up seem to overlook this change, despite the Rione Sanità revival being advantageous for some Sri Lankan businesses. Interviews reveal that starting a business is more of a response to employment issues, low-medium education qualifications that limit employability, and dissatisfaction with caregiving work within families.

This aligns perfectly with the general Italian context, which highlights, on the one hand, the sectoral concentration of Sri Lankans in public, social, and personal services (57%) and, on the other hand, modest growth in self-employment (+6% in the period 2020–2021) (Ministero del Lavoro e delle Politiche Sociali 2022).

The motivation behind the decision to start a business followed two trends: the first concerned early pioneers, while the second involved the younger generations. The pioneers, usually the first Sri Lankan immigrants in Naples, invested in trade, import/export, and services to gain tangible economic benefits and enjoy a certain social reliability within the community:

The problem with work practices, tax declaration, family reunifications [...] the community needed someone from within to solve these issues.

On the other hand, among the newcomer younger generations, there was a trend to seek out untapped market niches to fill in with more exclusive products compared with those already widespread in the ethnic market:

When I occasionally talked to my husband, I said that here, our fellow countrymen only open grocery stores and travel agencies . . . there are many new Sri Lankan shops, but no one has opened a stationery store. I thought that could be something different to sell not

only school supplies, stationery, phone recharges, and transport tickets that can also be suitable for Italians, but also books in the Sinhalese language for both adults and children.

This framework underlines how the decision to start a business depends on various factors attributable to the opportunities and limitations encountered in urban contexts and individual skills, such as past professional experiences, aspirations, soundness of business projects, and functional relationships.

5.2. Demography of Sri Lankan Businesses

This section presents descriptive data that outline the demographics of businesses (Table 1). Most activities belonged to two categories: (1) consultancy and services agencies and (2) retail. The former aimed to offer solutions that meet the needs of Sri Lankans, while the latter attracted a mix of customers. The first category included travel agencies, import and export businesses, money transfer services, tax assistance centres, and personal services (hairdressers and barbers). The second involved groceries, electronic devices, and other items. Only one business was a supplier of food products for ethnic shops and restaurants, which also catered to other groups. Considering other variables, such as the number of locations and employees, the emerging enterprises seemed less structured in the neighbourhood. Apart from suppliers, all of them operated from a single location. Concerning the number of employees, except for the restaurant and service sectors, which required more staff, all other activities had a self-employment profile. However, from the interviews, it was evident that even in cases where more employees were registered, they were usually recruited from within the family or from a circle of trusted friends.

Table 1. Business profile.

Investment Sector	N. Entreprises	Branches (Average)	Employees (Average)	Customers
Services and consultancy agencies	8	1	3	Ethnic
Retail	6	1	0.8	Mix
Restaurant and fast food	3	1	4.3	Mix
Supplier	1	2	4	Co-ethnic

As anticipated earlier in this article, the phenomenon of Sri Lankan entrepreneurship is of recent establishment in Rione Sanità. Therefore, time is also a variable that has impacted the current configuration of the business. In this regard, it is interesting to observe the temporal evolution of enterprises by year of foundation (Figure 1).

The observed trend highlights an incremental growth in openings, with a peak between 2006 and 2013, suggesting two reflections. First, it is significant to consider the settlement process of this group in the area. Considering that the first arrivals from Sri Lanka occurred approximately 40 years ago, it took some time for Sri Lankans to overcome the initial challenges of inclusion in the local job market. However, as the community stabilised within the host society, their entrepreneurial presence became more structured, mainly for providing typical ethnic services and products. A second observation explicitly concerned the neighbourhood. In fact, between 2010 and 2012, Rione Sanità began a social upgrading path by exploring workable alternatives to unemployment, urban decay, and organised crime that previously affected its social fabric. These regenerative drives had a beneficial influence in creating a more welcoming and secure environment to run businesses. Among the interviewees, some argued that the transformation within the neighbourhood served as an additional impetus towards initiating entrepreneurial endeavours and mitigating *the apprehension of encountering adverse retaliation*.

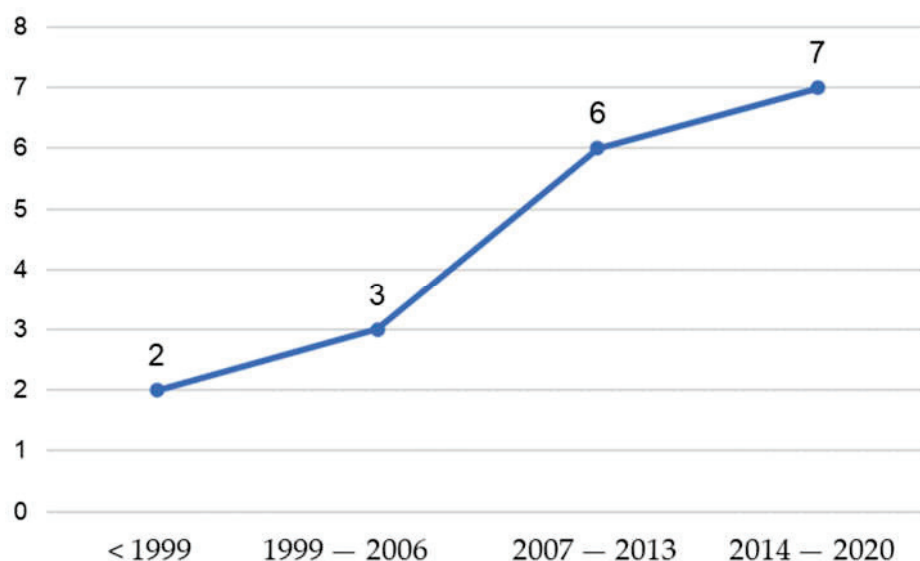


Figure 1. Foundation year.

6. Narrative Ego-Networks

This section provides an answer to the research question that focused on the functioning of ego networks and whether and how locally cultivated relationships supported the creation of the enterprise. As anticipated in the Research Methods section, the data collected yielded multi-level ego networks, where each level referred to a specific social environment: the family and friendship domain, the territorial context, and the commercial sphere.

This section discusses the ego-network configurations of two emblematic entrepreneurial strategies in which family support and the benefits of belonging to multiple social groups and contexts prevailed.

6.1. Family Support

The family institution plays a crucial role in immigrant entrepreneurship through various modes of involvement within it. Previous studies demonstrated that the family acts as a reference point at all stages of entrepreneurial venturing, including the creation stage for exploring business ideas, obtaining financial support, and making decisions (Bagwell 2015; Kloosterman et al. 2016; Evansluong and Ramírez-Pasillas 2019; Ljungkvist and Boers 2023). This significance extends to the organisational stage, where, for instance, recruiting labour within the family helps to cut management costs (Ram et al. 2008). Ultimately, *family social capital* (Portes and Sensenbrenner 1993; Astrachan and Shanker 2003; Tata and Prasad 2015) is a resource for entrepreneurial performance, especially in migratory contexts, where limited knowledge of the new local reality fuels dependence on family or community networks.

The case of P2, like other experiences revealed in this research, was a significant example of how relationships nurtured within a close-knit network facilitated immediate access to material and immaterial resources. These included financial resources, motivational support, and professional referrals, which contributed to opening a business focused on repairing and selling electronic devices (Figure 2).

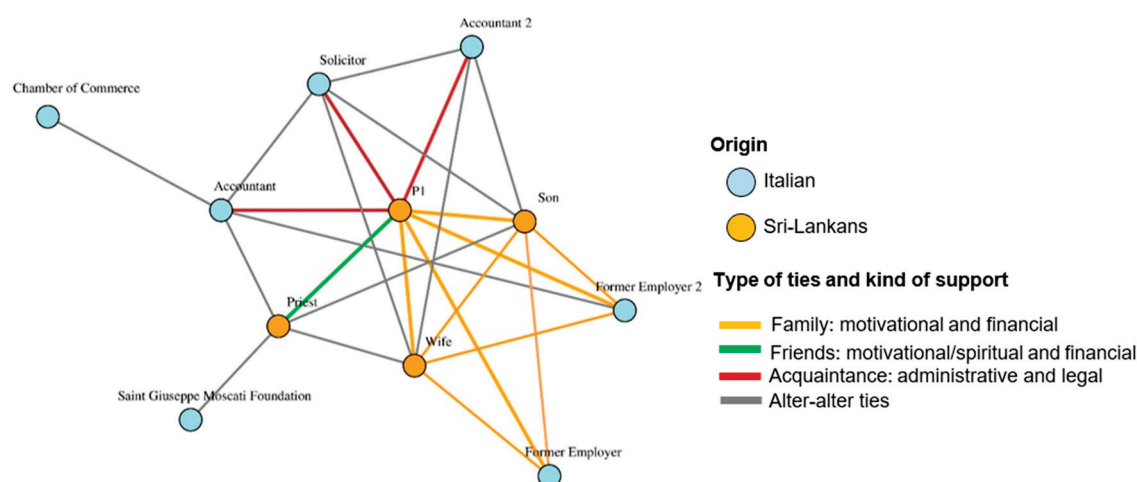


Figure 2. The close-knit network of P1.

Upon arriving in Naples in the 1980s, P1 obtained a job as a caregiver, despite his master's degree in electronic engineering. He spent about 15 years in the service of two Neapolitan families, establishing relationships of mutual respect and affection. These same relationships were helpful when P1 decided to invest his skills in more satisfying employment. The decision to set up his own business matured with the birth of his first child, and it was also a response to the difficulties he encountered in the employment market and the lack of recognition of his academic qualifications in Italy. According to the *blocked mobility* thesis (Bonacich 1973), the enterprise initiative is a response to the discrimination encountered in the possibility of social and employment mobility.

The family emerged as the principal provider of support by helping in terms of emotional and financial support. Support for P1 extended from the nuclear family to the extended family, including former employers. Hence, while his wife contributed to savings by continuing to work in domestic collaboration, the families for which P1 had previously worked were willing to support his project with a modest loan and introduce him to some accountants. After a year and a half, using this pocket of savings, he signed a lease and opened his own office. However, financial capital was insufficient at this early stage to purchase all the necessary work equipment. In addition, a lack of knowledge of regulations and bureaucratic trials caused further delays. For these reasons, P1 turned to the parish priest of the Sri Lankan community, who became a crucial resource. The priest made a grant through the San Giuseppe Moscati Foundation and interceded with the accountant to formalise P1's request. Henceforth, P1 was able to capitalise on resources and expand his network of connections with other Neapolitan professionals, who supported him in all stages of starting a business, including facilitating agreements with the Chamber of Commerce.

Some descriptive statistics of the network confirmed the behaviour of P1 in pursuing his business project. This network consisted of 13 nodes and 56 ties (size) and illustrated the active role of the close-knit network. The E-I index⁴ values for the formal–informal and out–in partitions explained this result. The first partition included all relationships established with the institution and local stakeholders (formal) and those within the close-knit network (informal). The second partition involved all the relationships that referred to the ethnic group (in) and externally with the locals (out). The homophily values (E-I index) confirmed that P1 realised his entrepreneurial project by leveraging his informal relationships (−0.571) and connections outside the Sri Lankan community (0.429).

As it emerged from P1's experience, like the other six Sri Lankan entrepreneurs, the domestic partnership within Neapolitan families fed the feeling of belonging to an extended family. These relationships often acted as a *glue* for socio-economic integration, enabling

immigrants to receive practical assistance for their needs, such as language acquisition, regularising their legal status, obtaining loans, and achieving labour mobility.

6.2. “Multifocality” Network

Entrepreneurial activities of immigrants reflect particular territorial and social configurations. In this sense, immigrants are greatly influenced by external constraints, such as the market opportunities and regulatory frameworks of the receiving contexts, as they can shape nascent ventures by leveraging individual skills and accessing resources and information by establishing contacts of different kinds (Kloosterman 2010; Rath and Schutjens 2016; Solano et al. 2022). As with the other 10 experiences collected, the second case refers to R4’s enterprise strategy (Figure 3), which leveraged various local and transnational channels to set up her business.

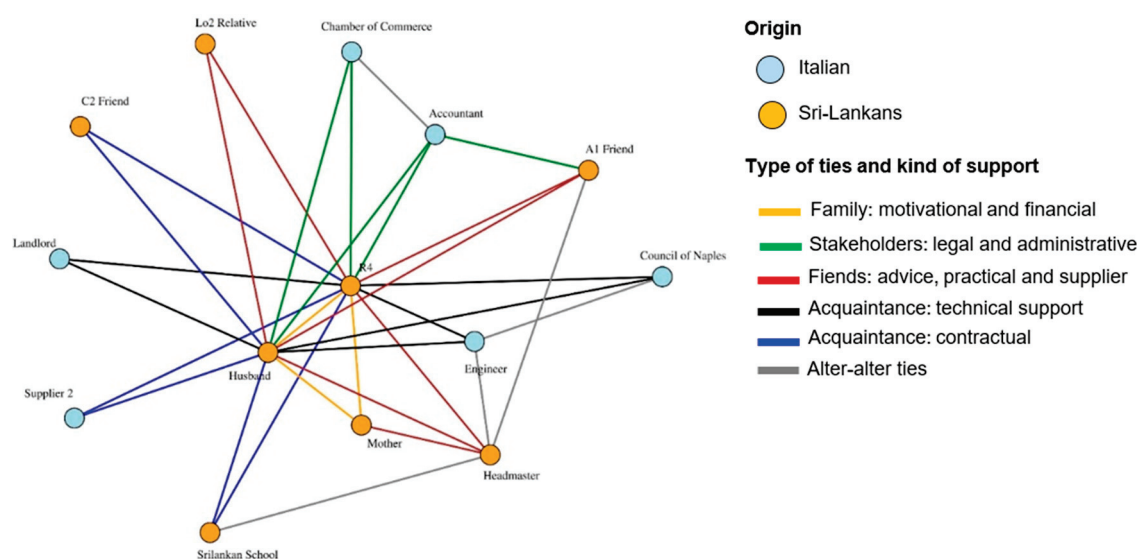


Figure 3. The *multifocality* network of R4.

The ego network of R4 had a size of 14 nodes and 63 ties. However, it is worth noting that many nodes and ties can be both a resource and a constraint for entrepreneurship. In the former case, it indicates a socialising profile of the ego that is capable of accessing diverse resources through multiple channels (Storti 2018). In the latter case, it reflects the difficulties encountered in realising projects, and thus, the involvement of several actors. Such explanations are not mutually exclusive, and the case of R4 provides an emblematic example of how social actors help to overcome the limitations encountered in the territory. The ego-network weaved together community relations and Neapolitan ties, all crucial in providing support. Moreover, the roles of R4 and her husband were structurally equivalent within the ego network since both had the same number of adjacent nodes with the same type of ties (Lorrain and White 1971). From a sociological point of view, this structural feature of the network denoted both a resource and a constraint. On the one hand, a pair (of actors) sharing similar attitudes and opinions best finalises the entrepreneurial strategies. On the other, structurally equivalent positions denote a relationship that is not very beneficial because it leads towards redundant and poorly capitalised information, as opposed to what those relationships established in other social circles would do (Burt 2000). This ego network was distinguished by its significant values of *structural holes* (Burt 1992) built on the effective size measure⁵ (10.04) that confirmed the presence of non-redundant contacts in the networks. To put it another way, egos of this type transform networks into devices to be consciously manipulated for their own ends (Watts 1999, p. 495) by occupying structural holes. R4’s ego-network revealed that occupying a strategic position in a network structure means gaining access to various social environments to draw essential resources.

When R4 thought of starting her own business, she figured she would do something new and different from the Sri Lankan grocery stores, minimarkets, takeaways, or travel agencies already in town. The idea of a stationery store that would sell Sri Lankan school books that were not readily stocked was born to meet the ethnic demand. Also, the focus was on attracting local customers for stationery, city transportation fares (Unico Campania), and mobile top-ups. In this regard, the role played by others (alters) was interesting to examine at different project stages. In the ideation stage, besides the support of her own family, R4 received strong encouragement from the headmaster of the Naples-based Sri Lankan school, who appreciated the project and assured her full support. However, the first delays occurred during setting up the commercial space due to a warehouse with infrastructural insecurities rented at a competitive price. R4 contacted the municipality's technical department and applied for a use conversion to resolve such issues. After several unsuccessful attempts, the headmaster put them in touch with an engineer in charge of restructuring the premises, who would also manage the relations with the competent offices. At the same time, through a compatriot, namely, A1, R4 entrusted an accountant to handle arrangements for registering the business with the Chamber of Commerce.

When the stationery store was finally inaugurated, the Sri Lankan school actively promoted it among students and families, leading to R4 receiving numerous orders. R4 established new relationships with local suppliers for printing support and stationery. Additionally, her network extended to transnational trade with her friend C2 and brother-in-law Lo2, who were the main suppliers of schoolbooks in the Sinhalese language. This network confirmed that a business strategy can be defined using the concept of *multifocality*, namely, the simultaneous involvement of migrant entrepreneurs in multiple places and multiple groups that influence their business opportunities (Solano 2016; Solano et al. 2022). In other words, the migrant entrepreneurs transcended the limitations of a single place or group, actively participating in various contexts. Multifocality underscored a comprehensive strategy, allowing the migrants to thrive in multiple locations and diverse communities. This diversification fosters expanded business prospects, as well as their network. Ultimately, multifocality emerged as a defining aspect of migrant entrepreneurial strategies, facilitating the utilisation of diverse contexts and relationships for entrepreneurial success.

7. Conclusions

Cities are the places most directly involved in the integration challenge and provide a testing ground for building an interethnic society. This study demonstrated, through the results of fieldwork, how the neighbourhood-based approach was effective for exploring the trajectories of integration of Sri Lankans in Rione Sanità in Naples. A key starting point was to consider the neighbourhood as a contextual factor, not of secondary importance, in determining the trajectories of immigrants' housing and economic and social integration.

Specifically, it was observed that integration was often the result of the interaction between immigrants and the urban context, highlighting how places became crucial in providing opportunities for economic and relational integration. Such interactions acted as a vehicle for various forms of social support, which fed integration dynamics.

The results show how the physical and social infrastructures created fertile conditions for the inclusion of Sri Lankans in the neighbourhood. Housing integration features vertical segregation, laying a basis for the social mix between social groups with different backgrounds. As a result of recent urban transformations, which have made the neighbourhood attractive to tourists and new residents, this coexistence did not seem to suffer significantly. Rather, the gradual exit from previous forms of urban and social decay created ideal conditions for reactivating local commerce, even acting as a stimulus for Sri Lankan entrepreneurship.

However, exploring Sri Lankan entrepreneurial trajectories revealed uncertain outcomes in terms of integration due to two key aspects. The first was that Sri Lankan businesses had a weak profile, which was attributable to a poor entrepreneurial culture, exposing them to the risk of failure in the long run. They were self-employed businesses

limited to the sale of goods and services within the community, limiting the profit margins that would result from expanding their customer base.

Moreover, the analysis of entrepreneurial networks revealed how these pathways often develop informally to fill gaps in the understanding of concrete regulatory mechanisms and to access economic resources otherwise unavailable, as in the case of banking channels. Social capital, which extended beyond the ethnic group by involving friends, local, and transnational acquaintances, played a major role in these dynamics.

The second aspect concerned considerations about the whole city, which appeared to be inadequately equipped to support and enhance immigrants' entrepreneurial paths through targeted counselling and support services. In this context, more critical issues emerged regarding the capacity of local authorities and non-governmental agencies to respond to the needs of aspiring entrepreneurs. These difficulties translated into a demand for assistance aimed at local professionals who acted as mediators with the territory, especially in dealing with the administrative and legal requirements needed to start a business.

In general, the results of this research highlight the fragility of integration policies, both at the national level in Italy, where a coherent strategy is lacking, and at the local level, where interventions, albeit existing, primarily focus on initial reception needs. These include programs for placement in reception centres, healthcare assistance, Italian language classes, and regularisation of legal status. However, considering that cities serve as permanent destinations for the foreign population, it is crucial to provide support during the entire migration process. In Naples, urban integration policies are deficient in addressing the concrete pathways to socio-economic inclusion for immigrants.

As a result, prioritising the design of more targeted policies and interventions, in collaboration with local institutions and third-sector associations, to overcome the narrowness of primary services and promote immigrant empowerment is crucial. For instance, it might be necessary to invest in a more varied service offering, including professional workshops, know-how, support in business design, access to microcredit, and training in taxation for sustaining entrepreneurship. Such an approach would benefit not only immigrants interested in self-employment but also the entire urban context. Besides economic returns, it might serve as a resource for enhancing neighbourhoods experiencing social, cultural, and economic challenges.

This research, on the one hand, contributes to advancing the understanding of a field that is still underexplored in the Neapolitan context, offering valuable insights to guide the evolving integration trajectories of the Sri Lankan community. On the other hand, it aligns with the framework of the neighbourhood-based approach, emphasising the importance of adopting strategies that consider the specific dynamics of the neighbourhood to analyse and promote authentic social and economic inclusion of immigrants, fostering comparisons with other territorial contexts.

In addition, this research presented limitations that might be considered as starting points for future investigations. The low participation of women in self-employment requires empirical attention, considering gender inequalities and cultural factors. A more in-depth investigation into the weaknesses of the territory, including the influence of broader institutional and regulatory factors on the entrepreneurial dynamics of immigrants, would be relevant. Another worthy area of inquiry pertains to the sustainability of businesses over time, aiming to understand the determining factors of their survival or mortality. Lastly, the comparison between the initiatives promoted by migrant communities; local initiatives; and active forces in society, both political and economic, should be paid attention to.

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Institutional Review Board Statement: Ethical review and approval were waived for this study because the data were collected as to prevent or not allow the identification of the interested party. The information processed was not sensitive and was treated with strict confidentiality, in accordance

with the provisions of the legislation on the processing of personal data EU Regulation 2016/679, Legislative Decree 196/2003.

Informed Consent Statement: Written informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data sharing is not applicable to this article.

Conflicts of Interest: The author declares no conflict of interest.

Notes

- ¹ Source: Tutto Italia. Demographic statistics. Foreign residents in Naples, last update on 1st January 2023. Available online: www.tuttoitalia.it (accessed on 18 November 2023).
- ² Source: Demographic statistics. The foreign resident population, last update on 2016. Statistics Office, Naples City Council, Available online: www.comune.napoli.it, accessed on 22 November 2023.
- ³ Before the closure imposed by the lockdown due to the SARS-CoV-2 pandemic.
- ⁴ The E-I (external–internal) index, introduced by Krackhardt and Stern in 1988, is calculated by subtracting the number of ties between group members from the number of ties to outsiders and then dividing by the total number of ties. The index ranges from −1 (indicating entirely internal ties) to +1 (signifying exclusively external ties).
- ⁵ *Effective size of the network (EffSize)* is the number of alters that ego has, minus the average number of ties that each alter has to other alters (Hanneman and Riddle 2005).

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Article

Analyzing the Impact of Public Housing Privatization on Immigrant Micro-Segregation in Milan

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Abstract: In several Western European countries, a significant share of social rental housing stock has been sold since the 1980s as part of government policies aimed at promoting homeownership societies. Research has shown that tenure conversion has contributed to increasing socio-spatial segregation of lower-income groups, with diverging spatial patterns of homeownership among immigrants. This paper examines the impact of recent public housing privatization schemes in Milan in relation to micro-segregation and peripheralization processes of foreign populations, which represent distinctive features of immigrant residential distribution in this city. By employing name analysis, an unconventional approach in segregation studies, I inferred the geographical origins of homebuyers and mapped their distribution across the city. The findings reveal divergent purchasing behaviors, whereby Italians predominantly acquire properties in semi-central areas currently undergoing urban regeneration. In contrast, immigrants tend to concentrate their acquisitions in peripheral post-war public housing neighborhoods or in areas predominantly inhabited by residents with similar geographical origins. This paper contributes to the existing literature on ethnic residential segregation in Southern European cities by shedding light on the underexplored role of public housing privatization policies in shaping specific residential patterns and housing outcomes among different groups.

Keywords: social housing; housing preferences; residential segregation; housing policy; social mix; name analysis

1. Introduction

In several Western European countries, a significant share of social housing stock has been privatized since the 1980s as part of government policies aimed at promoting homeownership societies (Gibb 2003; Gimat et al. 2023; Pattison and Cole 2020). Among the different pathways of privatization, one of the most popular forms has been tenure conversion, whereby social or public dwellings have been converted into private, owner-occupied houses, often by granting occupants the right to buy at discounted rates (Forrest and Murie 1988; Elsinga et al. 2014)¹. In the UK, more than 1,500,000 dwellings were sold off to sitting tenants under the well-known Right to Buy program (Kleinhans and Van Ham 2013), representing one of the most remarkable examples of the neoliberal turn in housing policy in Western societies (Whitehead 2012).

The privatization of social dwellings has been supported by several assumptions asserting the “superiority” of homeownership over rental housing. According to policy-makers, homeowners exhibit greater self-sufficiency and take better care of their dwellings compared to tenants. Homeownership is associated with positive socio-spatial outcomes as it is linked to lower residential turnover, which, in turn, is believed to positively impact the quality of social interactions, leading to increased social capital and trust among residents (Kleinhans and Elsinga 2010). In addition, the sale policies of social housing were motivated by nonprofit housing organizations’ need to compensate for the reduction in financial resources caused by government cutbacks in the social housing sector, which limited their ability to effectively manage the housing stock (Gibb 2003).

Regarding the effects of social housing privatization, studies have emphasized the widening socio-spatial divides between neighborhoods (Kleinhans and Van Ham 2013; Murie 2014). Sales policies have contributed to the increased residential segregation of socially disadvantaged groups, including immigrants, who have often remained confined to lower-quality housing concentrated in less attractive neighborhoods. Conversely, thanks to favorable market conditions created by these policies, more affluent tenants have gained access to better quality homes in the most desirable areas, where owner-occupancy rates were already high (Forrest and Murie 1988; Kleinhans and Van Ham 2013). One long-term consequence of sales policies is gentrification. When privatized dwellings are later resold or rented on the free market, they are rarely accessible to first-time buyers and low-income households due to the higher prices set. This phenomenon has been observed in certain areas of London, where privatized properties were increasingly occupied by younger, more affluent households with shorter-term residential mobility patterns (Gimat et al. 2023).

An underexplored aspect in this debate pertains to the outcomes of privatization policies on the residential distribution of immigrant populations. In their study conducted in Amsterdam, Boterman and van Gent (2014) found that tenure conversion has contributed to increasing ethnic polarization between the historical center and postwar peripheries of the Dutch capital. In addition, the authors have highlighted that each migrant group exhibits divergent patterns of purchase, suggesting the relevance of a more thorough examination of the factors that shape tenure conversion outcomes, such as the structure of the neighborhood housing market and the purchasing behaviors of homebuyers.

A deeper understanding of the outcomes of social housing sales for the immigrant population can help clarify the role of this policy in addressing a crucial component of social integration within the host society, namely housing, with homeownership being often considered a strong indicator of such integration (Constant et al. 2009; Kauppinen et al. 2015; Vono-de-Vilhena and Bayona-Carrasco 2012). In addition, examining this process through a spatial lens can shed light on the locational advantages and disadvantages associated with migrants' purchases, which extend beyond the tenure dimension. This is closely related to debates on neighborhood effects, which consider the extent to which neighborhood socio-spatial characteristics shape individual life chances and outcomes (Bolt et al. 2010; Fajth and Bilgili 2020; Gijsberts and Dagevos 2007).

Investigating the socio-spatial outcomes of sale policies remains a pertinent issue in light of ongoing debates surrounding the shortage of affordable housing (Wetzstein 2017) and concerns about the rising levels of socio-economic and ethnic segregation in cities (Tamaru et al. 2016). While some countries, such as the UK and Germany, are attempting to repurchase previously sold stock to address the current housing crisis, other countries, such as France and Italy, are accelerating the sale of social housing (Gimat et al. 2023). Taking Italy into consideration, this policy occurs in a context where the availability of social housing is minimal (only 5% of the stock) and where residential ethnic segregation assumes unique forms. Like in several Southern European contexts, Italian cities traditionally feature high levels of social segregation and low levels of spatial segregation (Arbaci 2019; Mugnano and Costarelli 2018; Zajczyk 2003).

This paper delves into the privatization policies of publicly owned dwellings in Milan. Since 2014, the local provider has put more than 2000 vacant dwellings up for auction at discounted rates, adding to long-standing policies that have reduced the availability of social units by about 30,000 since the 1990s (Report Milano 2021). Building on previous studies that have shown increasing trends of micro-segregation and peripheralization of immigrants in this city (Costarelli and Mugnano 2017; Mugnano and Costarelli 2018), this paper aims to examine the effects of public housing sales on the spatial distribution of the immigrant population. The research question guiding this paper is as follows: what are the socio-spatial outcomes of public housing privatization in the urban context of Milan?

To address this question, I identify and compare the purchasing behaviors and strategies of both native and immigrant groups, with a specific focus on two key migrant communities, namely Africans and Asians. These communities represent the largest seg-

ments of foreign citizens in Milan and have also accounted for the most significant number of public housing purchases among immigrant populations. Using a name-based classification method (Lan et al. 2021; Mateos 2007), I inferred the geographical origins of buyers based on their names and geolocalized the properties associated with these names to analyze and compare the spatial distribution of property purchases made by both native and immigrant populations, as well as Asian and African buyers.

The findings reveal a notable prevalence of property acquisitions by Italian citizens in residential estates located within central or semi-central areas that are currently undergoing urban regeneration projects bringing improvements to the built environment. Conversely, immigrant property acquisitions display a pronounced concentration in peripheral neighborhoods. Significantly, purchasers originating from African countries manifest a concentration of acquisitions within post-war public housing districts, whereas Asian buyers tend to converge in areas predominantly inhabited by residents with similar geographical origins. This underscores the existence of a discernible link between the outcomes of this policy and the distinctive residential patterns exhibited by Asian buyers, in particular the Chinese community.

This paper is divided into five sections. The following section contextualizes the present study within the framework of housing policies in Italy and their influence on the residential patterns of immigrant communities, with a specific focus on the city of Milan. Section 3 outlines the research design, encompassing data collection, methods, and analysis. In the fourth section, I present the findings, which are subsequently discussed in the concluding section of this paper.

2. Italian Housing Policies and Their Influence on Immigrant Residential Patterns in Milan

Since its inception, Italian public housing (*edilizia residenziale pubblica*) has offered tenants various advantageous opportunities to access homeownership, such as rent-to-buy (*affitto a riscatto*) and right-to-buy schemes (*piani di vendita e alienazione*). According to estimates, the rent-to-buy schemes facilitated the conversion of at least 50,000 units, while approximately 100,000 units have been sold as part of the right-to-buy schemes introduced in 1993. The latter encouraged public landlords to sell up to 50% of their stock to sitting tenants with at least five years of occupancy, resulting in a 22% reduction in the availability of public housing stock and generating approximately EUR 2.4 billion in earnings (for a stock valued at EUR 9 billion).

Despite the increasing tenure mix, privatization has brought about additional managerial challenges for public landlords². In post-privatization multi-tenure buildings, roughly 70,000 (Federcasa 2015), public landlords have found it increasingly difficult to align their managerial strategies with the requests and needs of new homeowners. In the majority of these estates, these landlords retained only a minority share of dwellings. Consequently, public landlords were compelled to accept homeowners' decisions, such as initiating renovation works, which posed further challenges to the financial stability of these organizations, already affected by budget reductions. Therefore, sales policies have primarily targeted this segment of the public housing stock.

In Italian cities, right-to-buy schemes have also contributed to the exacerbation of socio-spatial segregation through filtering processes that increasingly marginalized lower-income households, including immigrants who were unable to buy, in unattractive and low-quality estates. Meanwhile, better-off tenants were able to purchase higher-quality housing stock (Bergamaschi and Maggio 2020). Rent-to-buy and right-to-buy schemes continue to shape current housing policies in Italy, which have been reconfigured on a regional basis since 2001, granting local authorities more autonomy to define their agendas (Costarelli and Mugnano 2017).

In Milan, public housing is jointly owned by the City Council (46%) and the regional public housing company ALER (*Azienda Lombarda per l'Edilizia Residenziale*) (54%)³ (Petersen 2018; Report Milano 2021). The current privatization policy primarily targets

vacant dwellings owned by the latter, constituting approximately 10% of the entire stock (7200 units in 2020). These sales policies aim to bolster the financial stability of the organization, which currently struggles to cover the expenses of necessary renovation work required for the allocation of these dwellings to eligible households (Costarelli 2022). However, this policy has further diminished the availability of public rental solutions that were already challenging to access for immigrant groups. This difficulty arises from the requirement of at least five years of regular registration and a stable presence in the region (*anzianità di residenza*). In 2017, immigrants accounted for 16.8% of total tenants living in the City Council's public housing stock, with the most prevalent nationalities being Moroccan (2.9%), Filipino (2.3%), Sri Lankan (1.6%), Peruvian, and Ecuadorian (1.1%) (Petsimeris 2018). The combination of a limited supply of public housing, stringent allocation rules, and immigrants' vulnerable position within the labor market are crucial factors in explaining both residential patterns and housing conditions of foreign populations (Benassi et al. 2019; Mugnano and Costarelli 2018).

While rent remains the most prevalent tenure choice among immigrant households, accounting for 63.5% at the national level, recent years have witnessed increased attention on the homeownership trends within this population, which rate stood at 20% in 2021. The typical social profile of immigrant homeowners corresponds to long-term residents (with at least 10 years in the country) holding stable job positions (Scenari Immobiliari 2021). The highest rates of homeownership are recorded among Albanian immigrants, who were among the earliest significant immigrant groups in Italy, dating back to the early 1990s. They are followed by Chinese, Moldovan, and Moroccan immigrants (Ministero dell'Economia e delle Finanze and Agenzia delle Entrate 2019).

However, the mere access to homeownership by immigrants does not necessarily indicate full social integration. Variables such as the conditions of their dwellings, mortgage burdens, and property locations should also be taken into account. In fact, limited economic resources and a lack of credit market guarantees have directed immigrants toward smaller and lower-quality housing in the homeownership market, compared to native households (Alietti and Agustoni 2013).

In addition, immigrants' home purchases have been strongly influenced by economic downturns resulting from recent crises and subsequent increases in immigrant employment rates. The incidence of home purchases by immigrants declined from 17.3% in 2017 to 8.9% in 2019 and further dropped to 5% in 2021 following the onset of the COVID-19 pandemic. Similarly, during the period 2004–2007, immigrants from non-European countries accounted for 8.2% of the total mortgages disbursed. However, this percentage decreased to 4.5% between 2008–2011 (Banca d'Italia 2012).

When looking at the spatial implications of these trends, recent data show that immigrants' home purchases are more frequent in small-sized towns and peripheral areas of the largest cities. The incidence of foreign purchases in peripheral areas increased from 31.7% in 2017 to 35% in 2021, and from 53.1% to 57% in greater peripheral areas (provinces). Meanwhile, in central and semi-central areas, it dropped, respectively, from 8% to 3.7% and from 7.2% to 4.3%. These trends underscore significant changes compared to past situations in the largest cities, where access to homeownership had enabled immigrants to move from high-immigrant concentration neighborhoods into more socially diverse areas (Scenari Immobiliari 2021).

In Milan, recent research has pointed out a growing trend of peripheralization among ethnic minorities in the city (Bergamaschi et al. 2021; Costarelli and Mugnano 2017). This socio-spatial process, common to other Southern European metropolises, has been described as an “urban diaspora” by Arbaci (2019). While immigrants are increasingly choosing to reside in peripheral areas, they also tend to cluster together, leading to a process of micro-segregation. Unlike many American and Continental European cities, where ethnic concentration often results in large homogeneous neighborhoods in the outskirts (Maloutas and Karadimitriou 2022), Milan's micro-segregation occurs at smaller scales. It is observed at the level of streets, individual buildings, or blocks of buildings. Several

contextual factors contribute to the formation of micro-segregation, including the relatively low proportion of public housing and its scattered distribution. Research indicates that these micro-segregation areas in Milan are expanding, giving rise to larger clusters where the divisions along income or ethnic lines are becoming more pronounced (Mugnano and Costarelli 2018).

In 2022, foreign citizens constituted 20.61% of Milan's total population, representing a diverse array of over 140 nationalities. The largest groups among these foreign citizens were Egyptians, Filipinos, and Chinese, accounting for 14.91%, 13.77%, and 12.11% of the immigrant population, respectively. These were followed by Peruvians, Sri Lankans, and Romanians, each making up approximately 5–6% of the immigrant population (City Council Register). After a substantial increase during the 2003–2013 decade, the growth rate of the migrant population in Milan has gradually declined, indicating that many immigrants have become integrated into the city's social fabric.

Immigrant groups tend to occupy older and lower-quality public housing units, particularly in historic public housing neighborhoods like San Siro, Mazzini, Calvairate, and Stadera, which were built before World War II. In these areas, immigrants share spaces with other vulnerable populations such as elderly individuals living alone, households with invalidating health problems, and squatters. A minority of immigrants (less than 15%) reside in post-war public housing neighborhoods like Gratosoglio, Gallarate, and S. Ambrogio, located in more peripheral areas but offering better housing standards (Alietti and Agustoni 2013). Micro-segregation is also noticeable in areas like Bovisa and Via Padova, where the housing structure is predominantly private, but the low quality of dwellings makes it unattractive to middle-income households.

Regarding the residential patterns of some of the most prominent immigrant groups, Egyptians have tended to settle in the southern and western public housing peripheries (San Siro, Giambellino, Lorenteggio, and Mazzini), as well as in areas dominated by private housing. Chinese citizens have exhibited a more uniform distribution in the northern periphery, while clusters of Sri Lankans and Filipinos have been observed in both multiethnic neighborhoods in the northeastern private housing periphery of Via Padova and affluent condominiums in the city center, where they often work as caretakers (Mugnano and Costarelli 2018).

While some immigrants have reached similar conditions to the native population, others live in precarious arrangements that expose them to greater risks. This polarization in the housing outcomes of the immigrant population is a result of market-led housing policies that have been able to integrate the majority, albeit at higher costs, while systematically excluding another part (Tosi 2017). Given the significant role of public housing in shaping immigrant residential patterns and the critical interaction with the private housing market in drawing socio-spatial boundaries along ethnic lines, in this paper, I am interested in investigating the impact of tenure conversion policies of public housing on the ongoing dynamics of micro-segregation among immigrant populations in Milan.

3. Data and Approach

Between 2014 and 2016, the Lombardy regional government initiated two plans aimed at auctioning off 2955 vacant public housing units owned by the local public housing company ALER, within the Milan metropolitan area. These plans focused on units in multi-tenure buildings, where the public landlord maintained a minority share of dwellings, including units in prestigious or highly lucrative buildings, as indicated in official documents. The dwellings were made available through monthly public calls, which provided information regarding size, location, opening bids, and various dwelling characteristics.

These calls also featured images of the dwellings and outlined eligibility criteria for prospective homebuyers. Both EU and non-EU citizens were allowed to participate. For non-EU participants, possessing a valid residence permit and having worked continuously in Italy for at least two years were prerequisites. Additionally, applicants must not have

any criminal convictions or have been involved in the illegal occupation of public or private dwellings within the last five years.

The starting bid was set at 20 to 30% below the market price, depending on the condition of the dwellings. Aspiring homebuyers were obligated to provide a 10% down payment of their bid as a guarantee, and in the event of a successful bid, they were prohibited from reselling the property for the following ten years. After this period, the public landlord retained the right of first refusal if an auctioned dwelling was to be resold on the open market.

The following analysis is based on the outcomes of the auctions, specifically the information extracted from official documents that report auction prices, the location of sold units, and the names of buyers⁴. Comprehensive data for the first sale plan (2014–2019) were already accessible in official records when data collection commenced in January 2022. Data pertaining to the outcomes of the second plan (2016–2022) were supplemented through direct observation of public auctions for units sold between February and May 2022.

Observation occurred during the monthly public web-streamed openings of bid envelopes. Two public officers were responsible for unveiling these envelopes, disclosing the number of bids received, revealing bidders' names, and verifying the completeness of documents before assigning units to the highest offer. In instances where two or more applicants offered the same price, priority was given to first-time homebuyers, defined in policy documents as those who bid for a house to reside in and do not own any other property in the country. As a result of these plans, 2255 dwellings were sold, with 85% (1928) located in the city of Milan. This generated earnings of EUR 257,598,182.7, approximately EUR 80 million more than the total opening bid.

From both documents and direct observation, the following data were collected: (a) the precise location (address) of 1928 sold dwellings in the city of Milan; (b) the surnames and forenames of 901 buyers; (c) the initials of 1027 buyers' surnames and forenames⁵. To determine the geographical origins of buyers and infer the socio-spatial outcomes of sale policies, I relied on name–origin classification drawing from previous studies in the field of residential segregation (Mateos et al. 2006). This approach aimed to associate buyers with the most likely geographical origin of their names. To enhance the reliability of the information for inferring such origin, only buyers with full surnames available were considered, necessitating the removal of the set of data involving only initials, namely 1027 cases.

Applying Name–Origin Analysis

Conventional methods for measuring residential segregation rely on statistical indices designed to capture specific dimensions that characterize the proximity and separation of groups. These indices include measures of evenness, exposure, concentration, clustering, and centralization (Massey and Denton 1988). The application of these indices necessitates the availability of reliable data on variables of interest, such as citizenship, ethnicity, or other relevant ones, at appropriate temporal, spatial, or nominal resolutions. In cases where such data are unavailable, proxies are employed. For instance, in the UK, country of birth has been utilized as a proxy to determine a person's ethnicity. However, this classification overlooks the increasing numbers of second-generation ethnic minorities born in the “destination” or “host” countries, as well as migrants born in “intermediate” countries. In Spain and France, an alternative proxy used is nationality, although it is important to note that the latter can change over time, and individuals may possess more than one, including the host country's nationality, especially for second- or third-generation migrants (Mateos 2007).

Name–origin represents an alternative approach to studying ethnic residential segregation. This approach is grounded on the idea that classifying surnames and forenames into ancestral groups of origin (referred to as ethnic classification) offers a feasible alternative to subdividing populations or classifying neighborhoods based on common origin. It introduces novel ways to measure residential segregation in cases where official information

and statistics are unavailable. Instead of relying on statistical data and census information, these approaches rely on the likely ethnic origin of names. It is important to note that while this methodology cannot completely replace self-assigned ethnicity information, scholars have acknowledged that it provides a sufficient level of confidence in classifications to be utilized in measuring inequalities (Lan et al. 2021; Mateos 2007).

The current limitations of name–origin classification methods stem from several factors. Firstly, these methods are constrained by the availability of a limited number of names in their reference datasets. This limitation means that less common or newer-generation names may not be adequately represented, potentially affecting the accuracy of the analysis. Secondly, processes like transliteration, where names are converted from one script to another, or the “acculturation of a name” in a host country, can alter the way names are written or perceived. Additionally, intermarriage between different ethnic groups can result in names that do not clearly indicate a single ethnic origin, making it challenging to classify individuals with “mixed ethnicity” (Mateos et al. 2007; Mateos 2007).

In this paper, the verification of the origin of the buyers’ surnames was conducted using the Worldnames tool⁶. This analysis attributed 551 units to Italian buyers and 350 to immigrants. Among the immigrant buyers, it was possible to determine the geographic origin of 266 surnames, corresponding to 97 buyers from Africa, 108 from Asia, 41 from Europe, and 20 from America. However, there were 84 buyers whose surnames, in principle, were attributed to immigrants, but accurate verification was not possible. As a result, these cases were excluded from the analysis. Data reported in Table 1 synthesize the results of name–origin analysis.

Table 1. Categories of buyers according to attributed geographical origin.

Attributed Origin	Number of Buyers	Share of Total Buyers (%)	Average Purchase Price (EUR)
Italy	551	67	112,283
Africa	97	12	99,062
Asia	108	13	110,897
Europe (excluding Italy)	41	5	80,764
America	20	2	90,753
Total	817	100	108,421

The subsequent steps involved calculating (a) the incidence of immigrant purchases at the neighborhood level and comparing it to the overall distribution of auctioned dwellings; (b) the incidence of purchases by two specific immigrant communities, namely Africans and Asians—who were the most frequent buyers within the immigrant population—and comparing it with their overall residential distribution at a neighborhood scale. In the first case, the incidence was calculated by determining the proportion of dwellings purchased by immigrants in a specific neighborhood in relation to the total number of dwellings sold citywide, multiplied by 100. In the second case, for both Africans and Asians, the incidence was calculated by assessing the proportion of dwellings purchased by each group within the neighborhood relative to the total number of dwellings bought by immigrants across the entire city, also multiplied by 100. The residential distribution of these communities was determined by comparing the number of residents from each group to the total population of the neighborhood, multiplied by 100⁷. The definition of neighborhood aligns with the administrative unit, known as the *Nucleo d’Identità Locale* (NIL), of the city. The findings from these calculations will be presented in the following section.

4. Socio-Spatial Impacts of Public Housing Privatization in Milan

In this section, I examine the socio-spatial outcomes of public housing privatization in Milan by analyzing the distribution of purchased dwellings among buyers of different geographical origins and comparing the average purchase prices. As indicated in Table 1, the name-based classification approach reveals that Italians acquired the majority of auctioned dwellings, accounting for 551 units, in contrast to the 350 units purchased by immigrants. Among the immigrant population, the highest number of units was purchased by Asians and Africans, totaling 205 units, while Europeans and Americans contributed only minimally with 61 units in total. In terms of the average auction price, Table 1 highlights more similar values for Italians (EUR 112,283) and Asians (EUR 110,897) compared to the other groups: Africans (EUR 99,062), Americans (EUR 90,753), and Europeans (EUR 80,764). These findings suggest the existence of distinct participation patterns within this specific housing market, as well as disparities in both the quantity and value of purchases.

These patterns are shaped by various factors, including the distribution of economic resources, which can vary significantly both between and within each group. The results indicate that, among all immigrant communities, individuals of Asian origin were able to mobilize substantial economic capital, enabling them to actively participate in auctions and seize the residential opportunities they aspired to. In this regard, their performance closely resembles that of Italians. These observations support previous findings in the Italian context (Alietti and Agustoni 2013; Tosi 2017), which indicate that certain immigrant groups have achieved comparable socio-economic conditions to native residents.

The spatial distribution of privatized dwellings (see Figure 1) highlights the highest concentrations in peripheral neighborhoods of the city, specifically in the northwest (Gallaratese, Quarto Oggiaro, Comasina, Villapizzone), west (Baggio), south (Barona and Gratosoglio), and east (Taliedo). In contrast, a smaller share is located in central and semi-central areas. Many of the estates in these neighborhoods were once entirely publicly owned housing. They have been turned into multi-tenure buildings as a result of tenure mixing processes initiated a long time ago by sale policies. The examined sale plans represent a significant step in the ongoing process of public housing dismissal in these areas, accelerating the transformation of these neighborhoods into fully privately owned condominium blocks.

A pivotal question to investigate in the context of current tenure conversion operations is whether these sale plans will result in increased social diversity, particularly in terms of changes in the socio-economic, demographic, and ethnic characteristics of residents. Studies conducted in the UK context have indicated that in the short term, privatization policies primarily altered the tenure balance, as targeting sitting tenants did not necessarily lead to increased residential mobility (Kleinhans and Van Ham 2013). However, our study deals with the sale of vacant public dwellings, which represents a distinct form of privatization and implies a twofold change in the short term. On the one hand, this change pertains to the tenure dimension, transitioning from public to private ownership. On the other hand, it has social implications, involving new residents occupying previously empty units.

The name analysis approach discussed in the previous section allowed us to infer the geographical origin of 901 buyers, constituting 47% of the total sales, providing insights into both social and tenure change dynamics triggered by this policy. I will begin by presenting the incidence of purchases by immigrants compared to the overall distribution of privatized units.

Figure 1 illustrates that the highest incidence of immigrant buyers is observed in peripheral neighborhoods (highlighted in red), some of which feature a significant presence of public housing (such as Barona, Comasina, and Gallaratese). In contrast, central and semi-central areas have the lowest incidence (close to 0). Immigrants tend to gain access to homeownership in the outermost areas, while Italians are more successful in securing dwellings in central locations. For instance, in the case of Porta Ticinese, the incidence of Italian buyers is 2.46, compared to 0 for immigrants. Similar disparities, but with a reverse situation, can be observed in other areas, such as Barona and Gratosoglio in the south,

where the incidence of immigrant purchases is higher than that of Italians (3.01 against 0.68 and 2.33 against 0.68, respectively). These data indicate a pattern of differentiation, between natives and immigrants, regarding the outcomes of sale plans.

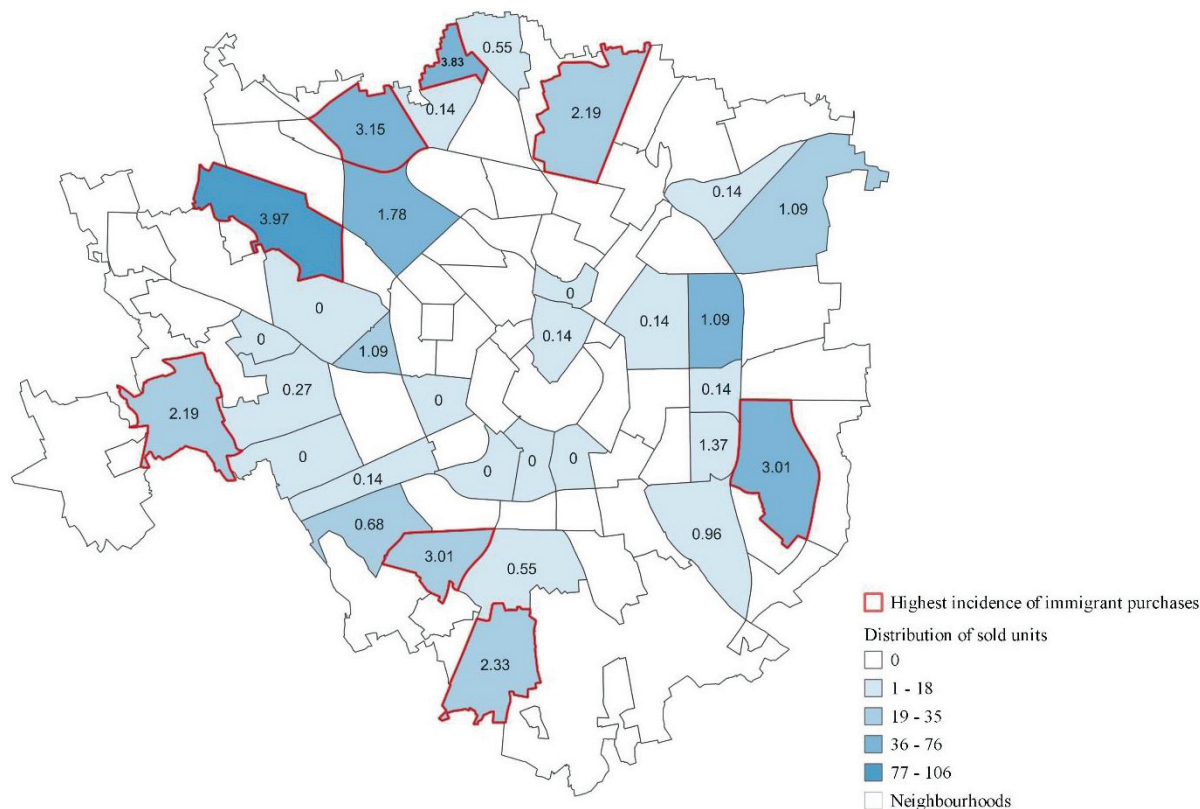


Figure 1. Distribution of sold units and incidence of immigrant purchases.

In particular, purchases made by Italians are concentrated in areas targeted for urban regeneration, which are receiving significant investments in infrastructure and housing renovation, making them attractive and accessible hubs for various urban functions. For instance, apartments in the semi-central blocks of public housing estates, known as Quartiere Filzi near Città Studi (east), have predominantly been bought by Italians, with an incidence of 8.07 compared to 1.09 for immigrants. Urban renovation efforts in these areas are in full swing, including the introduction of new metro line stops, which enhances the accessibility of both existing and future households. Similarly, in Taliedo, the incidence of immigrants is relatively high (3.01), while that of Italian buyers is even more notable (7.39). Here, Italian buyers appear to have strategically targeted apartments in public estates to benefit from the spillover effects of urban transformations in neighboring areas like Rogoredo and Santa Giulia. In these adjacent areas, new residential units and improved connectivity to railways and motorways are rapidly increasing the residential property values.

A more balanced allocation of purchased dwellings was observed in the northern neighborhoods of Comasina (4.1 Italians and 3.83 immigrants), Quarto Oggiaro (3.28 Italians and 3.15 immigrants), and Niguarda (1.92 Italians and 2.19 immigrants), as well as in the western district of Baggio (2.6 Italians and 2.19 immigrants). In these working-class areas, differences between the two categories are rather small, possibly indicating that apartments were sold to households with similar socio-economic backgrounds, despite their different origins. Unlike the dynamics observed in the eastern neighborhoods mentioned earlier, the outcomes of public housing sales in these areas serve to maintain the existing social fabric rather than facilitating the potential influx of gentrifiers into highly sought-after areas.

A Focus on African and Asian Communities

When examining the outcomes for the immigrant population, it becomes evident that Africans and Asians emerge as the two groups with the highest share of dwelling purchases, accounting for 36% and 41% of attributed sales, respectively. Figures 2 and 3 show the incidence of purchases by each category and the spatial distribution of residents from the same continent. The statistics presented in Section 2 indicated that Egyptians, Filipinos, and Chinese constitute the three largest components of the total immigrant population. Therefore, it is reasonable to associate these countries of origin with African and Asian buyers identified in this study.

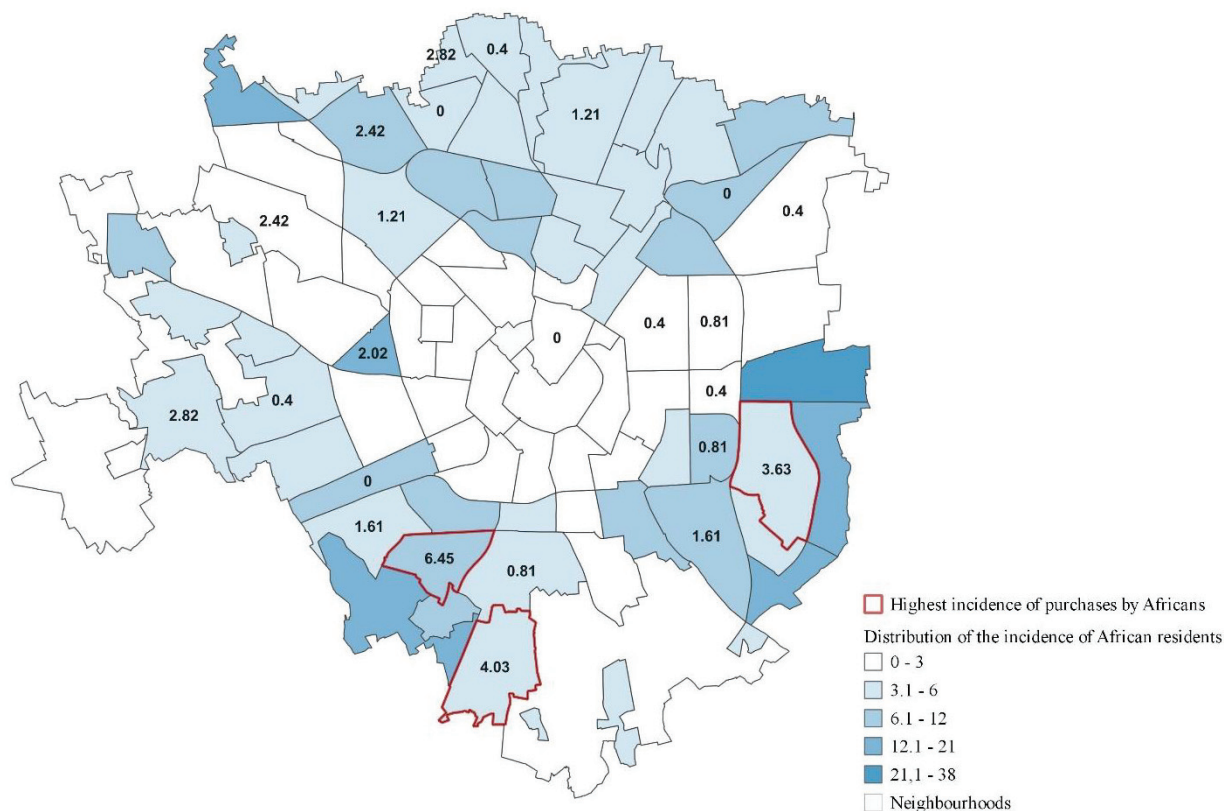


Figure 2. Distribution of African residents and incidence of purchases by Africans.

Prior research (Mugnano and Costarelli 2018) has highlighted that Egyptian residents are primarily concentrated outside the city center, particularly in the proximity of pre-World War II public housing estates known as *quartieri storici* (historical neighborhoods) such as Stadera, Mazzini, and San Siro. Additionally, there is a notable Egyptian presence in the multicultural neighborhood around Via Padova in the north of the city. The Chinese community is particularly concentrated in the northern periphery, characterized by a working-class background and predominance of owner-occupied housing. This periphery has seen an increase in Chinese residents in the first two decades of the 2000s, coinciding with commercial gentrification in the nearby Via Paolo Sarpi, traditionally known as the Milanese Chinatown. Concerning the third largest immigrant community in Milan, Filipinos, together with Sri Lankans, exhibit a distinct residential pattern. Due to their employment in domestic service and caretaking, often for affluent households in prestigious residential areas, they tend to concentrate in the city center. However, many of them are gradually transitioning from situations of dependence, such as co-residence with their employers, to independence. This shift is reflected in their increasing presence in post-war housing blocks in peripheral districts like Quarto Oggiaro and Gratosoglio.

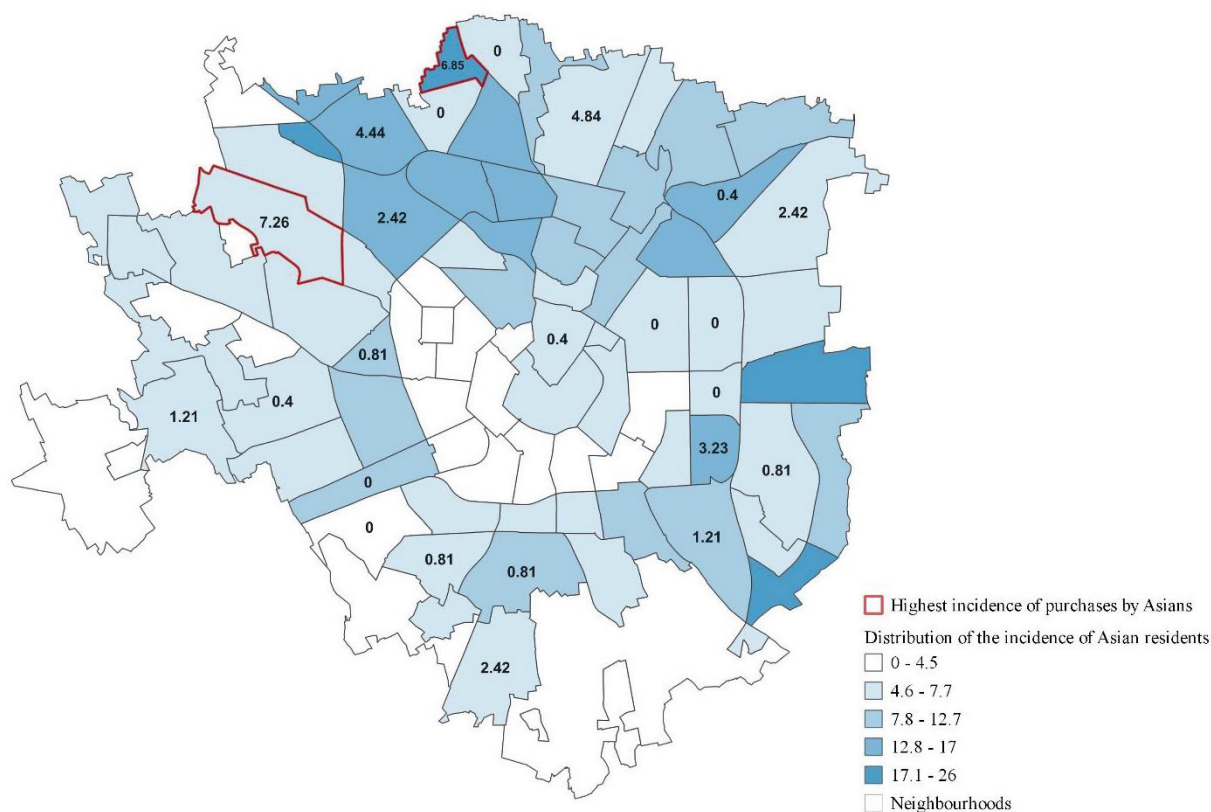


Figure 3. Distribution of Asian residents and incidence of purchases by Asians.

Taking the localization of purchases by African buyers, Figure 2 highlights that the highest incidences are observed in Barona, Gratosoglio, and Taliedo (highlighted in red). This suggests that this group has adopted purchasing strategies aimed at acquiring apartments located in areas already inhabited by a significant proportion of residents from the same group (or close to), particularly evident in Barona (incidence of 6.45) and Gratosoglio (incidence of 4.03). In addition, considering the notably low incidence of purchases by Italians in these neighborhoods (0.68), the outcomes of privatization are likely to further accentuate the ongoing dynamics of socio-ethnic differentiation between these peripheral neighborhoods and the rest of the city.

In the other districts, the outcomes of privatization exhibit notable variations. It is interesting to observe that, despite a relatively low presence of African residents in Gallarate (northwest), the incidence of African buyers is higher (2.42) than in the well-known public housing neighborhood San Siro (2.02) where the incidence of this population is among the highest in Milanese neighborhoods (19.63). While in certain neighborhoods privatization appears likely to exacerbate socio-ethnic polarization, in others, the outcomes can contribute to greater social diversity. However, it is crucial to emphasize the importance of micro-level analysis to comprehensively understand the dynamics of socio-spatial inequality in urban contexts like Milan. A closer examination of the spatial distribution of sold apartments at the street or estate level is necessary to draw more robust conclusions. Indeed, while a mixed allocation of privatized units may indicate increased social diversity at the neighborhood level, it can also result in greater separation at a more granular scale of analysis.

Turning our attention to the second immigrant group considered in this paper, the Asian community, Figure 3 reveals that the highest incidences of house purchases are concentrated in the northern periphery, particularly in the neighborhoods of Comasina (6.85), Gallarate (7.26), Niguarda (4.84), and Quarto Oggiaro (4.44) (highlighted in red). These areas were found to have a balanced allocation between Italians and the whole migrant population. However, a closer examination of the geographical origin of immigrant

buyers suggests a strong homogeneity in terms of background. Asian individuals tended to purchase properties in areas with the highest concentration of residents from the same group. An illustrative case is Comasina, where both the incidence of Asian-origin residents and their property purchases are notably high. Here, the outcomes of housing privatization policies reflect, and reinforce, pre-existing residential patterns among Asians, particularly the Chinese community.

The purchasing strategies of Asians are not only directed to the aforementioned neighborhoods but extend to neighboring districts as well, including Stephenson, Quarto Oggiaro, Villapizzone, and Affori. Throughout the rest of the city, both the distribution of residents and the incidence of property purchases by Asians are relatively low and evenly dispersed. According to this pattern, Asians, and Chinese in particular, have specific residential preferences that can satisfy thanks to stronger financial capabilities, and lead them to cluster in certain areas of the city. This tendency, however, raises an important question pertaining to the implications for social integration opportunities. In this regard, issues to be further investigated include people's daily life experiences in these neighborhoods, the dynamics of social interactions, and the use of public and semi-public spaces, from local parks to common areas within condominiums.

5. Discussion and Conclusions

In many Western European countries, the privatization of social rental housing has become a common housing policy aligning with neoliberal principles. Since the 1980s, this policy has been actively promoted with the aim of encouraging households to achieve self-sufficiency while simultaneously reducing public expenditures (Gibb 2003; Kleinhans and Elsinga 2010). In addition to reducing the size and scope of social housing sectors developed during the post-war era, the sale schemes have also contributed to the growing socio-spatial segregation of lower-income communities, including ethnic minorities (Kleinhans and Van Ham 2013; Boterman and van Gent 2014).

Conceptualizing segregation as a process influenced by households' preferences, housing market structure (Musterd and Van Kempen 2009), and policies governing housing supply (Van Ham et al. 2021), this paper examined the impact of public housing sales on the socio-spatial residential dynamics of immigrant populations in Milan. In such an urban context, the public housing system plays a pivotal role in shaping the residential patterns of immigrants. Indeed, the interplay between limited housing supply, stringent allocation regulations, and the scattered distribution of public housing units contributes to the emergence of micro-segregation patterns within lower-quality housing estates, manifesting at the level of streets, individual buildings, or blocks of buildings. In addition to micro-segregation, immigrant residential patterns are also characterized by growing peripheralization, wherein foreigners are progressively settling in outlying and metropolitan areas (Arbaci 2019; Bergamaschi et al. 2021; Costarelli and Mugnano 2017), reflecting evolving housing trajectories and stabilization of socio-economic conditions, which often coincide with access to homeownership.

This paper delved into a distinctive facet of public housing privatization that characterizes current housing policy in Milan, where the public landlord has been auctioning off vacant dwellings that are unsuitable for regular allocation due to necessary renovation work. Using original data on buyers' names and the locations of sold properties obtained from official documents, I employed a name-origin analysis to infer the geographical origins of buyers and geolocated the prevalence of purchases made by immigrants with a focus on the two groups that have bought the largest share of units among immigrant populations: Africans and Asians.

The findings highlighted a predominance of property purchases made by Italians in dwellings located in central or semi-central areas undergoing significant improvements in the built environment. Native buyers demonstrated the willingness and ability to mobilize greater financial resources to acquire properties concentrated in relatively central, well-connected areas with a growing potential for attractiveness, portraying them

as early gentrifiers. Conversely, the highest concentrations of immigrant purchases are observed in peripheral areas, with some notable peaks, particularly evident among buyers from African countries, in post-war public housing areas characterized by low-quality housing conditions.

Asian buyers tend to concentrate their purchases in areas with a high proportion of residents from similar geographical origins and cultural backgrounds. This suggests a desire, as well as the capacity, to seize residential opportunities offered by this policy to reside in specific neighborhoods. These efforts are possibly linked to expectations of mutual support and resource exchange through migrant networks, which might have also played a role in disseminating crucial information about upcoming purchase opportunities within neighborhoods and estates, potentially influencing bidding strategies. This could include prior knowledge of the number of potential bidders and their offers. Therefore, in addition to financial resources, it is worth investigating how the social capital of prospective homebuyers could have played a significant role in determining bidding strategies.

These findings contribute to the growing international debate on ethnic residential segregation and immigrant homeownership in Southern European cities (Arbaci 2019; Balampanidis 2020; Benassi et al. 2020; Maloutas and Spyrellis 2020; Mazza et al. 2018) by uncovering the neglected role of public housing privatization policies, and their outcomes, in shaping the spatial distribution of immigrant populations and their housing pathways. Faced with a limited supply of social housing and increasing difficulties in accessing the private rental market due to discrimination, some immigrants actively employ alternative strategies to achieve homeownership under relatively favorable conditions compared to the “regular” housing market.

This paper has several limitations, primarily pertaining to the nature of the data and the chosen analytical approach. Despite its innovative application within the context of public housing sales, the name–origin approach lacked the capability to ascertain whether immigrants with foreign names had undergone naturalization and, if so, whether they should have been categorized as Italians. In addition, it is worth noting that the various immigrant groups may have displayed a considerable range of socio-economic conditions, which proved impossible to consider when explaining the observed spatial outcomes. Last, the analysis was based on a limited number of cases, thereby constraining the generalizability of the results, although it did serve to shed light on a relatively unexplored research subject.

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Notes

- ¹ Different patterns of privatization have characterized housing in Eastern European countries. After the communist period, expropriated properties were returned to their previous owners, sparking various socio-spatial dynamics and transformations of housing systems (see Hegedüs and Tosics 1994; Lux et al. 2012).
- ² See Gruis et al. (2009) for a review of international case studies.
- ³ Corresponding to 29,486 dwellings owned by the City Council and 35,001 to regional public company ALER.
- ⁴ Available at <https://alermipianovendite.it/asta-alloggi/>. Last accessed 25 September 2023.
- ⁵ From 2015 to 2018, the website publicly disclosed the complete names of buyers. However, from 2018 to 2022, it only displayed the initials of their first and last name. There is an exception for the period spanning from February to May 2022, during which full name details were obtained through direct observation of the auctions.
- ⁶ See <https://apps.cdrc.ac.uk/worldnames/index.php>. Last accessed 25 September 2023.
- ⁷ Data on resident population refer to 2022 and are retrieved from the City Council official register.

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Article

Exploring the Settlement Models of the Main Foreign Communities Residing in Italy (2003–2021)

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Abstract: In the last few decades, the foreign resident population in Italy has grown considerably, showing a tendency towards a stable settlement. The spatial distribution of this population is an important key to better understanding the integration process in the host society. This paper aims to explore the diachronic evolution of the settlement models of the foreign population and the main ethnic groups usually classified as residents in Italy in the period 2003–2021. Towards this aim, we computed statistical global indices referring to evenness, concentration, and clustering dimension of residential segregation and ad hoc indices that regard territorial dimensions. One of the major novelties of the contribution lies in the attempt to compute these indices not only in reference to the major population group—i.e., the Italians—but also between foreign communities and considering the gender structure. The indices are then synthesised by a multivariate analysis (principal component analysis and cluster analysis). The results of this study show that (a) higher differences in terms of settlement models are found by comparing different minority groups rather than by comparing minorities to Italians; (b) the settlement models of each foreign citizenship remain almost stable over time despite their growth in both absolute and relative terms.

Keywords: foreign population; settlement models; global approach

1. Introduction

In the last few decades, the foreign resident population in Italy has grown considerably, showing a clear tendency towards stable settlement (ISTAT 2022b). The analysis by gender and citizenship of the regular foreign presence in Italy contributes decisively to the study of the migratory phenomenon in the country. Since the beginning of the phenomenon, scholars have described immigration in Italy as an “archipelago” (Mottura 1992). For the foreign population, in fact, the demographic and social characteristics (for example, the gender structure and composition of households) and employment, the settlement models in the territory are often closely connected with the citizenship of origin (Conti and Strozza 2006; Blangiardo et al. 2017). Therefore, the numerous foreign communities residing in Italy show very different characteristics, and it is impossible to ignore the analysis by citizenship when reconstructing the complete picture of the phenomenon (Blangiardo et al. 2017). In addition, migratory networks, which, through the transmission and dissemination of accurate and up-to-date information, act as a factor of attraction for the entry of new migrants into Italy, play a rather significant role in the consolidation of several immigrant communities already settled in specific areas of the country (Cesareo and Blangiardo 2009; Cvajner and Sciortino 2010). The spatial distribution of this population is another important key to better understand the general integration process (Lichter et al. 2020). It is important to consider that the settlement patterns are the consequence of not only migrations from abroad but also of the internal mobility of foreign immigrants (Casacchia et al. 2022). Social integration and spatial integration are deeply linked (Liebig and Spielvogel 2021). Every

place—region, city, suburb, etc.—represents a unique context of integration that affects how immigrants could be incorporated into neighbourhoods, schools, local labour markets, and, ultimately, society. According to some scholars, “the uneven spatial distribution of immigrant and minority populations provides a useful summary indicator of social and economic integration and inclusion in modern societies” (Lichter et al. 2020). Indeed, the settlement model expresses: (i) the community links and the role played by migration networks in determining the arrival and insertion of migrants in the host society, and (ii) the connection between territory and the occupational specialisation (or segregation) of the different foreign communities residing in the country (Benassi and Ferrara 2013; Tintori et al. 2018).

Considering these key elements, the aim of this research is to explore the diachronic evolution of the settlement models of the foreign population and the main ethnic groups usually classified as residents in Italy in the period 2003–2021. To achieve this goal, we used global statistical indices referring to three dimensions (evenness, concentration, and clustering) and ad hoc indices that regard territorial issues. These are some of the principal dimensions for the study of the spatial distribution of population groups and, specifically, of migrants’ populations (Massey and Denton 1988). The principal novelties of the contribution lie in the attempt to compute these indexes not only in reference to the major population group (i.e., the Italians) but also between different foreign communities; in addition, the paper considers the gender structure.

These two fundamental aspects enrich the analysis and achieved results. Indeed, there is strong evidence that the higher differences in terms of settlement models are between “minority” groups, and it could be interesting to test if gender has an effect on shaping the residential geography of the foreign population. Finally, the paper proposes a diachronic approach of analysis, focusing on the last 20 years, following a specific multivariate analysis strategy (i.e., principal component analysis and clusters analysis).

The paper is organised as follows: in the next section, the settlement patterns of the foreign population in Italy are described; in Section 3, we discuss the approach and measures for detecting the settlement models of the foreign population; Section 4 is dedicated to the data; Section 5 presents the results obtained through a specific multivariate analysis strategy by integrating principal component analysis and cluster analysis. A discussion of the results and future developments conclude the article.

2. An Overview of the Settlement Patterns of the Foreign Population in Italy

Before analysing the settlement of immigrants in Italy in depth, it is appropriate to briefly discuss the most recent evolution of the phenomenon. A peak in immigrant flows was recorded in the period between 2000 and 2010. The consistent flows were a consequence of both several regularisation processes and the fact that the Republics of Bulgaria and Romania joined the European Union. The economic crisis of 2008 interrupted this growth process and opened a new phase for international migration flows towards Italy (Colombo and Dalla Zuanna 2019). In addition, during the last few years, a reduction in immigration was registered as a consequence of the measures to limit the spread of COVID-19 (Bonifazi et al. 2021).

The economic crisis that started in 2008 also led to evident changes in the type of migratory flows arriving in Italy. Although the crisis made Italy less attractive, in some areas of origin, the importance of the push factors grew. The escalation of various crises, wars, and clashes on the international scene and the opening of new migratory routes have meant that in recent years, the profile of migrations and migrants in Italy has changed radically.

Focusing attention on non-EU citizens, it seems clear that if “work” was the prevalent reason for the new residence permits issued up to 2010, since 2011, the most widespread reason for entry into Italy has been “family reunification” (Figure 1)¹.

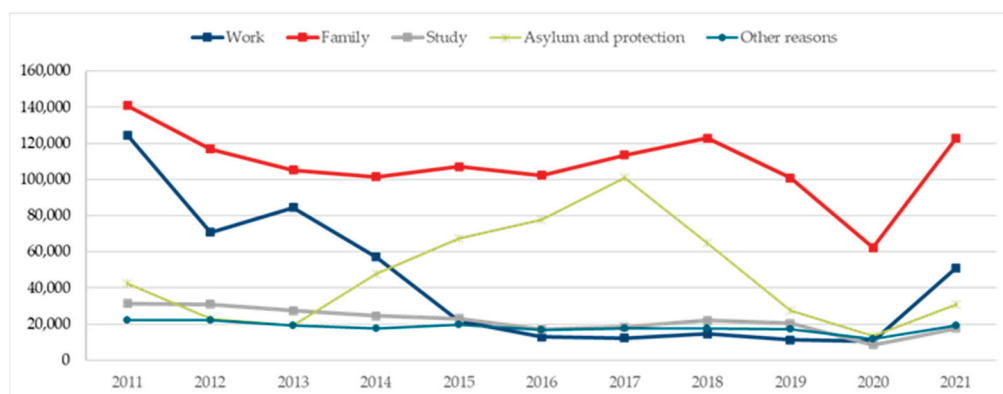


Figure 1. New residence permits issued during the reference year by motivation, Italy. Years 2011–2021, absolute values (source: ISTAT, elaborations on data of Ministry of Interior).

The rapid growth in permits for asylum and humanitarian reasons, which, in 2015, exceeded 28% of the total number of new documents issued during the year (ISTAT 2022a), should be noted. The data referring to immigrants in 2015 marked an epochal transition in which new flows for work represented only the fourth reason for new arrivals; this was also surpassed by permits granted for study reasons. Between 2015 and 2018, as a consequence of the so-called “Mediterranean refugee crisis” (Piguet 2021), Italy registered a peak in arrivals of asylum seekers. Asylum seekers have a very peculiar profile in terms of demographic characteristics and countries of origin. The crisis in the Mediterranean Sea opened a new period of emergency around migrations for Italy; during this period, in fact, the country had to manage significant landings by the sea.

During the same years, Italy became a country of advanced integration. Many immigrants have been living in Italy for 20 years or more. Many of them have acquired Italian citizenship. A growing second—and even third—generation presents new social needs. The stock of immigrants has changed in size and characteristics. As of 1 January 2021, the foreign population in Italy amounted to 5,171,894 residents. In 2019, there were 4,996,158; and, therefore, in three years, it increased by fewer than 200,000 people. The growth of the foreign population slowed both owing to a decrease in new entry flows and as a result of citizenship acquisition. Between 2011 and 2020, over 1,250,000 people acquired Italian citizenship; and it can be estimated that as of 1 January 2021, there were approximately 1,600,000 naturalised citizens residing in Italy.

Despite the more recent flows and—above all—the landings involving the South of Italy and the islands, the foreign presence is concentrated in the North and Centre of Italy. Some scholars (Casacchia et al. 1999) distinguish three prevailing settlement models:

- (1) a metropolitan model: it regards the communities with a strong imbalance in the gender structure, mostly employed in services to families or in commercial activities;
- (2) a widespread model, typical of those groups that are more dispersed as a result of a greater range of employment opportunities;
- (3) a border model, typical of the communities that come from countries bordering Italy and which tend to settle mainly in the areas geographically closest to their areas of origin.

The gender structure of the foreign population is, in general, balanced—the gender ratio is 95 women for every 100 men—but evident imbalances are registered regarding different citizenships. This is the case of the Eastern European communities for which the women represent the majority of the nationality: for Ukrainians and Russians, the female component exceeds 75 percent of the total. The gender ratio for Romanians is more balanced, where women represent almost 57% of the residents (as of 31 December 2021). Other citizenships, such as those from Bangladesh, Egypt, and Pakistan, are, instead, unbalanced towards men; and the percentage of women represents between 28 and 34% of those nationalities. In some cases—like the one of Moroccans—balance has been achieved

over time starting from a situation of an initial imbalance (in favour of men); for other communities, like Chinese, migrations have always been based on a familiar migratory model with the co-presence of men and women; consequently, the gender structure has always been balanced. In the case of citizenships characterised by a greater female presence, job placement in family services is widespread, both in domestic and personal services. It would be interesting to focus the analysis on different communities to discover if men and women belonging to the same citizenship have different settlement models.

3. Approach and Measures for Detecting the Settlement Models of the Foreign Population

A peculiar trait of the foreign population is its settlement models and the way it is spatially distributed. This is a very old and classic theme that originated from the Ecological School of Chicago (Duncan and Duncan 1955; Massey and Denton 1988; Bailey 2012; Yao et al. 2019). Although they focused on the urban scale of analysis and the segregation process as the degree of spatial separation between two (or more) population groups, this theory states that over time, foreign communities settle across the territory and tend to expand. The settlement models of the foreign population (and its subgroups) remain an important field of study. Indeed, the settlement model of a given foreign group expresses: (a) the community links and the role played by migration networks in determining the arrival and insertion into the host society; (b) the connection between the territory and occupational specialisation (or segregation) of different foreign communities residing in the country (Benassi and Ferrara 2013).

But, of course, studying settlement models of a foreign population (and its subgroups) implies facing a great level of heterogeneity. Indeed, each foreign group has its own settlement model that varies from a dispersed one, like the Romanian population, to a concentrated one, like the Egyptian group, with many intermediate models, like that of the Chinese people, often defined as clustered–dispersed. Moreover, to appreciate the evolution of the settlement model and to detect its real features, we should follow a diachronic approach. Of course, it will be impossible to face such complexity using local indexes. The idea, therefore, is to measure the settlement model by a global (i.e., by means of global indices) and diachronic approach.

In the light of the above, in this paper, we used a mix of classic indices related to the three main dimensions of residential segregation, based on the pioneering work of Massey and Denton (1988) about the dimensions of residential segregation, and “ad hoc” indices that regard territorial dimensions. We show, here, some proprieties about the elementary indices computed in this research (Table 1).

Table 1. Elementary indices computed for each foreign community.

Index *	Label	Type	Dimension	Range	Reference
Index of dissimilarity	ID	Two-group (ref. Italians)	Evenness	[0, 1]	Duncan and Duncan (1955)
Relative concentration index	RCO	Two-group (ref. Italians)	Concentration	[−1, 1]	Massey and Denton (1988)
Relative clustering index	RCL	Two-group (ref. Italians)	Clustering	[−∞, ∞]	White (1986)
Delta index	DEL	One-group	Concentration	[0, 1]	Duncan et al. (1961)
Coastal diffusion index	CDI	One-group	Diffusion	[0, 1]	Ad hoc
Urban diffusion index	UDI	One-group	Diffusion	[0, 1]	Ad hoc
Over-representation index	ORI	Two-group (ref. Italians)	Over-representation	[0, 1]	Isard (1960)/ad hoc

* We provide the relative formula (For more information about the formulas of the indexes ID, RCO, RCL, and DEL, see Massey and Denton (1988) and Apparicio et al. (2014)) in Appendix A for each index that was used.

First, a basic distinction of the indices is the following (Massey and Denton 1988): “one-group” indices that measure a group’s distribution compared to that of the entire population; “two-group” indices that compare a group’s distribution with that of another group.

The dimensions that are used are²: (1) evenness, (2) concentration, and (3) clustering. The dimensions that each index refers to are the ones that normally synthesise the spatial distribution of the population. Table 1 summarises all the indices used in this research.

The meaning of each index is as follows:

The value of ID represents the share of a group that would have to move to create a uniform population distribution. If ID is closer to 1, the further the territorial distribution of a certain foreign group is from a condition of equal distribution compared to the Italian one (higher values mean higher dissimilarity between the foreign group and the Italian population).

The RCO indicates the relative amount of physical space that is occupied. The closer that RCO is to +1, the more concentrated the territorial distribution of a certain foreign group is as compared to the distribution of Italians (a higher positive value means a higher level of relative concentration).

The RCL index refers to the “relative amount of physical space occupied by a minority group in the urban environment” (Massey and Denton 1988). If RCL³ is greater (a positive value) then the level of clustering of the analysed foreign community with respect to Italians is greater (a higher positive value means a higher level of relative clustering). To better clarify the concept with respect to concentration, we can define clustering as a measure in which the municipalities inhabited by members of a minority group are contiguous or spatially concentrated in comparison to each other in the territory. Thus, a high degree of clustering implies a settlement structure where the municipalities of the minority group are contiguous, creating a kind of “enclave”.

DEL refers to the physical space occupied by each foreign community and gives the proportion of a group’s population that would have to move between municipalities to achieve a uniform density. The higher the level of the index, the higher the absolute concentration level of the group, and the lower the physical space occupied (higher values mean higher levels of absolute concentration).

CDI⁴ refers to the quota of each foreign population group that resides in coastal municipalities (higher values mean higher levels of coastal diffusion).

UDI refers to the quota of each foreign population group that resides in urban municipalities, which are municipalities with urbanisation degrees equal to one (higher values mean higher levels of urban diffusion).

ORI refers to the quota of municipalities in which each foreign group is over-represented, where the values of the location quotient (LQ) are higher than two (higher values mean more situations with higher over-representations). We recall that the location quotient is useful for identifying territorial units in an area where a population group is under-represented ($LQ < 1$) or, conversely, over-represented ($LQ > 1$) (Isard 1960). In this study, we set the over-representation value to two.

In the first step, we computed these seven global elementary indices for each of the first 10 foreign communities in 2021, for gender and three years (2003, 2011, and 2021)⁵. We adopted a very fine geographical scale of analysis by considering about 7904 municipalities. The geographical boundaries of 2003 and 2011 were brought back to those of 2021 to standardise the number of municipalities (the same municipalities each year). This procedure allows us to obtain an $M(c,v)$ matrix in which there are 60 cases (c) (10 foreign communities, three years, and two genders); the variables (v) are the seven elementary indices reported in Table 1. In the second step, $M(c,v)$ is synthesised by the principal component analysis (PCA) method. Following this, a probabilistic clustering method called Expectation Maximisation (EM) (Dempster et al. 1977; Witten and Frank 2011) is applied to the factorial scores of each statistical unit.

In the next section, we will focus on the data that were used in detail, while the results of the complete analysis will be discussed in Section 5.

4. Data

Official administrative data provide precious resources for monitoring the largest part of the phenomenon of immigration in Italy. The strength of these kinds of statistics is, most of all, the availability and the reliability of data at the deepest territorial level of disaggregation. These data have some limits for offering widespread information on the phenomenon. For this reason, the Italian National Institute of Statistics (ISTAT) carries out several data collections to cover more dimensions of immigration. Integrating the information obtained from other sources is a crucial task to obtain a more complete and reasonable picture of immigration in Italy.

The available data are taken from administrative sources (municipality registers) and show municipal details but not sub-municipal-level details. For this reason, they are very useful for spatial analyses, but they are not suitable for conducting sociological analyses focused on social segregation and marginalisation (Wacquant 2008; Liebig and Spielvogel 2021; Sleutjes et al. 2019). At the same time, administrative data, naturally, do not take into account the social networks and relationships of immigrants (Sleutjes et al. 2019). Compared with survey data, administrative data have the advantage of covering the entire national territory and allow for a comparison over time. This work intends to provide a useful quantitative framework at the macro level for more detailed territorial investigations that are conducted, including a qualitative approach.

According to the Registry Law (Law 1228/1954), the whole population having usual residence in Italy must be registered in the registry office (right/duty). Only foreigners who have a valid residence permit can be registered. The demographic balance of the yearly foreign resident population, disseminated by ISTAT, provides the results of the processing of data for the flows of demographic dynamics acquired through the notifications sent by the municipalities to the National Registry of the Resident Population (ANPR system). The object of the survey consists of all the registration and cancellation data relating to foreign individuals registered in the municipal registry records (live births, deaths, immigration, and emigration), distributed by gender and country of citizenship (numbers of the EU and non-EU citizens). The criterion for selecting the population is that of citizenship. The data refer to regular foreigners residing (registered in the municipality lists) in Italy; the place of birth is not considered. It should be noted that in Italy, children born to foreign parents are considered as foreigners by law, at least until they turn eighteen.

Starting from 2019, the demographic balance of the foreign resident population considers the results of the Permanent Population Census. The consolidation process ends about 11 months later, with the validation of the annual resident balance data and with the alignment of the foreign population as of 31 December with the results of the Permanent Population Census (ISTAT 2023).

The availability of the foreign resident population data by gender and country of citizenship from 2003 to 2021 allows the investigation of the main characteristics and evolution patterns of the settlement models of the main foreign communities in Italy in the period between 2003 and 2021 (Table 2).

Of the almost 200 communities represented in Italy, only fourteen have more than 100,000, and fifty exceed the threshold of 10,000. In this paper, the ten largest foreign resident communities in Italy on 31 December 2021 are considered. In 2021, the ten largest communities amounted to 3.2 million individuals (63.7% of the total foreign residents); the top five, to 48.7% (almost 2.5 million people). In the first place, we find the Romanian community with 1.1 million citizens (21.5% of the total) followed by the Moroccans (420,000, 8.4% of the total), the Albanians (almost 420,000, 8.3%), the Chinese (300,000, 6.0%), and the Ukrainians (225,000, 4.5%). In 20 years, the ranking of the top 10 communities shows significant changes. From 2003 to 2021, considering the first five largest communities, only the Romanians increased their incidence in the total population of foreigners (+12.6%). Albanians, Moroccans, and Filipinos, despite being characterised by a longer migration history, have decreased in population in relative terms over time (respectively −5.2%, −4.4%, and −0.5%). Instead, during the same period, most recent settlement communities

have grown to a certain level and are the recoveries related to the Bangladeshi (+1.8%), the Chinese (+1.6%), the Ukrainian (+1.6%), and the Pakistani (+1.3%) populations, while the increases in the Egyptian and Indian populations are more contained.

Table 2. Foreign resident population and citizenships of foreigners (from first 10 countries) residing in Italy. Years 2003, 2011, and 2021, absolute values and percentages.

Population	Absolute Values				Percentages			
	2003	2011	2021	Delta 2021–2003	2003	2011	2021	Delta 2021–2003
Total foreign population	1,893,927	4,319,201	5,030,716	3,136,789	100.0	100.0	100.0	-
Romania	169,214	889,474	1,083,771	914,557	8.9	20.6	21.5	12.6
Morocco	241,111	435,607	420,172	179,061	12.7	10.1	8.4	−4.4
Albania	257,309	480,633	419,987	162,678	13.6	11.1	8.3	−5.2
China	82,544	210,055	300,216	217,672	4.4	4.9	6.0	1.6
Ukraine	55,168	191,995	225,307	170,139	2.9	4.4	4.5	1.6
India	42,625	126,215	162,492	119,867	2.3	2.9	3.2	1.0
Bangladesh	26,033	87,068	159,003	132,970	1.4	2.0	3.2	1.8
Philippines	68,873	137,704	158,997	90,124	3.6	3.2	3.2	−0.5
Egypt	38,621	71,344	140,322	101,701	2.0	1.7	2.8	0.8
Pakistan	26,454	75,713	134,182	107,728	1.4	1.8	2.7	1.3
Other foreigners	885,976	1,613,393	1,826,267	940,291	46.8	37.4	36.3	−10.5

Source: Elaboration on ISTAT data. For the years 2003 and 2011, estimates on 2018 inter-census population; for the year 2021, demographic balance of foreign-resident population by gender and citizenship data.

Although the paper is focused just on a few communities, they are sufficient to individuate several relevant models. The process of generating the database was elaborated from resident population data (at 31.12 in the years 2003, 2011, and 2021) by gender and citizenship at the municipal level. First, based on the ten largest foreign resident communities in Italy on 31.12.2021, the same communities were selected for the years 2003 and 2011. The purpose of this operation is to obtain a homogeneous group, regardless of the dimension of the communities in the other chosen years.

Once the communities were selected, the data at the municipal level were standardised to eliminate differences in the number of municipalities that change over time. The process consisted of reclassifying the data of each municipality in the years 2003 and 2011 and bringing them back to the administrative territorial boundaries of 2021. In this way, the historical series reports the data according to the administrative territorial boundaries relating to the year 2021 (7904 municipalities).

The results should be considered as a first step that is useful to test the measures and the methods on the most representative communities; in future works, other communities will be considered to enrich the analysis.

5. Results

As mentioned in Section 3, we computed the seven global elementary indices for each of the first 10 foreign communities in 2021, for gender and for three years (2003, 2011, and 2021). In the following subsections, we focus on the results of the two procedures⁶: (1) principal component analysis and (2) cluster analysis.

5.1. Principal Component Analysis Results

We recall that principal component analysis (PCA) is a technique for reducing the dimensionality of a dataset, increasing its interpretability, but, at the same time, minimising the loss of information. It does this by creating new uncorrelated variables, called factors, which subsequently maximise the explained variance. For the extraction of the factors, we followed the well-known criterion with eigenvalues greater than one (Kaiser 1960). The adequacy of the sampling is evaluated through the Kaiser–Meyer–Olkin (KMO) test (Kaiser

1970), while the strength of the relationship among the variables is evaluated through Bartlett's Test of Sphericity (Bartlett 1954). Large loadings were highlighted for the ease of interpretation (Table 3). The results of the conducted principal component analysis appear quite clear⁷. The first component synthesises almost 51% of the total (initial) variance, while the second component synthesises almost 26.2%. Overall, the first two extracted components summarise almost 77.2% of the initial variance. The first component is positively correlated with ID, DEL, and UDI; instead, it is negatively correlated with ORI (as dissimilarity increases with respect to Italians; thus, the group tends to be under-represented). This component informs us about the dimensions of *dissimilarity, absolute concentration, urban diffusion, and under-representation*. The second component is positively correlated with RCO and CDI; instead, it is negatively correlated with RCL. This second component is related to the *relative concentration, relative clustering (low contiguity), and coastal diffusion* (Table 3).

Table 3. Component loadings: 1st and 2nd factors extracted.

	Component	
	1	2
ID	0.828	−0.322
RCO	0.181	0.574
RCL	0.429	−0.813
DEL	0.963	−0.169
CDI	0.424	0.798
UDI	0.860	0.227
ORI	−0.905	−0.157

Kaiser–Meyer–Olkin (KMO) test = 0.71; Bartlett's Test of Sphericity: $\chi^2 = 435$; d.f. = 21 (p -value < 0.001).

It is interesting to note the projection of the statistical units (foreign communities) on the factorial plane of the first two extracted components (Figure 2).

Let us examine the units in detail. We can appreciate two opposite settlement models: the units that are in the second quadrant, mainly Romanians, Albanians, and Moroccans, and the units that are in the fourth quadrant, mainly Egyptians and Pakistanis. The first three communities have been present in Italy for a long time; the other two have arrived more recently and have continued to grow in recent years. There is another model, quite different from these two, which is the one with statistical units in the first quadrant: Filipinos and Bangladeshis in recent years. It must be remembered that these two groups are both characterised by a strong concentration in the Lazio region and in the metropolitan city of Rome. Indians are almost an isolated community, even if their settlement models are less clearly defined compared to the previous ones, while the Chinese and Ukrainian populations are very near the origin of the axis so that their settlement models do not seem to emerge using these indices. It could be useful to emphasise that some sociological studies express doubts about the validity of the indicator for the territorial concentration when applied to the Chinese community because it is concentrated in some residential areas for reasons related to the specificity of its production structure, which is characterised by the contiguity between the workplace and the home and by the diffusion of mono-ethnic businesses (Tosi 1994; Cellini and Fideli 2002). Moreover, genders of the same citizenship are almost always very clearly set apart from each other, and (with very few exceptions) statistical units remain in the same position over time. This means that their settlement models are time-invariant. It is interesting to note that in almost twenty years, the settlement models have changed little, even though over time, the integration paths of some communities have progressed far. The integration processes would, therefore, appear to take place within the initial territorial grid without modifying the pattern of the territorial distribution. Some changes can be highlighted among the more recently settled groups in the Italian territory, such as the Pakistani and Bangladeshi communities.

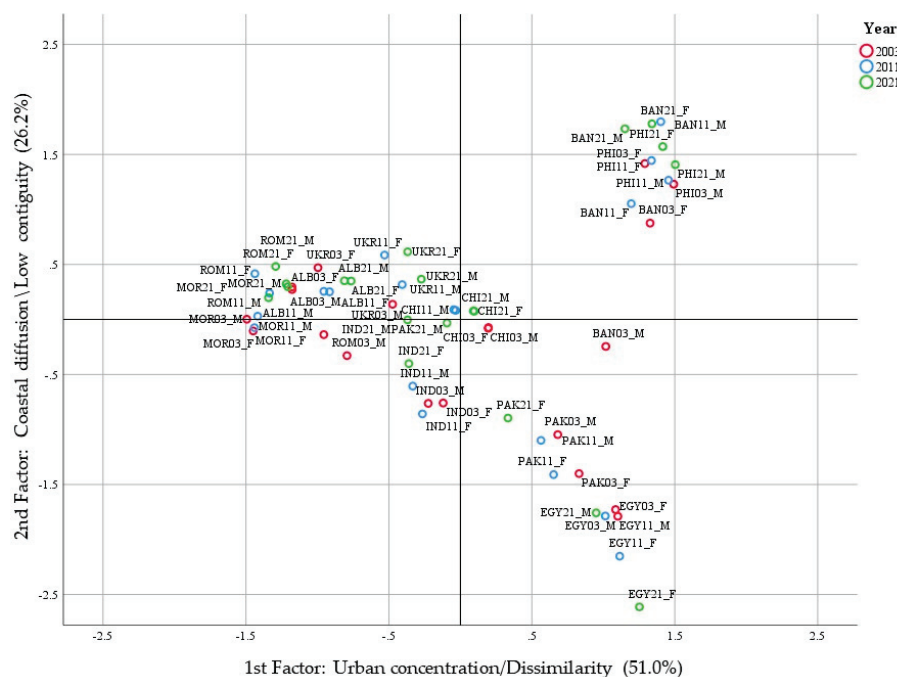


Figure 2. Statistical units projected on the factorial plane of the first two extracted components. (Legend: ROM = Romania; MOR = Morocco; ALB = Albania; CHI = China; UKR = Ukraine; IND = India; PHI = Philippines; EGY = Egypt; PAK = Pakistan; 03 = 2003; 11 = 2011; 21 = 2021; M = Male; F = Female).

5.2. EM Clustering Results

Before showing the obtained results, we briefly recall the clustering method that was used. The EM algorithm is an iterative method relying on the assumption that data are generated by a mixture of underlying probability distributions, where each component represents a separate group or cluster. The method provides the optimal number of clusters in any empirical situation by a two-step iterative algorithm: the (E) or expectation step and the (M) or maximisation step. These two steps are repeated until a further increase in the number of clusters would result in a negligible improvement in the log-likelihood, namely, a convergence. Accordingly, the program checks how much the overall fit improves in passing from one to two clusters (formed in all the possible ways and then selects the best), then from two to three, etc. If the increase in the log-likelihood function calculated for the solution with $K + 1$ clusters is not marked (e.g., at least five percent better) more than the simpler solution with K clusters then the solution with K clusters is considered as ideal and, therefore, retained (for more details, see Dempster et al. 1977; Witten and Frank 2011). We set a minimum increase in the log-likelihood value over consecutive iterations equal to 0.1%. According to this setting, we obtained the best solution with five clusters (Table 4). The Average Silhouette (AS) and Analysis of Variance (ANOVA) were used for analysing the cluster quality (Libório et al. 2022).

Jointly, with the cluster membership of the statistical units (Figure 3) and the cluster means of the indices computed for each foreign community (Figures 4 and 5), we provide some comments about the detailed EM clustering results.

The clustering results confirm what we have already said in the previous paragraph but with some more interesting details. Cluster 1 presents low levels of dissimilarity (ID) and absolute concentration (DEL) and a comparatively high level of urban diffusion (UDI). At the same time, it has comparatively high levels of relative concentration (RCO) and over-representation (ORI). This can be seen as a paradoxical result, but it is not. Indeed, Romanians are so diffused that they reside in territories where the number of Italians is comparatively low. This explains the higher levels of RCO and ORI. Cluster 3 (Egyptians and Pakistanis) and Cluster 4 (Filipinos and Bangladeshis) present high levels

of dissimilarity (ID) but, only for Cluster 4, a high absolute concentration value (RCO) and, only for Cluster 3, a high level of relative clustering (RCL). Over-representation (ORI) is low in both clusters. Therefore, both groups differ mainly in RCO and RCL. The first is high in Cluster 3; the second is high in Cluster 4 because they are in very few municipalities with high levels of absolute concentration (DEL) and dissimilarity indexes (ID) but where there are also many Italians (which is typical of large cities and, in particular, Rome and Milan). As a consequence, over-representation (ORI) is comparatively low. Cluster 5 (Indians) has quite a peculiar profile with very high levels of ID and DEL and very low levels of CDI and UDI. Cluster 2, finally, is a sort of residual cluster because it is composed mostly of Chinese and Ukrainians. This means that these two groups are quite different from the others in terms of their settlement models (i.e., their settlement models are not grasped using the same indices that are able to measure the settlement models of the other foreign groups). Finally, clusters are almost always composed of both genders in the same groups and by the same nationalities each year.

Table 4. Cluster memberships of foreign communities.

#Cluster	Foreign Communities
C1	ALB03_F, ALB03_M, ALB11_F, ALB11_M, ALB21_F, ALB21_M, MOR03_F, MOR03_M, MOR11_F, MOR11_M, MOR21_F, MOR21_M, ROM03_F, ROM03_M, ROM11_F, ROM11_M, ROM21_F, ROM21_M, UKR03_F
C2	CHI03_F, CHI03_M, CHI11_F, CHI11_M, CHI21_F, CHI21_M, UKR03_M, UKR11_F, UKR11_M, UKR21_F, UKR21_M, PAK21_M
C3	EGY03_F, EGY03_M, EGY11_F, EGY11_M, EGY21_F, EGY21_M, PAK03_F, PAK03_M, PAK11_F, PAK11_M, PAK21_F, BAN03_M
C4	BAN03_F, BAN11_F, BAN11_M, BAN21_F, BAN21_M, PHI03_F, PHI03_M, PHI11_F, PHI11_M, PHI21_F, PHI21_M
C5	IND03_F, IND03_M, IND11_F, IND11_M, IND21_F, IND21_M

ANOVA Fisher test: ID = 89.38 *; RCO = 15.33 *; RCL = 38.80 *; DEL = 155.70 *; CDI = 34.25 *; UDI = 69.34 *; ORI = 59.44 (* p -value < 0.001). Average Silhouette: C1 = 0.46; C2 = 0.39; C3 = 0.36; C4 = 0.73; C5 = 0.70.

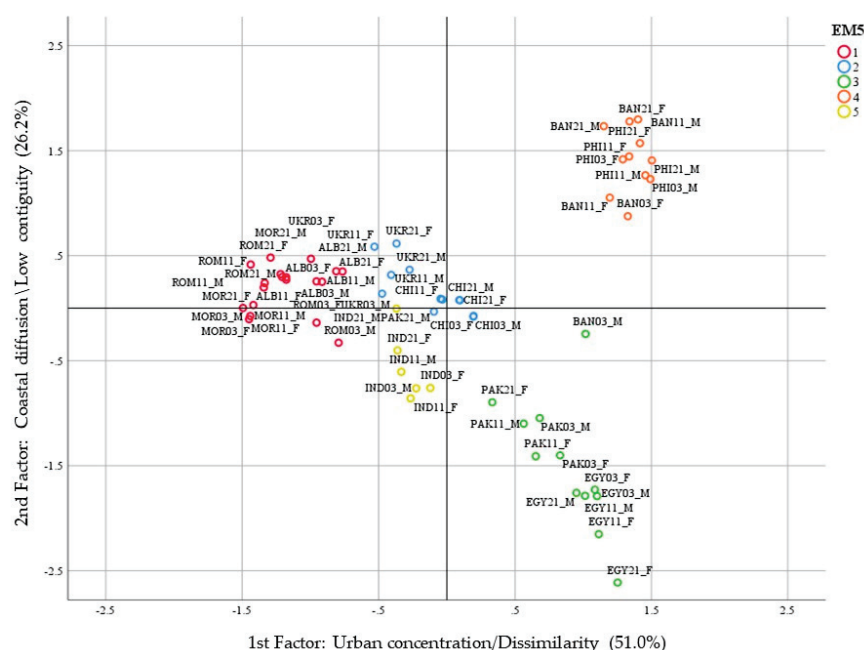


Figure 3. Cluster memberships of the statistical units projected on the factorial plane of the first two extracted components. (Legend: ROM = Romania; MOR = Morocco; ALB = Albania; CHI = China; UKR = Ukraine; IND = India; PHI = Philippines; EGY = Egypt; PAK = Pakistan; 03 = 2003; 11 = 2011; 21 = 2021; M = Male; F = Female).

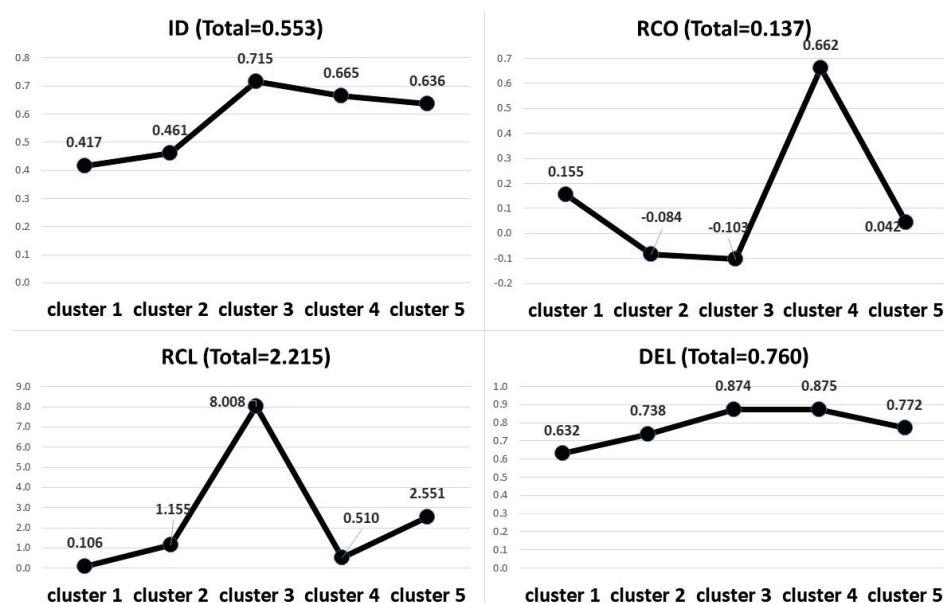


Figure 4. Cluster means for ID, RCO, RCL, and DEL. The total mean (Total) of the index is in parentheses.

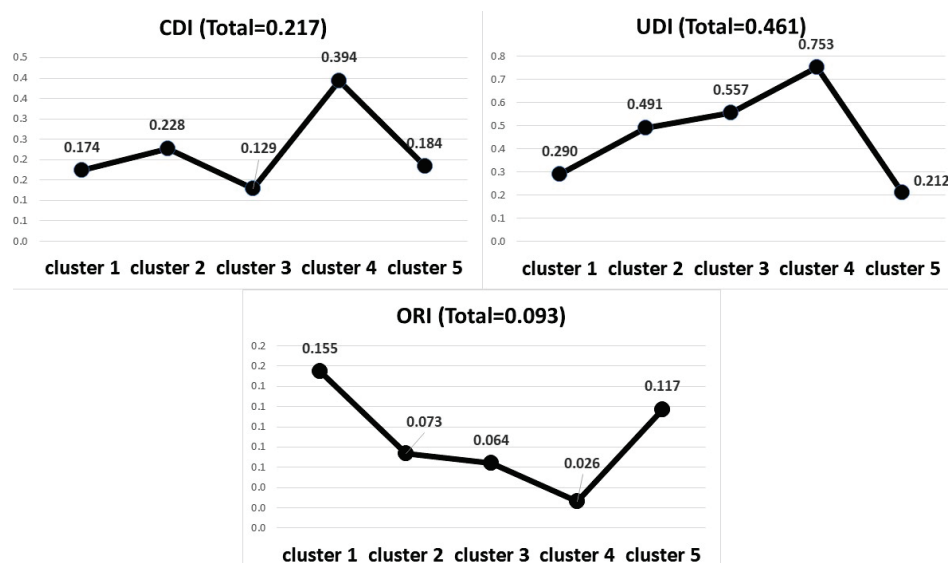


Figure 5. Cluster means for CDI, UDI, and ORI.

6. Discussion and Final Remarks

The present study attempts to provide new insights into some key factors behind the settlement models of the main foreign communities residing in Italy (2003–2021).

We focus on the changes in the global patterns of residential foreign communities, using a specific analysis strategy. First, we provided a synthesis of the evolution of time across the global indices, distinguished by gender, of the principal foreign communities residing in Italy. Second, we attempted to outline a model of residential settlement through the combined use of principal component analysis and cluster analysis. From the obtained results, we can conclude that the settlement model of each foreign citizenship remained almost stable over time (with rare exceptions). Moreover, if we consider that all the citizenships have grown over the considered period, this shows that the geographical distribution has not been affected much in its fundamental features. Gender does not seem to play a fundamental role within individual citizenships (albeit with some exceptions). Its role is the most evident between different communities. The country of citizenship seems to

remain a strong predictor in the settlement model, especially in relation to the dispersed dichotomy (Eastern European citizenships and the ones of older settlements) versus concentrated (Asians, also of old settlements, and communities of more recent settlements). The settlement patterns of Ukrainians and Chinese do not seem to manifest themselves clearly with respect to the indices that were used, which, on the other hand, characterise the other foreign communities quite well. This aspect indicates that these two communities represent an “exception” with respect to the other communities and their settlement patterns. In general, the analysis confirms the existence of different settlement models for different communities. Then, we must also emphasise the importance of the diachronic and global approaches and, moreover, the distinction between one- and two-group indices. Indeed, the geographical distribution of a “minority” group depends also on that of the majority. It is important to emphasise that in terms of social integration, the stability of the concentration of migrants is not always considered as a positive feature: “The effects of this concentration on integration are complex. On the one hand, arrival in an area with high concentration is often associated with better initial employment prospects for immigrants. On the other hand, in the longer run, immigrant concentration tends to hamper host-country language acquisition and, in many cases, educational advancement for children of immigrants” (Liebig and Spielvogel 2021). From this point of view, some communities, such as Filipinos and Bangladeshis, seem particularly vulnerable. In this respect, new steps need to be taken to refine the analysis. In fact, we are planning to test other (spatial) concentration indicators (for example, the recent SGI index for measuring spatial concentrations, (for example the recent SGI index for measuring spatial concentration, Mucciardi and Benassi 2023) to enrich the initial matrix and consider other dimensions. Another interesting aspect is to consider migratory cohorts by the year of the first arrival with the introduction of a longitudinal approach that is particularly effective in the study of integration. In this regard, it is important to remember how the differentiation between the different foreign communities can also be linked to the different phases of the migratory process (Casacchia et al. 1999). From a statistically methodological point of view, considering the communal variance in bidimensional matrixes in a more appropriate way (i.e., using a multiway approach, for example, the Statis method (Lavit et al. 1994)) could be important. New research into these topics is currently in progress. In this respect, it is also important to carry out analyses that include social indicators of integration to study the connection between the settlement models and social integration patterns. From this point of view, it would be important to have more detailed data at the territorial level, which would also allow for analysis at the sub-municipal level. The spatial patterns in the immigrant presence in urban places and their relations with socioeconomic integration have been the focus of many researchers since the pioneering work of the social scientists at the Chicago School in the first half of the 20th century (Park et al. 1925; Zorbaugh 1929; Gordon 1964). However, most of these studies consider integration within metropolitan areas as vantage points to examine the relationships between spatial segregation, often at the neighbourhood scale, and paths towards integration or what they defined as “assimilation”. In this sense, the present work can be considered as a broad framework within which to develop studies on specific areas and populations. The data that were used have the advantage of offering a description of the entire national territory but do not allow us to delve deep into the sub-municipal level. With the data from the new permanent census that ISTAT is carrying out, analyses with greater territorial detail will be possible. The census data could also provide information on migrants, which would be useful for understanding various dynamics (for example, the peculiarities of the Chinese and Ukrainian communities), such as educational qualifications, employment status, and family status, and certainly useful for refining the analysis. Instead, the study of relational aspects or participation can only be left to ad hoc surveys, which, however, hardly have territorial detail and broad coverage at the same time. Qualitative studies on integration at a disaggregated territorial level could also be useful to better understand the dynamics between the various factors that come into play in the complex dynamics of integration at a different territorial scale (Kreichauf 2015). The complexity

of the phenomena of the integration and territorial distribution of migrants undoubtedly requires not only a multidisciplinary approach but also a multi-source and multi-technique one. The use of studies based on different techniques and approaches will allow for a better understanding of the dynamics that are taking place.

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Appendix A

$$ID = \frac{1}{2} \sum_{i=1}^n \left| \frac{x_i}{X} - \frac{y_i}{Y} \right| \quad (A1)$$

where

x_i = total population of foreign group X in Italian municipality i ;

X = total population of foreign group X in the whole country;

y_i = total population of Italian group Y in municipality i ;

Y = total population of Italian group Y in the whole country;

n = number of Italian municipalities.

$$RCO = \left\{ \frac{\left(\frac{\sum_{i=1}^n \frac{x_i a_i}{X}}{\sum_{i=1}^n \frac{y_i a_i}{Y}} \right) - 1}{\left(\frac{\sum_{i=1}^{n_1} \frac{t_i a_i}{T_1}}{\sum_{i=n_1+1}^n \frac{t_i a_i}{T_2}} \right) - 1} \right\} \quad (A2)$$

where

x_i = total population of foreign group X in Italian municipality i ;

X = total population of foreign group X in the whole country;

y_i = total population of Italian group Y in municipality i ;

Y = total population of Italian group Y in the whole country;

a_i = area of municipality i ;

t_i = total population in municipality i ;

T_1 = total population for all municipalities from 1 to n_1 ;

T_2 = total population of municipalities from n_2 to n ;

n = number of Italian municipalities;

(n_1 and n_2 are the rank orders of spatial units from smallest to largest).

$$RCL = \frac{\frac{\sum_{i=1}^n \sum_{j=1}^n x_i x_j d_{ij}}{X^2}}{\frac{\sum_{i=1}^n \sum_{j=1}^n y_i y_j d_{ij}}{Y^2}} - 1 \quad (A3)$$

where

x_i = total population of foreign group X in Italian municipality i ;

x_j = total population of foreign group X in Italian municipality j ;

X = total population of foreign group X in the whole country;
 y_i = total population of Italian group Y in municipality i ;
 y_j = total population of Italian group Y in municipality j ;
 Y = total population of Italian group Y in the whole country;
 d_{ij} = distance between the centroids of municipality i and municipality j .

$$DEL = \frac{1}{2} \sum_{i=1}^n \left| \frac{x_i}{X} - \frac{A_i}{A} \right| \quad (A4)$$

where

x_i = total population of foreign group X in Italian municipality i ;
 X = total population of foreign group X in the whole country;
 a_i = area of municipality i ;
 A = area of the whole country.

$$CDI = \frac{C}{X} \quad (A5)$$

where

C = total population of foreign group X that resides in coastal municipalities;
 X = total population of foreign group X in the whole country.

$$UDI = \frac{U}{X} \quad (A6)$$

where

U = total population of foreign group X that resides in urban municipalities;
 X = total population of foreign group X in the whole country.

$$ORI = \frac{O}{X} \quad (A7)$$

where

O = number of municipalities in which the values of the location quotient

$LQ = \frac{\frac{x_i}{t_i}}{\frac{X}{T}}$ of foreign group X is higher than 2;

with

x_i = total population of foreign group X in Italian municipality i ;
 t_i = total population in municipality i ;
 X = total population of foreign group X in the whole country;
 T = total population in the whole country.

Notes

- ¹ It is important to emphasise that the data regarding the residence permits contain information about the reasons for the migration. They are particularly useful because they immediately register the changes in migration flows. They do not match with the data about the residents. In fact, not all the foreigners with a residence permit are enrolled in the municipalities' lists. At the same time, it is important to consider that the citizens of the European Union do not need a residence permit to enter and to legally stay in Italy.
- ² Although the seminal work of Massey and Denton (1988) includes five dimensions, we do not use the indices related to "exposure" and "centralisation" because the first index is not symmetrical between groups (Wong and Shaw 2011), while for the second index, the distance from the centre to the border of the municipality is not available. Currently, these two dimensions have been left out.
- ³ Although in the Massey and Denton (1988) work, the Spatial Proximity (SP) index seems to be the preferred measure of clustering, we prefer to use RCL, as it has better performance in terms of principal component analysis (see Section 5.1).
- ⁴ For the calculation of the CDI and UDI indices, we use the statistical classification of municipalities provided by ISTAT (2021).

- 5 We use Geo-Segregation Analyzer software (Apparicio et al. 2014) to calculate the ID, RCO, RCL, and DEL indices and Microsoft Excel for CDI, UDI, and ORI indices.
- 6 For all the multivariate statistical analyses, we use STATA ver. 15.0 and R ver. 4.3.2 software.
- 7 We also tried the same model with standardised variables and a more extensive model with the percentages of each foreign community in the three Italian areas (North, Centre, and South); but the results, given the increasing complexity of the model, did not show significant improvements in the analysis. The results are available upon request.

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Article

Framing the Residential Patterns of Asian Communities in Three Italian Cities: Evidence from Milan, Rome, and Naples

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Abstract: Today, the interplay between economic inequality, international migration, and urban transformation has raised awareness about segregation and its social implications on a global and European scale. As cities become home to diverse populations with various backgrounds including social, racial, ethnic, and cultural, the proximity of these groups becomes more pronounced. This article explores the residential segregation of four Asian immigrant groups in three major Italian cities: Milan, Rome, and Naples. Using data from the 2011 Italian General Population Census and employing an areal weighted interpolation procedure, the study measures segregation using both traditional two-group indices and multi-group indices that account for the complexities of contemporary societies. The results indicate a north–south disparity, with Naples exhibiting the highest levels of residential segregation. Among the analysed immigrant groups, Bangladeshis and Chinese tended to be more self-segregated, while Filipinos and Sri Lankans were relatively more dispersed. This research underscores the necessity for a nuanced understanding of segregation dynamics and the adoption of appropriate approaches to address the challenges and opportunities presented by the coexistence of diverse groups in urban areas. By contributing to the existing literature on residential segregation in Southern Europe, this study sheds light on the spatial patterns and social dynamics of different ethnic groups in Italian cities.

Keywords: segregation; ethnic groups; residential patterns; north–south differential; multi-group segregation

1. Introduction

The interplay between economic inequality, international migration, and urban transformation has sparked renewed attention to the issue of segregation and imbued questions of socio-spatial separation and interaction with heightened social significance (van Ham et al. 2021; Piekut et al. 2019), raising the concern of national and international actors (OECD 2018). The process is significantly influenced by migration, which plays a fundamental role in shaping the socio-spatial structures of contemporary urban and metropolitan areas as well as influencing demographic dynamics in host societies (Benassi et al. 2020b; Portes 2000; Strozza et al. 2016). As international migration volumes and patterns have evolved, there has been a notable rise in the concentration of migrants in specific geographic areas, coinciding with the global trend of increasing urbanisation (Piekut et al. 2019). According to the most updated World Bank figures¹, cities are home to approximately 56% of the global population, equivalent to 4.4 billion individuals. This pattern of urbanisation is projected to persist and grow in the next decades. In numerous countries, this has led to a situation where populations from increasingly diverse social, racial, ethnic, linguistic, and cultural backgrounds are being brought into closer proximity than ever before.

Residential segregation of ethnic groups has emerged as a significant concern in many European countries and cities. In some contexts, there is fear that segregation may hinder

integration, while in others, there are concerns about xenophobic reactions towards ethnic minorities from parts of the population (Musterd and Fullaondo 2008). Since the late 1980s, international migration flows have shifted relatively from Western to Southern European countries and metropolises, fundamentally transforming the European migration map (Carella and Pace 2001; King 2002, 1993). Immigration flows have continued to grow over the most recent decades, especially in Southern European regions. In fact, since the 1990s, countries such as Italy, Spain, and Greece have emerged as the main destination for immigrants seeking to reach Europe (Livi Bacci 2007; Pugliese 2006; Strozza 2010). This, coupled with the rise in social and economic inequalities, fuelled by the 2008 economic crisis and the ongoing pandemic, has further solidified social, economic, and residential segregation in southern urban areas (Allen et al. 2004; Musterd et al. 2015; Tammaru et al. 2016; Benassi and Iglesias-Pascual 2022).

Cities in Southern Europe have experienced rapid diversification, although their segregation patterns may not necessarily follow the same trajectory as those in Northern Europe. Extensive literature highlights the different patterns of segregation in cities in Northern and Southern Europe (Malheiros 2002; King 2002, 1993). Just as some authors argue against applying American segregation models to Western European cities (Van Kempen and Özüekren 1998; Musterd 2005; Wacquant 2007), other scholars have proposed an original ethnic segregation model for Southern European cities as distinct from Western European models (Malheiros 2002; Arbaci 2007, 2004). While studies on residential segregation and spatial inequalities in Southern Europe already exist (Arbaci 2008; Benassi et al. 2020b; Tammaru et al. 2017), recent years have seen an increase in the levels of residential segregation and inequalities, which has reduced the gap between the south and north (Panori et al. 2019; Benassi et al. 2020a, 2023a). Simultaneously, there has been a rise in poverty levels and social vulnerability (Arapoglou 2012).

Although there are fewer contributions focused on the Italian context compared to the ones regarding Northern Europe, the relevance of this topic has been rapidly increasing, leading to a growing number of analyses (Benassi et al. 2023b, 2019; Bitonti et al. 2023; Busetta et al. 2015; Mazza et al. 2018; Mazza and Punzo 2016; Petsimeris and Rimoldi 2015; Rimoldi and Terzera 2017). Overall, these studies have revealed a spatial dichotomy at the macro level between the northern and southern parts of Italy, with Northern Italy exhibiting a higher proportion of immigrants and experiencing lower levels of residential segregation and inequalities.

Given the increasing complexity and diversity of contemporary Italian urban contexts, which are becoming more and more multicultural, the work aims to provide the segregation configuration in 2011 of three major Italian cities, Milan, Rome, and Naples, representing the situation in the north, centre, and south of the country, respectively. Apart from being the most important cities of each geographical Italian macro-areas, Milan, Rome, and Naples also represent three different socioeconomic contexts emerging as a consequence of the long-lasting north–south Italian divide. In short, the centre–north has traditionally been more prosperous and industrialised compared to the south. This advantage has indeed allowed the former to attract foreign immigrants for a relatively longer time compared to the south. For this reason, we believe that the assessment of possible between-city variations in segregation could encourage the critical thinking of the implications of macro-level dynamics on the immigrants' residential allocation choices. Furthermore, the comparative approach implemented here allows the present work to cope with the scarcity of segregation studies (e.g., Benassi et al. 2023b), performing comparative analyses across Italian cities. The basic reasoning is to analyse several dimensions of segregation starting with the traditional separation between the dominant group (i.e., Italians) and the minority ones (the main immigrant groups residing in the areas), and then moving to the analysis of multi-group separation and interaction in the perspective of a growing “super-diversity” of the society. Super-diversity, as emphasised by Vertovec (2007) in its application to Britain and Wessendorf (2014) focussing on London, challenges traditional approaches to understanding and addressing segregation. It emphasises the need to move

beyond binary notions of “us versus them” and recognises the intricacies and fluidity of interactions among diverse groups. This framework acknowledges that patterns of segregation can vary significantly, with different groups experiencing distinct forms of spatial separation or integration and, in our thoughts, represents a suitable approach to cope with the actual challenges and opportunities arising from the coexistence of numerous diverse groups within a given urban area (i.e., the high level of ethnic diversity that is typical of contemporary urban societies). Our reasoning draws upon the recent literature suggesting that two-group indices are inadequate for capturing the complexities of contemporary societies, which consist of multiple population groups differing in ethnicity, race, religion, and citizenship, residing within the same context (Kramer and Kramer 2019; Olteanu et al. 2019; Reardon and Firebaugh 2002; Sturgis et al. 2014).

The four Asian immigrant groups analysed were Bangladeshis, Chinese, Filipinos, and Sri Lankans. We believe that the analysis of their residential models is of particular interest firstly because their presence in the country highlights the global dimension (given the distance between Italy and their countries of origin) that immigration flows towards Italy have reached through time due to the globalisation of migration. Secondly, to the best of our knowledge, no other works have comparatively studied these groups across different Italian urban contexts (apart from Benassi et al. (2023b) for Sri Lankans). Here, we intend to fill this gap in the literature by critically comparing segregation patterns both across immigrant groups and urban areas. Despite coming from the same continent, they present very different and peculiar characteristics both in relation to the type of settlement model and to their immigration tradition in Italy. For example, the Filipinos are a long-established community in Italy and present a model of urban settlement (i.e., they are mostly concentrated in Milan and Rome) and labour dominance (they usually work as domestic workers for wealthy Italian families). The original Filipino incoming wave to Italy was predominantly composed of women and, in any case, it did not involve family movements. Nevertheless, the ones already settled in Italy have implemented family reunification practices. The Chinese, on the other hand, are a group of relatively more recent immigration. They follow a family-based migration form with a high rate of self-employment, especially in the service sector, trade, and catering. Their distribution has been defined as “clustered dispersed” because they tend to follow a point distribution. Bangladeshis and Sri Lankans are communities of more recent settlement. They are generally communities in which only males migrate for work reasons. They are usually employed in the catering and service sectors with no self-employment profiles. They are communities with highly concentrated territorial distributions in Italy, often with high levels of residential segregation. Sri Lankans also work as care givers and housekeepers in Italian households.

The remainder of the paper is set out as follows. We begin by presenting the data and urban contexts analysed. We then illustrate the methodology implemented to homogenise geographies and assess the different types of segregation for each city. Next, we set out the results and conclude with a consideration of the implications of our findings for our understanding of whether and how the ethnic composition of neighbourhoods varies and is affected by the various urban structures.

2. Materials and Methods

2.1. Population Data and Geographical Areas of Interest

The analysis included all the Sri Lankan, Bangladeshi, Chinese, and Filipino citizens holders of a regular residence permit and that were counted during the Italian General Population Censuses in 2001, 2011, and 2021². As reported in Table 1, over time, all of these groups have increased in absolute values in each city. As for 2021 in Milan, the presence of Chinese and Filipinos was high both in terms of their relative proportions to the total foreign population living in the city and compared to the total number of the same nationalities residing in the country, with Filipinos accounting for almost a quarter of the whole Filipinos registered in Italy. Filipinos and Bangladeshis amounted to a high share of the foreign population present in Rome, with the former accounting for about a fourth of

the total number of Filipinos and the latter for over a quarter of the total Bangladeshis living in the country. Although Naples hosts fewer foreigners compared to Rome and Milan, the city is one of the preferred destinations for Sri Lankans. Indeed, the group has considerably increased over time, and in 2021, accounted for over a quarter of the total foreign population living in Naples and for the 13.2% of all Sri Lankans that have settled in Italy. Overall, despite the different migration history of each immigrant group, in 2021, the three cities together hosted 28.4%, 17.4%, 48.9%, and 35.6% of Bangladeshis, Chinese, Filipinos, and Sri Lankans, respectively, residing across the whole country. Their spatial arrangement in three Italian cities (namely Milan in the north, Rome in the centre, and Naples in the south of Italy) was plotted against the total resident population and total foreign resident population per census tract, alternatively, on the maps collected in Appendix A. The visualisation of the residential allocation patterns highlights a growing segregation from north to south for all the groups considered. Specifically in Milan, Filipinos and Sri Lankans appear more dispersed across the urban area with respect to Bangladeshis and Chinese, whereas they tend to progressively segregate in specific neighbourhoods in Rome and Naples, as the other immigrant communities.

Table 1. Summary statistics of the selected immigrant groups (BGD = Bangladeshis, CHN = Chinese, PHL = Filipinos, LKA = Sri Lankans) in the cities of Milan, Rome, and Naples as recorded in the Italian General Population Censuses in 2001, 2011, and 2021.

Value/Year	BGD	CHN	PHL	LKA	Total Immigrants
Milan					
Absolute values					
2001	769	5556	14,673	4889	87,590
2011	3740	19,795	33,214	11,440	198,813
2021	10,328	30,688	37,540	15,503	253,531
% of immigrants in the city					
2001	0.9	6.3	16.8	5.6	29.6
2011	1.9	10.0	16.7	5.7	34.3
2021	4.1	12.1	14.8	6.1	37.1
% of the nationality in Italy					
2001	5.2	11.8	27.2	18.5	6.6
2011	4.5	9.9	24.6	15.5	4.9
2021	6.5	10.2	23.6	14.3	5.0
Rome					
Absolute values					
2001	3124	2903	13,105	2296	98,427
2011	17,841	12,096	28,410	5228	260,171
2021	32,963	17,244	38,484	8719	338,548
% of immigrants in the city					
2001	3.2	2.9	13.3	2.3	21.8
2011	6.9	4.6	10.9	2.0	24.4
2021	9.7	5.1	11.4	2.6	28.8
% of the nationality in Italy					
2001	21.3	6.2	24.3	8.7	7.4
2011	21.7	6.1	21.0	7.1	6.5
2021	20.7	5.7	24.2	8.1	6.7

Table 1. Cont.

Value/Year	BGD	CHN	PHL	LKA	Total Immigrants
Naples					
Absolute values					
2001	14	285	480	1496	8757
2011	461	2636	1587	7238	35,580
2021	1960	4412	1708	14,291	53,440
% of immigrants in the city					
2001	0.2	3.3	5.5	17.1	26.0
2011	1.3	7.4	4.5	20.3	33.5
2021	3.7	8.3	3.2	26.7	41.9
% of the nationality in Italy					
2001	0.1	0.6	0.9	5.7	0.7
2011	0.6	1.3	1.2	9.8	0.9
2021	1.2	1.5	1.1	13.2	1.1

2.2. Homogenising Geographies

The analysed population data coming from the Italian General Population Census in 2011 refer to the census enumeration areas (representing the smallest spatial units at which the Italian National Official Statistics Institute (Istat) in Milan, Rome, and Naples. The use of these arbitrary reporting zones poses a challenge known as the modifiable areal unit problem (Openshaw 1984; Openshaw and Taylor 1979). This problem arises because the results of spatial analysis are influenced by the scales and methods used to define the areal units. To address this issue and enable comparison among municipalities, we employed an areal weighted interpolation procedure. This procedure, known as one of the most common forms of spatial basis change for socioeconomic data, transfers data from one set of reporting zones (referred to as “source”) to another independent set (referred to as “target”) (Goodchild et al. 1993). In our case, we redistributed the census tract-based data onto a uniform spatial grid composed of cells measuring 100 by 100 m. This interpolation was carried out using the `aw_interpolate()` function from the areal R package (Prener and Revord 2019; R Core Team 2023).

The choice of a 100 m grid cell size, although arbitrary like any other cell size, has become a standard in the recent literature on residential segregation and settlement models of migrant populations. This choice is supported by the D4I Data Challenge on “Integration of Migrants in Cities”, organised by the European Commission-Joint Research Centre (JRC). The D4I dataset provides researchers worldwide with population distribution grids consisting of 100 m grid cells for cities in eight EU Member States³. Many studies have utilised the D4I dataset to gain comparable insights into migrant settlement patterns across various urban contexts (Benassi et al. 2023a, 2020a, 2020b; Marcińczak et al. 2021; Olteanu et al. 2020).

For each intersected feature i , which represents the overlap between the source feature (such as a census tract) and the target feature (a 100 by 100-m cell), we assigned an areal weight. This was used to quantify the contribution of the source feature to the target feature and is defined as:

$$W_i = \frac{A_i}{A_j}, \quad (1)$$

where A_i is the area of the intersected feature i and A_j is the total area of the source feature j . We then estimated the share of the population data relating to the intersected feature as:

$$E_i = V_i * W_i, \quad (2)$$

where E_i is the estimated value for intersected feature I , V_i is the population (or OMI) value for source feature j , and W_i is the areal weight for intersected feature i . Finally, we summarised the data based on the target feature identification number through summation:

$$G_k = \sum E_{ik}, \quad (3)$$

where G_k is the sum of all estimated values for target feature k and E_{ik} is the estimated value from intersected features in i within target feature k . At the end of the areal weighted interpolation procedure, the census data referring to the enumeration areas are now rearranged and refer to a uniform spatial grid composed by cells of 100 by 100-m side.

2.3. Measuring Residential Segregation

Residential segregation has been extensively studied in the literature, starting with the influential work of the Chicago School (Bailey 2012). The seminal studies by Duncan and Duncan (1955) and Massey and Denton (1988) focussed on measuring segregation as the level of spatial separation between two or more population groups within a specific context (Yao et al. 2019). Initially, the groups investigated were typically White and Black populations (Farley 1977) or the majority (indigenous population) versus a minority group (foreigners) (Kauppinen and van Ham 2019; Wessel et al. 2018). However, the increasing ethnic diversity in Western societies necessitates moving beyond this dichotomous analysis of segregation. As mentioned earlier, such an approach is unable to adequately explain the complex patterns of segregation in today's multiracial, multi-ethnic societies (Kramer and Kramer 2019; Logan and Zhang 2010; Zwiers et al. 2017). In fact, the concept of segregation can be redefined as the extent to which individuals from different groups occupy and experience distinct social environments (Reardon and O'Sullivan 2004). For these reason, we exploited, together with standard between-group residential segregation indices, some multi-group indices. These indices were computed using the OasisR package (Tivadar 2019).

The traditional two-group indices that we considered were the Duncan's dissimilarity index (D), the Delta index, the Bell's isolation index (B), and the Shannon–Wiener (SW) diversity index. The dissimilarity index (DI) quantifies the level of segregation or dispersion of a minority group compared to the majority group, ranging from 0 (indicating no segregation or similar geographical distribution as the majority group) to 1 (representing complete separation).

The dissimilarity index (D) reveals how evenly people of different ethnic groups are distributed across areal units, in our case, across the 100×100 m squared cells obtained after the areal interpolation procedure (Duncan and Duncan 1955). One formula for the D is:

$$D = 0.5 \sum_{i=1}^N \left| \frac{x_i}{X} - \frac{y_i}{Y} \right| \quad (4)$$

where i is used to identify each of the N squared cells, while x and y are the foreign group and Italians, respectively. The D measures the disparity in the distribution of the specific foreign group compared to Italians, focusing on their evenness across spatial units. As a general guideline, a D below 0.30 suggests low segregation, while a range of 0.30 to 0.60 indicates moderate segregation, and values exceeding 0.60 indicate high segregation. It is important to note that these thresholds may vary depending on the national and local contexts (Massey and Denton 1993). The Delta index is a specialised version of the D (Duncan et al. 1961). It focusses on measuring the dissimilarity between the spatial distribution of a particular group and the distribution of available land. It can be seen as the proportion of the group that would need to relocate in order to achieve an even density across all spatial units.

B (Bell 1954) is an exposure index that measures the probability that two members of a group share the same spatial unit (Apparicio 2000). This indicator represents the average proportion of people from the same group living in a given neighbourhood. This refers to

the exclusive presence of the same group in a neighbourhood—one of the main aspects of segregation. For an immigrant community x , B is defined as:

$$B = \sum_{i=1}^N (x_i / X)(x_i / P_i) \quad (5)$$

where x_i is the population of community x in neighbourhood i , X is the total population of community x at the urban level, and P_i is the total population of neighbourhood i . Thus, an index of 1 would indicate that all members of community x live in a neighbourhood where 100% of the population belong to the same community (complete isolation). A B score close to 0 indicates that the proportion of community x is the same across all neighbourhoods in a urban area.

The SW diversity index (Shannon 1948) is based on the notion of entropy and measures population heterogeneity (Jost 2010). SW is calculated using the following formula:

$$SW = - \sum_{i=1}^N (\pi_i \cdot \ln(\pi_i)) \quad (6)$$

where π_i denotes the proportion or relative abundance of the i -th group considered. SW varies from 0—indicating the lowest level of evenness and the presence of a dominant population group (low level of mixing) to 1—the highest level of evenness with a uniform presence of different population groups (high level of mixing).

Here, we also considered two multi-group measures, namely, the multi-group version of Duncan's (D) dissimilarity index (Morgan 1975; Sakoda 1981) and the multi-group version of Theil's (H) index (Theil 1972; Theil and Finizza 1971), which has also been computed in its between-group version. In what follows, we provide their mathematical formulation following the notation adopted in Reardon and Firebaugh (2002). Specifying that x denotes the size of the specific group and π denotes proportion; subscript j indices territorial units (i.e., the squared cells); and subscript i indexes groups; hence, x_j represents the group size in territorial unit j ; X is the total size of the group; π_i is the proportion of group i ; π_{ij} is the proportion of group i , of those in unit j , we provide the formula of the multi-group version of the Duncan's dissimilarity index (MD) as:

$$MD = \sum_{i=1}^N \sum_{j=1}^M \frac{x_j}{2IX} |\pi_{ij} - \pi_i| \quad (7)$$

where I represents the Simpson's interaction index (Liebersohn 1969; White 1986) defined as:

$$I = \sum_{i=1}^N \pi_i (1 - \pi_i). \quad (8)$$

The multi-group version (H) of the Theil's entropy index measures the departure from evenness by assessing each spatial unit deviation from the entropy in the area considered. This entropy index (also called information index) measures the (weighted) average deviation of each areal unit from the urban area's "entropy" or racial and ethnic diversity, which is greatest when each group is equally represented in the metropolitan area. H also varies between 0 (when all geographical units have the same composition as the entire urban area) and 1 (when all geographical units contain one group only). Maintaining the same definitions provided for the MD formulation, H can be written as:

$$H = \sum_{i=1}^N \sum_{j=1}^M \frac{x_j}{XE} \pi_{ij} \ln \frac{\pi_{ij}}{\pi_i} \quad (9)$$

where E denotes the Theil's entropy index defined as follows:

$$E = \sum_{i=1}^N \pi_i \ln \left(\frac{1}{\pi_i} \right). \quad (10)$$

3. Results

The areal weighted interpolation of the population counts allowed us to anchor the census tract level data to a uniform grid and to calculate the different indices on these newly arranged counts. The first general consideration, based on the values assumed by the indices (Table 2) across the three cities, was the presence of a north–south differential with Naples, and in a certain measure also to Rome, being more segregated than Milan with respect to all of the immigrant groups analysed. The standard and the multi-group versions of D, Delta, B, MD, and H took on values considerably higher in Naples, in accordance with the existing literature (Benassi et al. 2020a, 2020b). Despite the general difference in the level of segregation between cities, when drawing comparisons among the immigrant groups, a homogeneous situation emerged for all the urban areas considered. Specifically, the Bangladeshis and Chinese were the most segregated communities, while Filipinos and Sri Lankans appeared more dispersed over space, independently of the urban context. Moreover, both multi-group indices decreased when the Italians were included in the computation. This could suggest that there is some degree of separation between the immigrant groups themselves, highlighting a difference in their allocation preference that goes beyond the status of immigrant.

Table 2. Segregation indices for the selected immigrant groups (BGD = Bangladeshis, CHN = Chinese, PHL = Filipinos, LKA = Sri Lankans) in Milan, Rome, and Naples. Time period: 2011. Source: Authors' elaboration.

Segregation Indices	Milan			
	BGD	CHN	PHL	LKA
Duncan's dissimilarity (ref. group: Italians)	0.7897	0.6067	0.4214	0.4887
Multi-group Duncan's dissimilarity		0.4777		
Multi-group Duncan's dissimilarity (including Italians)		0.4566		
Delta	0.8423	0.6788	0.5435	0.5904
Bell's isolation (ref. group: Italians)	0.0612	0.0996	0.0757	0.0361
Theil's entropy (ref. group: Italians)	0.3284	0.2451	0.1291	0.1435
Multi-group Theil's entropy		0.2944		
Multi-group Theil's entropy (including Italians)		0.176		

Table 2. Cont.

Segregation Indices	Rome			
	BGD	CHN	PHL	LKA
Duncan's dissimilarity (ref. group: Italians)	0.7151	0.6989	0.5172	0.7308
Multi-group Duncan's dissimilarity		0.6521		
Multi-group Duncan's dissimilarity (including Italians)		0.5467		
Delta	0.8673	0.8493	0.7130	0.7912
Bell's isolation (ref. group: Italians)	0.2203	0.074	0.0455	0.0302
Theil's entropy (ref. group: Italians)	0.3812	0.2895	0.1628	0.2598
Multi-group Theil's entropy		0.4955		
Multi-group Theil's entropy (including Italians)		0.2559		
Segregation Indices	Naples			
	BGD	CHN	PHL	LKA
Duncan's dissimilarity (ref. group: Italians)	0.9444	0.9042	0.7972	0.6765
Multi-group Duncan's dissimilarity		0.7837		
Multi-group Duncan's dissimilarity (including Italians)		0.7086		
Delta	0.9662	0.8814	0.7669	0.6958
Bell's isolation (ref. group: Italians)	0.0466	0.1605	0.0257	0.0525
Theil's entropy (ref. group: Italians)	0.4567	0.5087	0.2891	0.2523
Multi-group Theil's entropy		0.6636		
Multi-group Theil's entropy (including Italians)		0.3287		

Analysing the indices measuring the different dimensions of segregation between groups (Table 3), additional considerations conveyed a more articulated picture of the residential configuration across cities. In Milan, the most segregated group with respect to the other is that of Bangladeshis, while Sri Lankans, Chinese, and Filipinos appeared to share a more similar allocation pattern. This configuration disappeared in Rome and Naples, where each group exhibited high levels of segregation with respect to the other. The worst situation emerged in Naples. The different forms of segregation measured with respect to the Italians indicated that Filipinos showed low to moderate levels of segregation in Milan and Rome, while Sri Lankans exhibited medium segregation from Italians only in the city of Milan. Overall, the north–south gradient of segregation detected by previous research on Italian contexts was confirmed (see Section 1).

These results could be partially related to the fact that in general, excluding instances where ethnic discriminatory rules are enforced by law or traditions in certain places and times, we can identify two main factors shaping the spatial allocation of minority groups, as proposed by Schelling (1971). One factor is the presence of spatial inhomogeneity or “apparent contagion”. Typically, various areas within a city display significant disparities in residential property prices, accessibility to affordable public infrastructure, and the availability of specific job opportunities (Mazza and Punzo 2016). Therefore, even in the absence of ethnic discrimination, different ethnic groups would not be randomly distributed among residences. The second factor is spatial attraction or “true contagion”. Survey

data from Clark and Fossett (2008) regarding the preferred neighbourhood composition for various ethnic groups in the USA indicate that all groups generally prefer to live in areas where their own group is a majority or close to it. These preferences stem from complex factors and may reflect a sense of attachment to group identity and culture such as language, religion, and customs. Newly arrived minority migrants may benefit from positive effects by settling in proximity to fellow compatriots such as experiencing mutual acceptance, sharing a common language, and receiving support. Additionally, transnational social networks play a significant role in guiding incoming migrants towards specific neighbourhoods and occupations, as highlighted by Gelderblom and Adams (2006).

The high segregation levels detected for Bangladeshis could be partly explained by the significant role played by chain migration. The existence of established Bangladeshi communities in certain areas acts as a pull factor for subsequent migrants, leading to the formation of ethnic enclaves and reinforcing segregation (Knights 1996).

Similarly, according to Chang (2012, p. 181), Chinese migration in Italy is described as a deliberate decision made in the family's best interests. It is characterised by phenomena such as chain migration, ethnic enclaves, and a sense of familial duty. Additionally, the Chinese community in Italy tends to live in a relatively isolated manner, as noted, for example, by Mazza and Punzo (2016), and faces significant linguistic difficulties.

The Sri Lankans' and Filipinos' relatively lower levels of segregation align with the fact that they are mostly employed in the occupational niches of domestic assistance, housekeeping, waiting, factory-work in light industry, and cleaning services (Benassi et al. 2023b; Henayaka-Lochbihler and Lambusta 2004; Mazza et al. 2018). Since many of them work in Italian households, their allocation model is more adjusted to that of Italians, making proximity to workplace a strong factor influencing the residential choices.

Table 3. Segregation indices across the selected immigrant groups (BGD = Bangladeshis, CHN = Chinese, PHL = Filipinos, LKA = Sri Lankans) and Italians (ITA) in Milan, Rome, and Naples. Time period: 2011. Source: Authors' elaboration.

Segregation Indices	LKA— BGD	LKA— CHN	LKA— PHL	LKA—ITA	BGD— CHN	BGD— PHL	BGD— ITA	CHN— PHL	CHN— ITA	PHL—ITA
	Milan									
Duncan's dissimilarity	0.7244	0.602	0.4439	0.489	0.6746	0.6941	0.79	0.539	0.607	0.421
Theil's entropy	0.5353	0.426	0.231	0.144	0.4492	0.4196	0.328	0.3334	0.245	0.129
Bell's isolation	0.8855	0.663	0.4367	0.036	0.5103	0.4033	0.061	0.6066	0.1	0.076
Shannon–Wiener diversity	0.5583	0.657	0.569	0.06	0.4379	0.3277	0.024	0.6608	0.093	0.138
Segregation Indices	Rome									
Duncan's dissimilarity	0.8431	0.851	0.6603	0.731	0.5796	0.7445	0.715	0.767	0.699	0.517
Theil's entropy	0.9062	0.931	0.7096	0.763	0.5643	0.7987	0.77	0.819	0.732	0.459
Bell's isolation	0.7446	0.774	0.4603	0.26	0.3901	0.6012	0.381	0.6118	0.29	0.163
Shannon–Wiener diversity	0.8217	0.857	0.5241	0.03	0.7711	0.7756	0.22	0.7443	0.074	0.046
Segregation Indices	Naples									
Duncan's dissimilarity	0.9244	0.931	0.6567	0.677	0.7677	0.9244	0.944	0.9136	0.904	0.797
Theil's entropy	0.9705	0.971	0.6673	0.667	0.8048	0.9791	0.967	0.9696	0.942	0.828
Bell's isolation	0.8174	0.864	0.4311	0.252	0.5828	0.8772	0.457	0.8564	0.509	0.289
Shannon–Wiener diversity	0.9872	0.969	0.8942	0.053	0.6411	0.9136	0.047	0.953	0.161	0.026

4. Discussion and Conclusions

The study aimed to provide a snapshot of the ethnic residential segregation of four selected Asian foreign groups in 2011 in three Italian cities, namely, Milan, Rome, and Naples, representing the north, centre, and south of the country, respectively. The analysis focused on the segregation patterns of various ethnic groups and aimed to move beyond traditional binary notions of segregation to account for the complexities of a diverse and multicultural society. Moreover, the quantitative analysis was based on regular lattice data that allow for robust spatial comparison between different geographical settings.

The findings revealed a north–south differential in segregation levels, with Naples exhibiting the highest levels of segregation, followed by Rome, while Milan displayed relatively lower levels. The immigrant groups analysed including Bangladeshis, Chinese, Filipinos, and Sri Lankans showed varying degrees of spatial dispersion or concentration across the cities. The Bangladeshi and Chinese communities appeared more segregated, while the Filipinos and Sri Lankans were relatively more dispersed. The study also explored multi-group segregation measures, considering the interactions and allocation preferences among different ethnic groups. The inclusion of Italians in the analysis highlighted some degree of separation between the immigrant groups themselves, indicating differences in their residential preferences beyond their immigrant status. Comparisons among the cities and ethnic groups provided a nuanced understanding of the residential configuration. Milan showed higher segregation levels for Bangladeshis compared to the other groups, while Rome and Naples exhibited high levels of segregation for all of the analysed groups. Naples emerged as the city with the highest levels of segregation across various dimensions.

The study's findings confirm the presence of a north–south segregation gradient in Italy, with the southern cities experiencing greater levels of segregation. Indeed, segregation seems to increase in those areas, the southern ones, which already face issues relating to economic deprivation, poverty, and marginalisation. As already pointed out in Benassi et al. (2023a), segregation is higher in the urban areas of Europe with a less stable economy and a high level of social vulnerability. As far as the current application is concerned, one can postulate that the north–south differential in the amount and diversification of productive and economic activities and their consequent urban spatial allocation could have influenced the residential choice of the foreign groups across the cities. Roughly speaking, the availability of many and more spatially dispersed economic and work opportunities, especially in Milan, could explain the lower levels of segregation. On the other hand, the less dynamic economy in Naples could foster the localisation of immigrants in proximity of the few productive activities available. Our findings and reasoning confirm what Ambrosini (2013) has called “the four territorial models of immigrant integration on the Italian labour market”. According to this classification, the “small and medium enterprises (SMEs) model” characterises the industrial provinces of the centre–north (especially the north-eastern ones), where immigrants are typically factory workers, and more and more women find jobs in the domestic or care sectors. The “metropolitan economies model”, typical of Milan and to a lesser extent Rome, show that the immigrants' occupations are more varied but are included in a range that goes from building and restaurants to cleaning and transportation. The “seasonal activities model” of the south, which serves as a gateway for many immigrants, provides mostly temporary or irregular jobs in the agricultural sector. Here, women's employment in housekeeping is also significant. The “seasonal activities model” of the centre–north characterises those regions attracting significant flows of seasonal workers, employed in the summer by the tourism industry and in autumn by fruit harvesting. A notable example is the region of Trentino-Alto Adige (Süd Tirol), where the regular employment rates are relatively higher. A similar classification of the immigrants' integration process in Italy by economic sectors and regional economic variations has been proposed by Allasino et al. (2004). As well as the integration index proposed by Cesareo and Blangiardo (2009) to measure the migrants' integration levels in Italy at the NUTS-3 level, which indicates a different level of integration, and is based, among other dimensions, on the characteristics of the local economies. Indeed, the economic

sub-domain of the index registered a very high value for Milan, a medium value for Rome, and a low one for Naples. In summary, different regions in Italy exhibit distinct patterns of migrant worker employment, with variations in the sectors and types of jobs available as well as differences in employment stability and regularity.

In addition to the dynamics of socio-economic and professional polarisation, of which segregation is a spatial expression, depending on the territorial and institutional context of reference, there are mechanisms that can contribute to exacerbating or mitigating the segregation of immigrants, one of which is housing welfare (Costarelli and Mugnano 2017). In Italy, the housing problem faced by immigrants sheds light on numerous challenges that the Italian housing system must confront (Mugnano 2017). For a considerable period, the Italian housing system has been primarily oriented towards the property market. This circumstance leaves low-income immigrants, particularly newcomers, in a vulnerable position due to their inadequate resources to enter the housing market as homeowners or afford private rental accommodation. Notably, the availability of public residential buildings in Italy is currently at a level slightly below 5%. Many immigrants reside in rental houses, and often, this sector of the real estate market is the most discriminatory (Baldini and Federici 2011; Caritas 2011). Moreover, they usually live in precarious conditions due to overcrowding and poor housing quality (Costarelli and Mugnano 2017). Although the analysis of the implications of the real estate market and housing discrimination on ethnic segregation goes beyond the scope of the work, it is noteworthy to consider these dynamics and their urban-specific peculiarities when comparing segregation among different cities.

The increasing complexity and diversity of Italian urban contexts call for a deeper understanding of segregation dynamics and the adoption of suitable approaches to address the challenges and opportunities arising from the coexistence of diverse groups within urban areas. By employing multi-group segregation measures and considering the complexities of contemporary societies, this study contributes to the existing literature on residential segregation in Southern Europe (Benassi et al. 2020b). The future availability of data concerning other time periods will allow us to uncover the implications of the growing diversity of these Italian cities on the segregation and social inclusion of migrants. The current sociological debate on ethnic diversity and segregation is dominated by two contrasting schools of thought (Sturgis et al. 2014). According to the so-called “conflict theory”, the interethnic mixing can induce a feeling of threat and anxiety between minority and majority groups (Blalock 1967). In particular, Putnam stated that ethnic diversity leads people to “hunker down” (i.e., to withdraw from collective life and distrust their neighbours), regardless of their racial or ethnic background (Putnam 2007). Conversely, the “contact theory” proposes that racial diversity has the potential to diminish stereotyping and prejudice as it fosters direct interactions between individuals belonging to different ethnic groups (Allport 1954; Hewstone and Brown 1986).

Overall, the findings shed light on the spatial patterns of different ethnic groups in Italian cities and provide insights into the social and spatial dynamics of urban areas. Understanding and addressing segregation are crucial for fostering inclusive and cohesive societies. Future research could further investigate the underlying factors driving segregation in specific urban contexts and explore policy interventions to promote social integration and reduce disparities.

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Data Availability Statement: The population data (Italians, foreigners, and individual citizenships) for each municipality is available on the Istat website. The population data for the year 2011, without distinguishing individual citizenships, for census sections, is available on the Istat website and can be freely downloaded. Their distribution based on individual citizenships is not available but has been obtained through a specific scientific agreement. Consequently, the data is not accessible and cannot be released. Finally, the geographical bases, municipal shape files, and census section shape files can be freely downloaded from the Istat website.

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

Appendix A

The following figures show the spatial point pattern of the selected foreign groups displayed above the total resident population per census tract and the foreign total resident population per census tract. Given the initial number of foreigners was not georeferenced but just referred to the census tract, the number of points corresponding to the foreigners residing in the given census tract was randomly generated so that the number of points falling in each census tract, corresponds to the numerosity of the specific group in the same census tract.

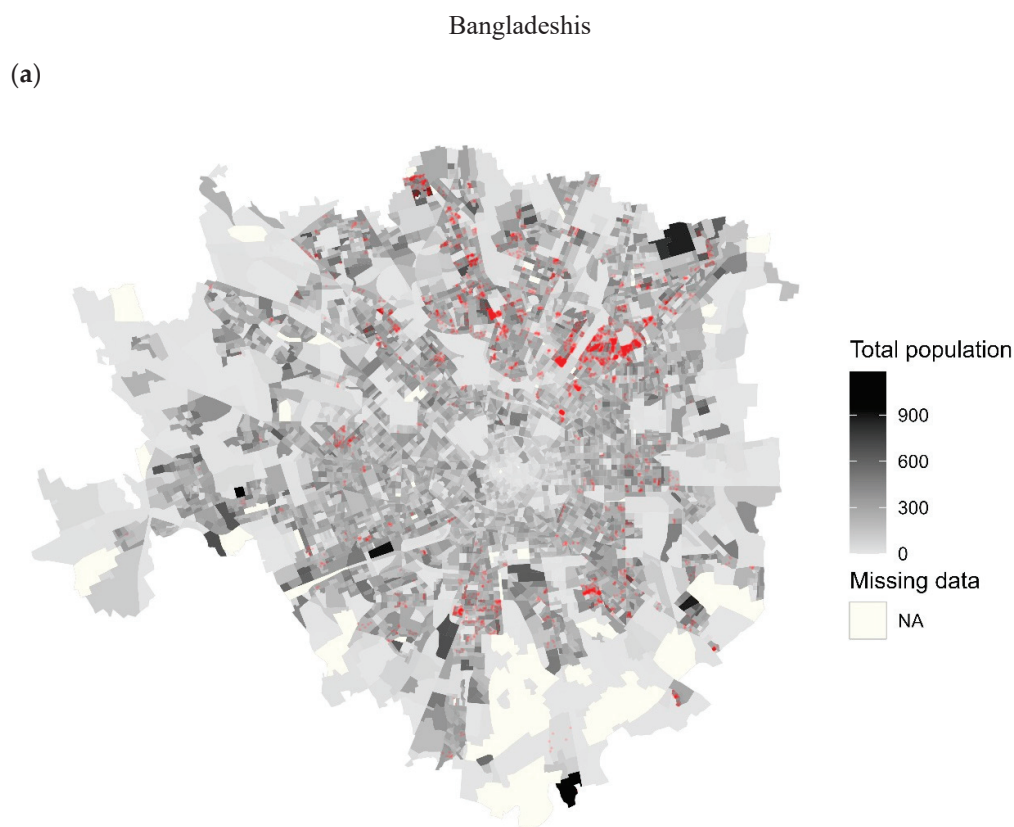


Figure A1. *Cont.*

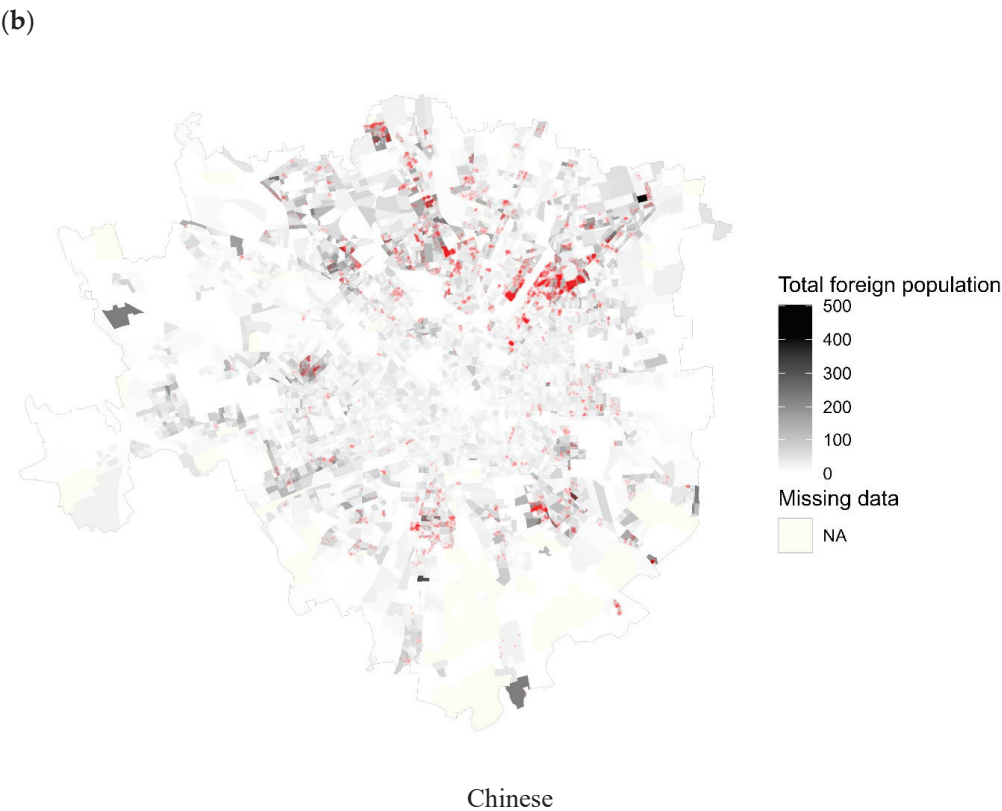
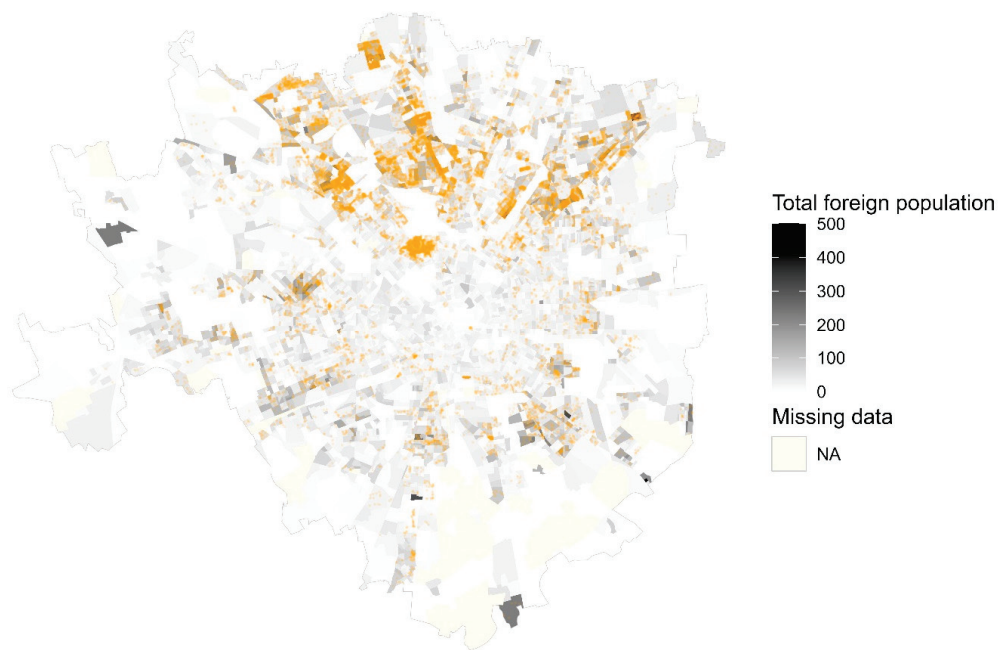


Figure A1. Cont.

(d)



Filipinos

(e)

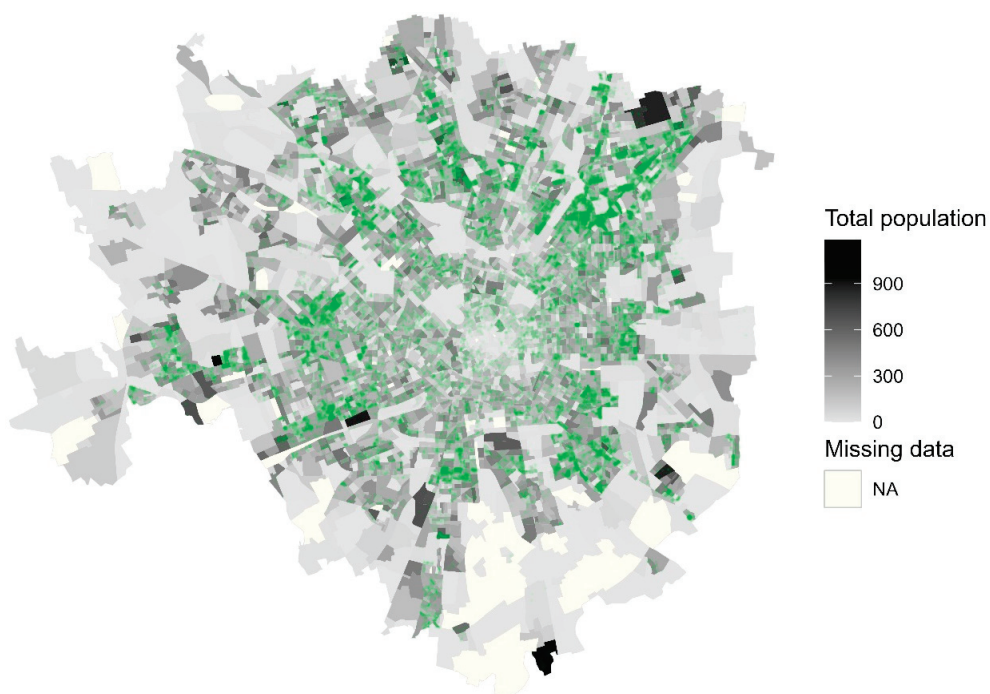
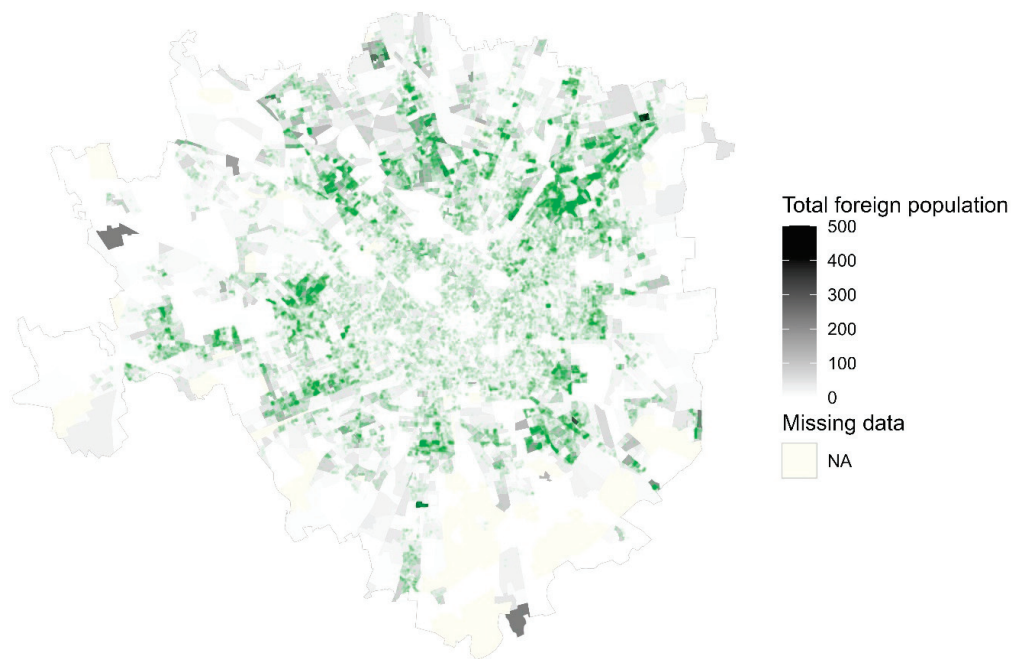


Figure A1. *Cont.*

(f)



Sri Lankans

(g)



Figure A1. Cont.

(h)

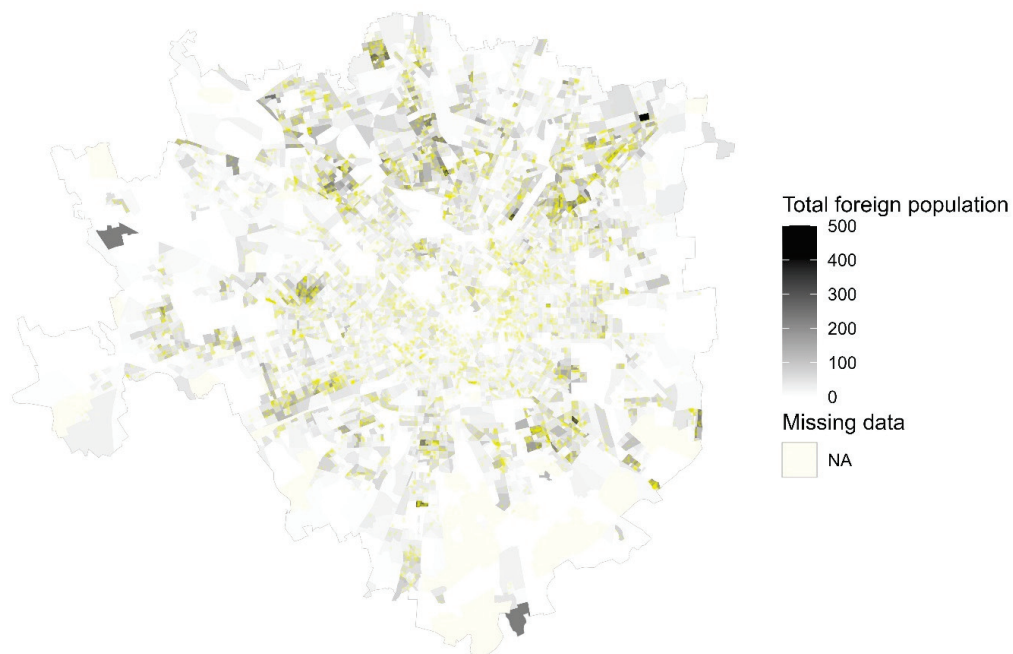


Figure A1. Spatial distribution of the selected immigrant groups (in coloured dots) in the city of Milan. The number of points, randomly generated per each census tract, corresponds to the numerosity of the specific group in the same census tract. In the background (in grey scale) are the total resident population per census tract and the foreign total resident population per census tract, alternatively. Time period: 2011. Source: Authors' elaboration on the Italian census data.

Bangladeshis

(a)

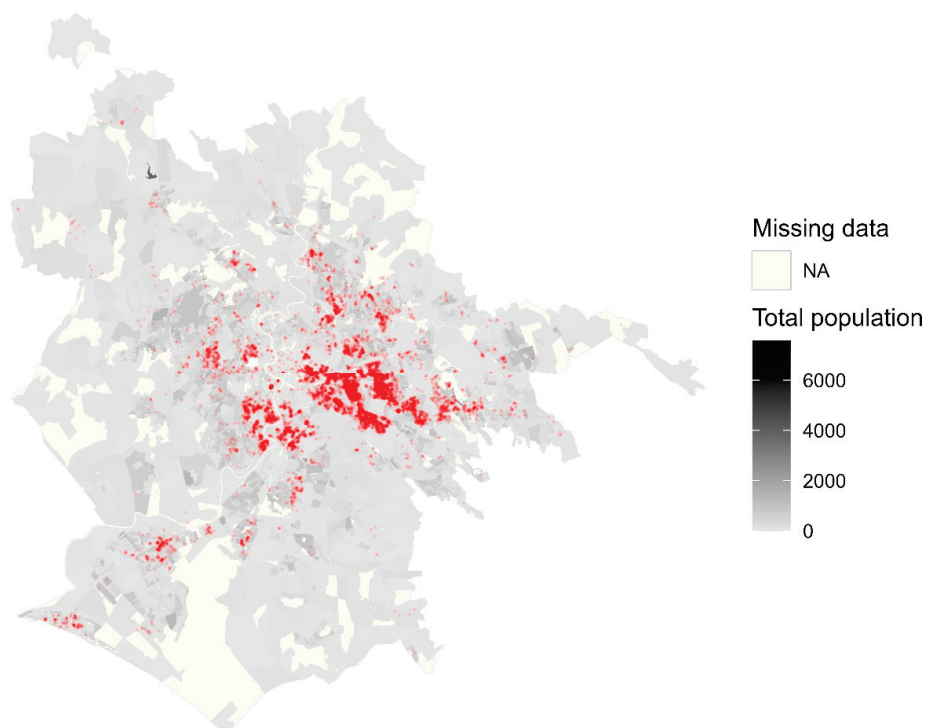
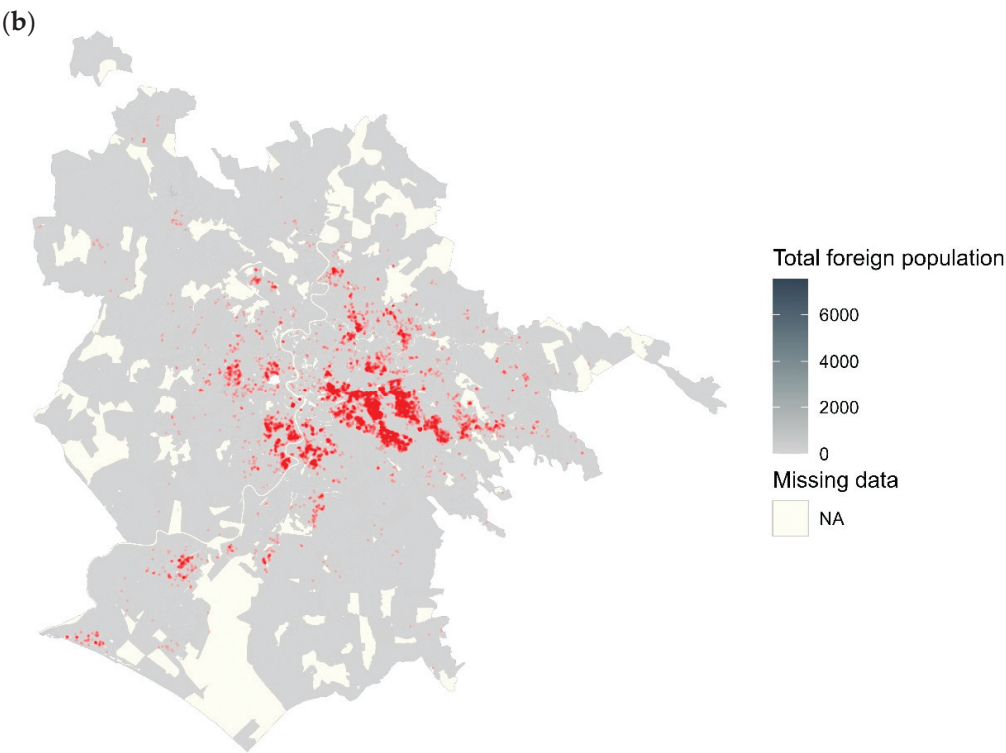


Figure A2. *Cont.*



Chinese

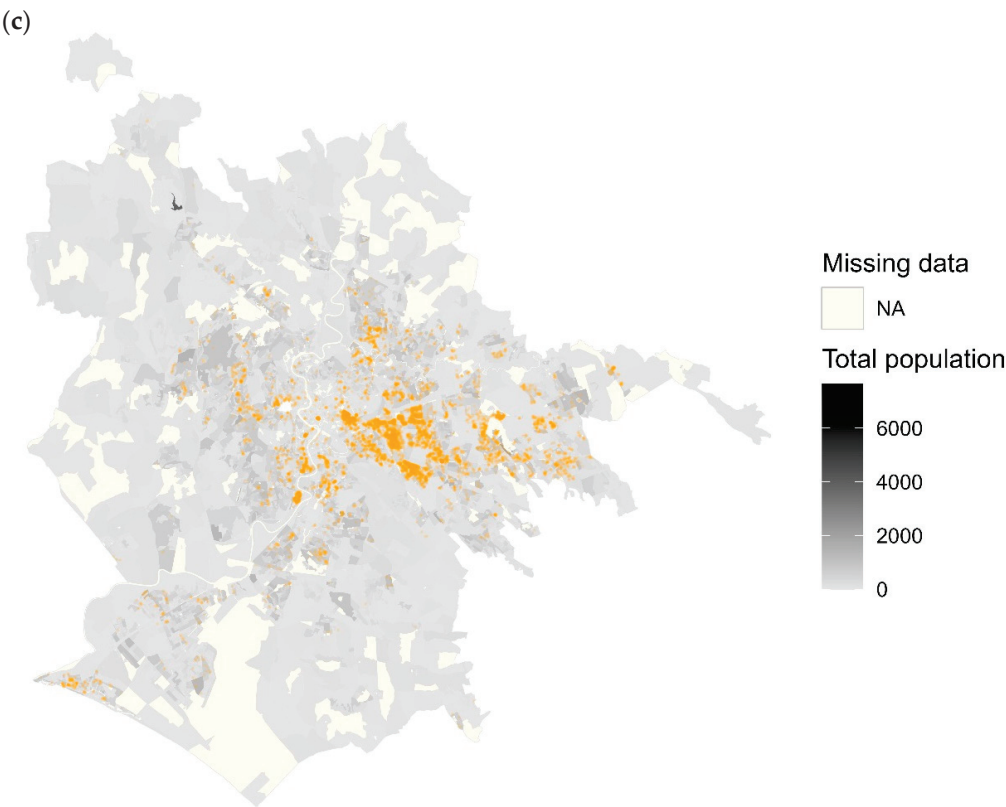
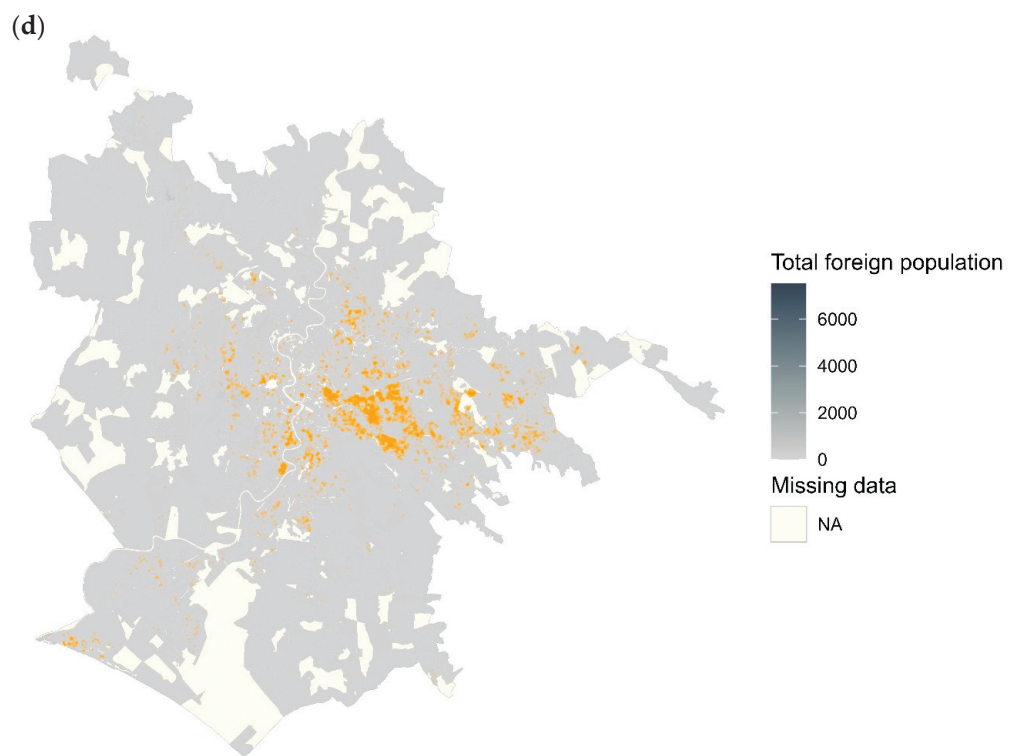


Figure A2. Cont.



Filipinos

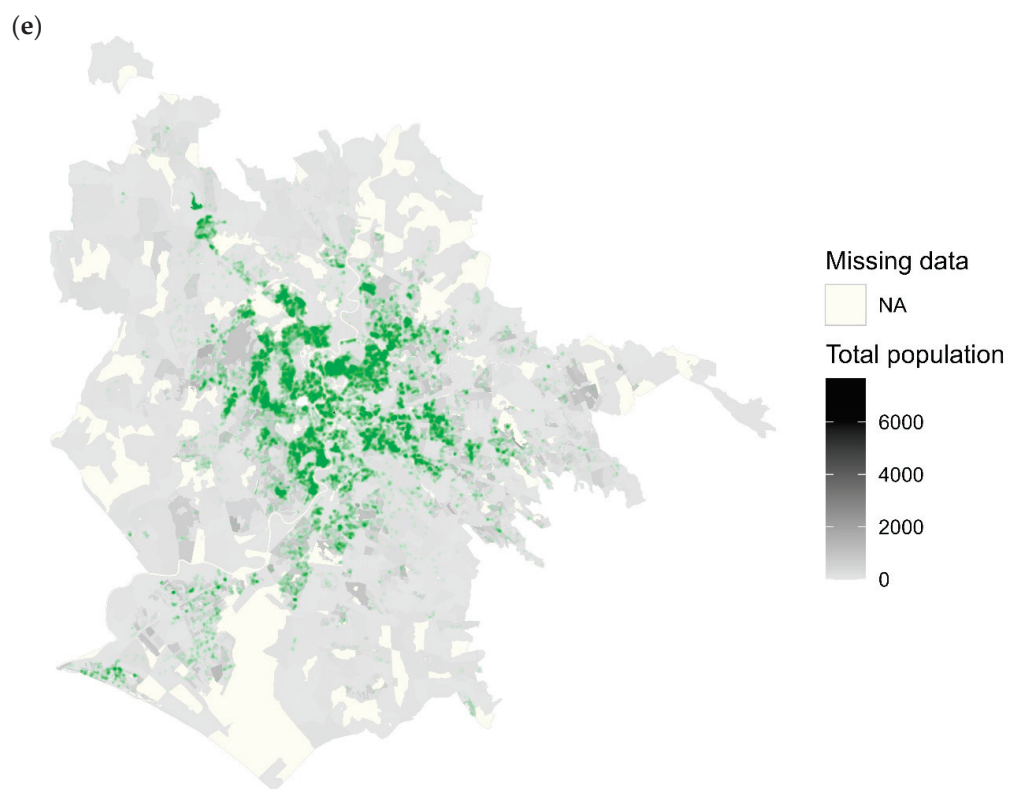
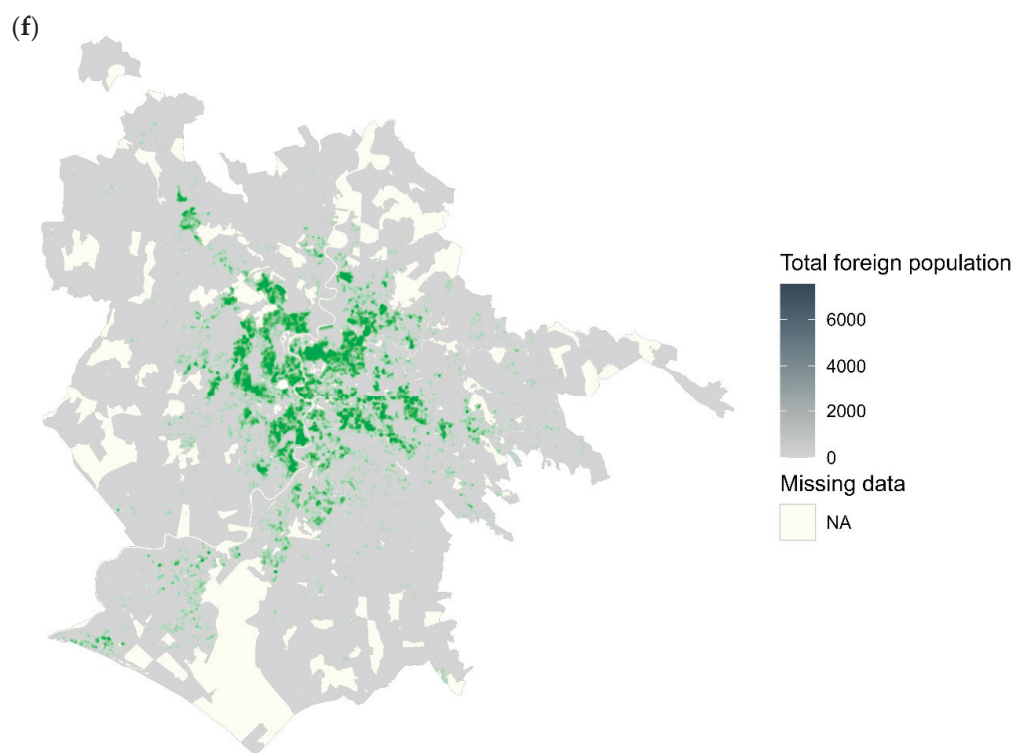


Figure A2. Cont.



Sri Lankans

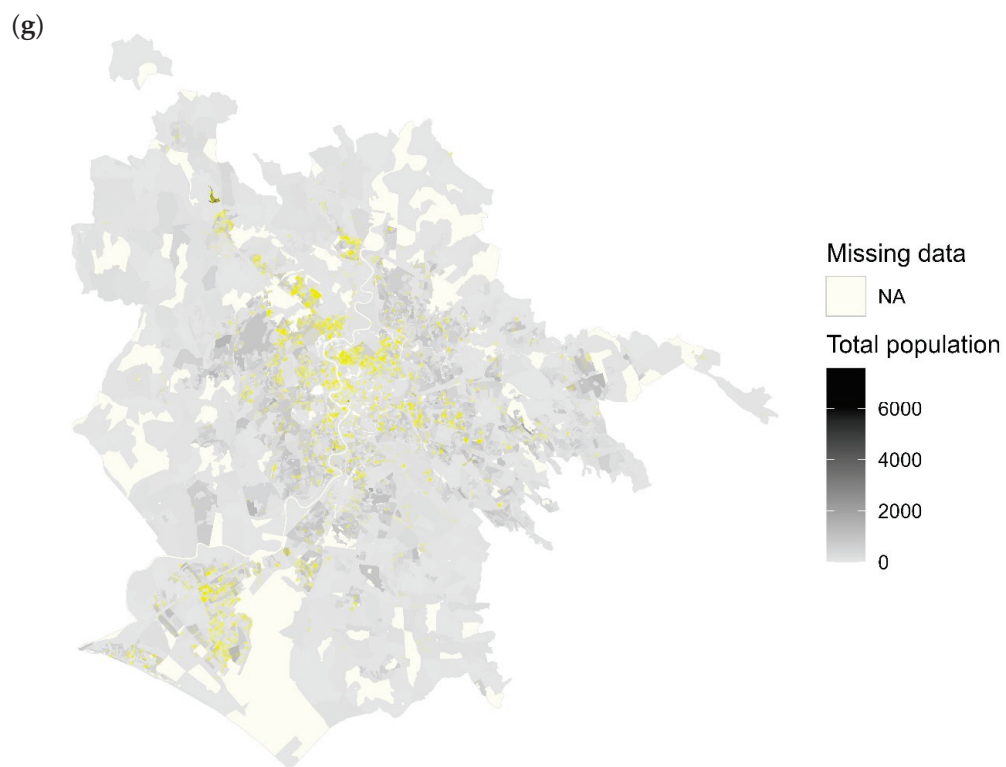


Figure A2. Cont.

(h)

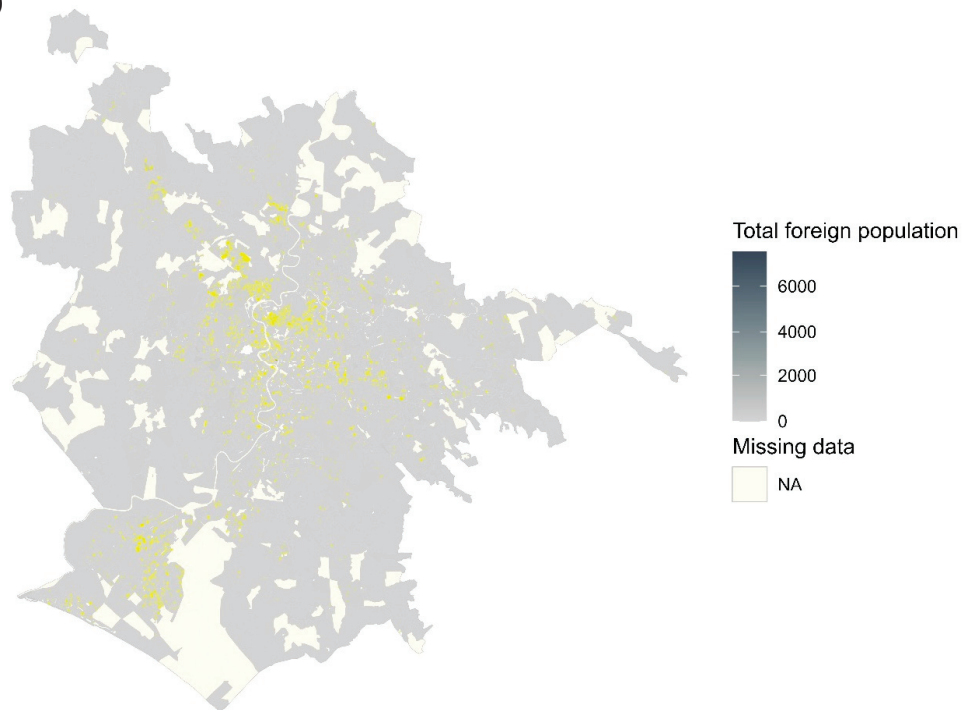


Figure A2. Spatial distribution of the selected immigrant groups (in coloured dots) in the city of Rome. The number of points, randomly generated per each census tract, corresponds to the numerosity of the specific group in the same census tract. In the background (in grey scale) are the total resident population per census tract and the foreign total resident population per census tract, alternatively. Time period: 2011. Source: Authors' elaboration on the Italian census data.

Bangladeshis

(a)



Figure A3. *Cont.*

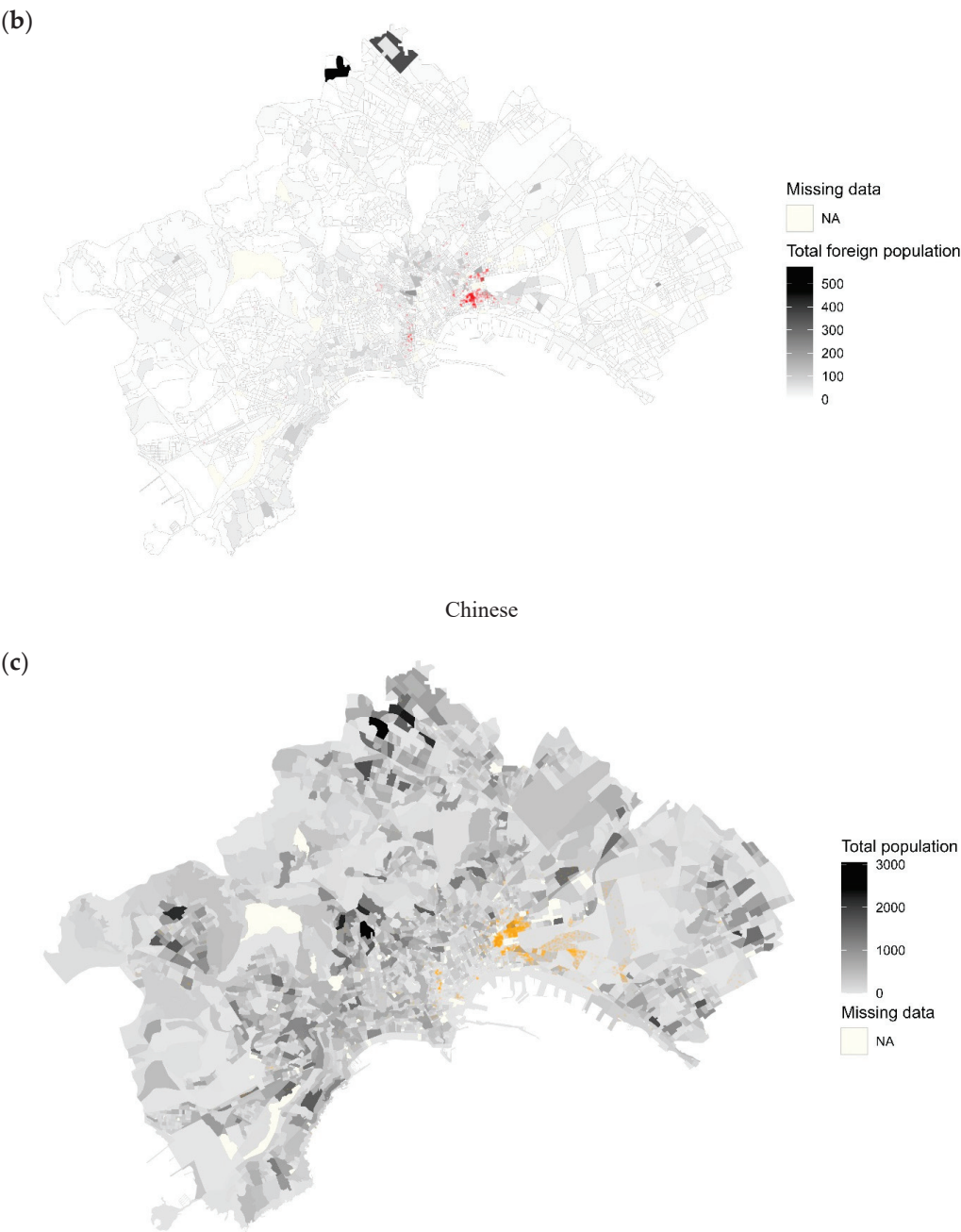


Figure A3. Cont.

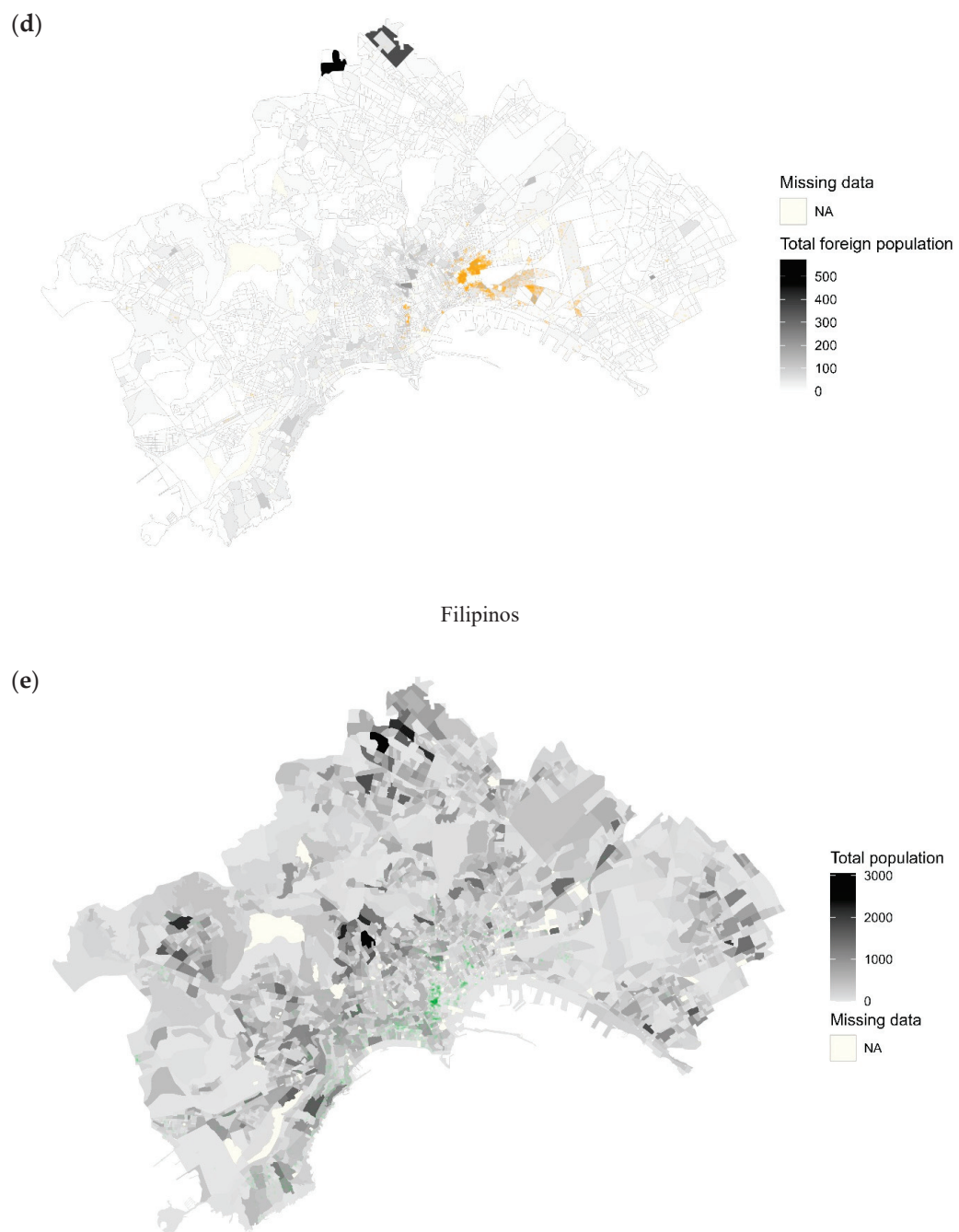


Figure A3. Cont.

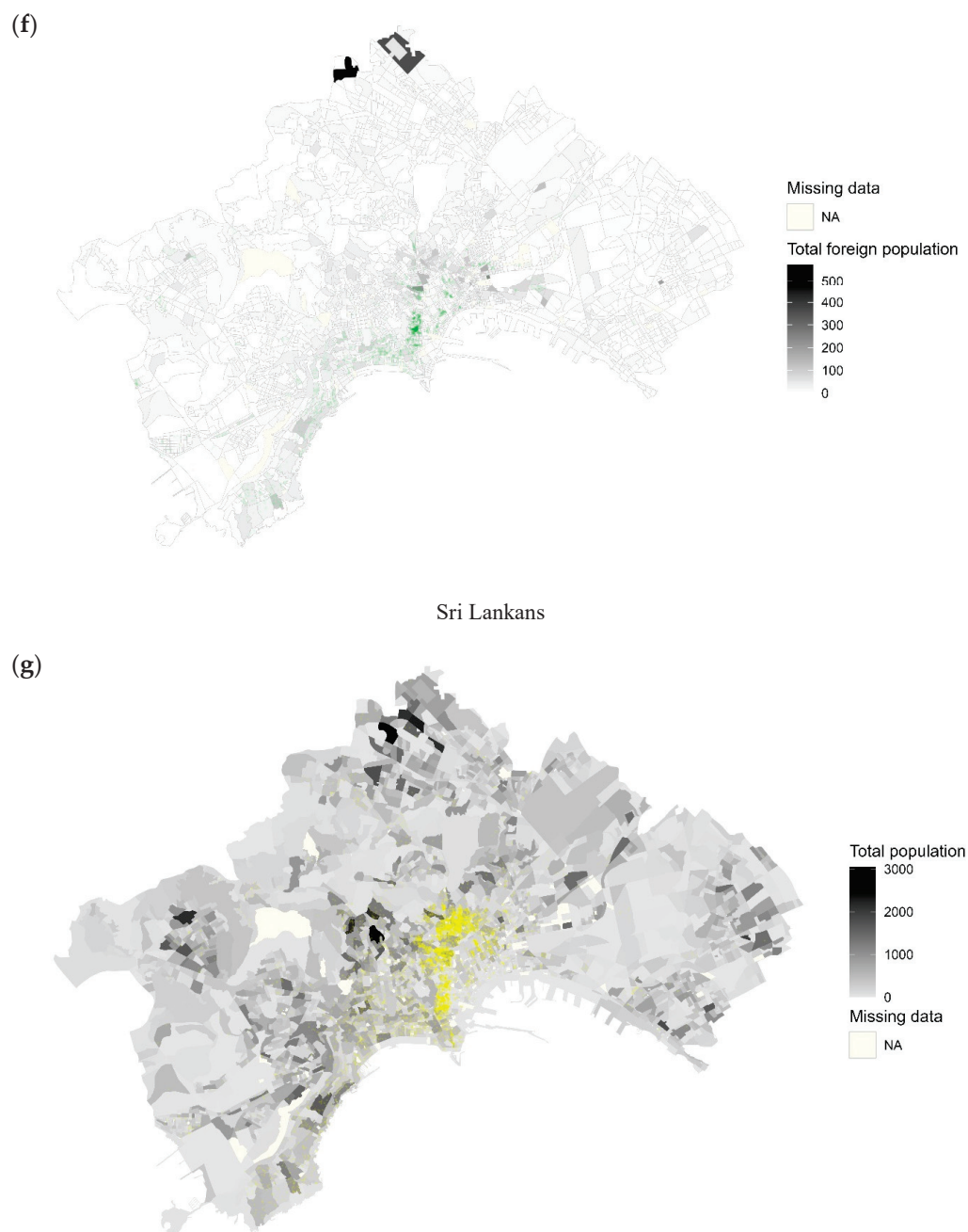


Figure A3. Cont.

(h)

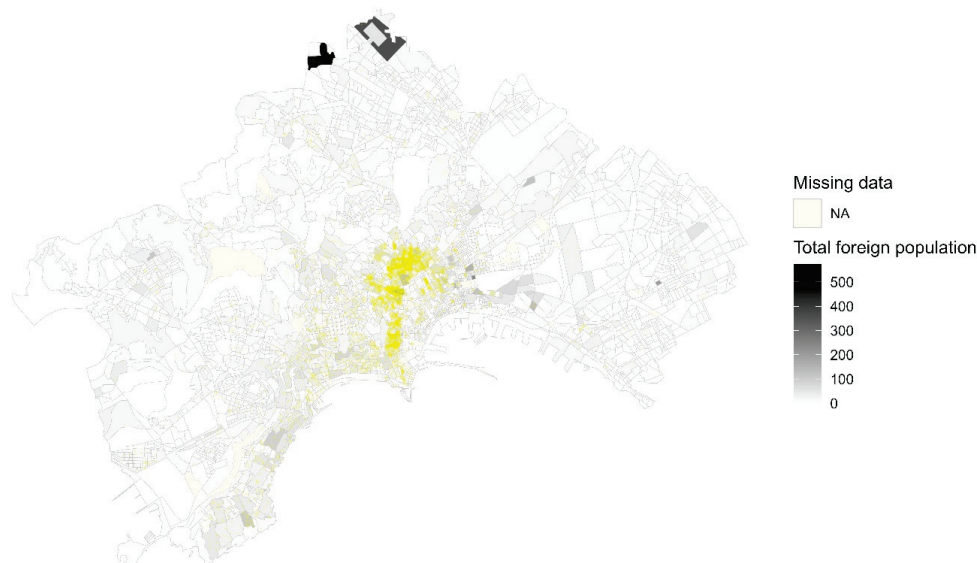


Figure A3. Spatial distribution of the selected immigrant groups (in coloured dots) in the city of Naples. The number of points, randomly generated per each census tract, corresponds to the numerosity of the specific group in the same census tract. In the background (in grey scale) are the total resident population per census tract and the foreign total resident population per census tract, alternatively. Time period: 2011. Source: Authors' elaboration on the Italian census data.

Notes

- ¹ World Bank data were retrieved from: <https://data.worldbank.org/topic/urban-development> (accessed on 27 June 2023).
- ² Data on the selected immigrant groups did not include individuals who acquired Italian citizenship.
- ³ The Data for Integration (D4I) dataset, recently released by the European Commission's Knowledge Centre on Migration and Demography, provides valuable information on migration patterns. This dataset was created by spatially disaggregating statistics from the 2011 Census, which were collected by national statistical institutes. Through this spatial processing, the original data were transformed into a uniform grid, revealing the distribution of migrants in cells measuring 100 by 100 m. This comprehensive dataset covers cities in eight European countries, namely, France, Germany, Ireland, Italy, the Netherlands, Portugal, Spain, and the United Kingdom.

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Case Report

Toward a ‘Migrant Trap’? Local Development, Urban Sustainability, Sociodemographic Inequalities, and the Economic Decline in a Mediterranean Metropolis

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Abstract: After years following the breakdown of the Great Recession in Europe, crisis-driven urban shrinkage can be adequately investigated considering changes over time in selected demographic indicators, with a specific focus on migration. Using official statistics and a literature review, the present study documents the inherent demographic decline in metropolitan Athens (Greece) as a response to economic stagnation after a long-lasting expansion. The empirical results of our study delineate metropolitan shrinkage in Southern Europe as a process associated with complex socioeconomic conditions leading to (possibly counterintuitive) demographic outcomes as far as migration trends are concerned. Recession has determined unsustainable economic conditions especially for non-native population segments, promoting both class and ethnic segregation. The negative migration balance in the 2010s led to an intense population decline hitting settlements made already demographically fragile because of low fertility and aging. Athens became a sort of ‘migrant trap’, being progressively unattractive for incoming migration flows—both internal and international—and losing an increasingly high number of non-native residents settling in the area, especially during the ‘gold’ decade of the 2004 Olympics. A sudden reduction in immigration rates reflected both economic (recession) and non-economic (population aging, fertility reduction, and childbearing postponement) factors, causing an incipient shrinkage after secular urban growth. The empirical results of our study add to the traditional literature on ‘industrial cities shrinkage’ in Europe and contribute to (re)formulate short- and medium-term development scenarios in large agglomerations, shedding further light on the role of migration in crisis-driven processes of urban decline in Mediterranean Europe.

Keywords: economic downturns; migration; population shrinkage; social inequalities; Europe

1. Introduction

Being reflective of a latent (demographic) decline in central cities (Turok and Mykhnenko 2007; Oueslati et al. 2015; Robinson 2017), recent population dynamics have demonstrated that they exert basic implications for policy strategies that address urban sustainability and metropolitan resilience to economic shocks (Seto et al. 2010; Arribas-Bel et al. 2011; Alves et al. 2016). Traditional research has defined and characterized urban cycles, outlining the importance of a comprehensive investigation of metropolitan regions’ socioeconomic dynamics (Boyle 2003; Angel et al. 2011; Aurambout et al. 2018). However, the empirical results of such studies demonstrate the urgent need of novel approaches going beyond

the traditional economic theories and the geographical interpretation of growth as a result of urban–rural polarizations (Buzar et al. 2005; Carbonaro et al. 2018; Salvati et al. 2018a). Research integrating multidisciplinary perspectives with a quantitative analysis of (spatially varying) socioeconomic contexts are, therefore, particularly welcome in both urban studies and regional science (Haase et al. 2010; Kroll and Kabisch 2012; Gil-Alonso et al. 2016).

In this perspective, understanding how demographic processes, economic downturns, and metropolitan cycles interact, contributes to a better definition of mechanisms at the base of regional and local development paths (Reques Velasco and Rodriguez Rodriguez 2000; Rontos 2007; Kelly et al. 2015; Sabater and Graham 2019). It was demonstrated widely how economic downturns led to heterogeneous demographic processes over metropolitan spaces (e.g., García 2010; Pérez 2010; De Rosa and Salvati 2016). More specifically, with economic stagnation stimulating population aging and consolidating a polarized distribution of activities across regions, changes in local job markets and spatially varying conditions for growth were demonstrated to be intrinsically associated with demographic expansion and decline in metropolitan regions (Casado-Díaz et al. 2004; Bontje 2005; Buzar et al. 2007; Camarda et al. 2015; Barbieri et al. 2019).

By experiencing a significant population loss in a given time interval, shrinking cities were popularized in reference to specific socioeconomic contexts (Bayona-Carrasco and Gil-Alonso 2012; Bayona-i-Carrasco and Gil-Alonso 2013; Bocquier and Costa 2015; Batunova and Gunko 2018). In the United States, for instance, some large cities have displayed de-industrialization, human migration, and economic stagnation in recent times (Sevilla-Buitrago 2013; Benassi and Naccarato 2017; Wolff and Wiechmann 2018; Wang et al. 2020a). In Europe, a renewed example of shrinking cities came from Eastern countries at the end of the socialist regime phase, when old industrial regions came under Western privatization and capitalism since the early 1990s (Kabisch and Haase 2011; Chelleri et al. 2015; Krueger et al. 2018). A refined investigation of the negative impact of recession on local communities and regional socioeconomic structures may shed further light on present and future population dynamics in other European regions (Rontos et al. 2016; Salvati and Serra 2016; Stockdale 2016).

Mixing peculiar sociodemographic conditions, processes of shrinkage in the Northern Mediterranean basin were poorly documented with respect to other regions in Europe (e.g., Arbaci 2007, 2008; Martori and Apparicio 2011; Arbaci and Tapada-Berteli 2012). In Southern Europe, a progressive mismatch between population growth, demographic dynamics, household structure, and settlement preferences makes understanding of the mechanisms governing metropolitan development and determining urban decline a particularly hard task (Arapoglou and Sayas 2009; Gavalas et al. 2014; Giner-Monfort et al. 2016). For more than one century, high fertility, young population structures, rising life expectancy, and immigration, together with a slowdown of emigration flows, prevented extensive processes of urban decline (Dura-Guimera 2003; Fol 2012; Carlucci et al. 2018).

Assuming short-term urban expansion as a result of regional demographic processes, population dynamics—especially the migratory component of population balances—were mainly dependent on economic attractiveness, social cohesion, and local development of contemporary metropolitan regions (e.g., Michielin 2004; Liu 2005; Longhi and Musolesi 2007; Mallach et al. 2017). Based on these premises, our study is aimed at defining more precisely the demographic mechanisms at the base of a recent process of metropolitan shrinkage observed in some cities of Southern Europe—a region experiencing the most negative impact of the 2007 recession (Kaika 2012)—and the latent relationship with changes over time in migration flows. Assuming population shrinkage in Mediterranean cities as being intrinsically associated with multidimensional socioeconomic phenomena that affect immigration and emigration rates (Ogden and Hall 2000; Nijkamp and Kourtit 2013; Zambon et al. 2017), the extensive use of multisource indicators from official statistics allows a dynamic representation of metropolitan decline (Morelli et al. 2014; Nelle et al. 2017; Liu et al. 2020). These phenomena were investigated considering together the interplay of long-term demographic factors (e.g., population aging, low fertility) and concomitant short-term

disturbances including crisis-driven emigration and counter urbanization (Repetti et al. 2008; Remoundou et al. 2016; Rees et al. 2017).

A slowdown of international migrations, together with the progressive gentrification of inner cities, formation of new family structures, and the recovery of internal (urban-to-rural) mobility (Schwarz et al. 2010; Serra et al. 2014; Stergiou et al. 2017), have been important forces rebalancing the spatial distribution of population, economic activities, and social functions in metropolitan regions (e.g., Scott and Storper 2015; Lerch 2016; Robinson 2017). Contributing to formulate reliable short- and medium-term development scenarios in large metropolitan regions (Alexandri 2015; Kandylis 2015; Vinci et al. 2022), the empirical results of our analysis are intended to shed further light on crisis-driven metropolitan shrinkage, keeping in mind the dominant migration patterns and processes as the main factor of urban change under crises (Carlucci et al. 2017; Gounaridis et al. 2018; Maloutas and Spyrellis 2019). Short-haul residential mobility, internal movements (e.g., rural-to-urban), and foreigners' immigration to Greece have been taken as representative of more general population trends in Southern Europe, possibly as a consequence of economic stagnation (Dalakoglou 2013; Souliotis 2013; Morelli et al. 2014). Having experienced the greatest impact of the 2007 recession in Europe, Greece—a traditional emigration country up to the 1970s—was an important hotspot for international migration in the 1990s and the 2000s (Maloutas 2007; Martinez-Fernandez et al. 2012; Gavalas et al. 2014; Bagavos et al. 2018).

Based on these premises, our study investigates crisis-driven urban shrinkage considering changes over time in selected demographic indicators, with a specific focus on migration (Strozza et al. 2016; Tragaki and Bagavos 2019; Wang et al. 2020b). Assuming recession as a cause of unsustainable economic conditions, especially for non-native population segments—promoting both class and ethnic segregation—public data and sociodemographic indicators now available for a sufficiently long time interval before, during, and after the great crisis, allow a coherent and broadly documented investigation of metropolitan shrinkage in Mediterranean cities with uninterrupted population growth in the last century (Hondroyiannis and Papapetrou 2002; Kasimis 2008; Zambon et al. 2018). More specifically, using official statistics and a literature review, the present study documents the inherent demographic decline in metropolitan Athens (Greece) as a response to economic stagnation after a long-lasting expansion (Haase et al. 2014, 2017; Gkartzios and Scott 2015; Kashnitsky et al. 2017). The empirical results of our study delineate metropolitan shrinkage in Southern Europe as a process associated with complex socioeconomic conditions leading to (possibly counterintuitive) demographic outcomes as far as migration trends are concerned (Lauf et al. 2012; Gkartzios 2013; Lerch 2014, 2016).

Following the intrinsic complexity of the sociodemographic issues at stake, this paper is organized as follows. A literature review deals with demographic dynamics, economic downturns, and urban decline, providing a broad, international perspective on metropolitan shrinkage, and a specific focus on Mediterranean cities. The subsequent chapter provides a detailed description of the study area and the background context. Methodological details appropriate to reproduce and generalize the statistical analysis in other socioeconomic contexts were also presented and briefly discussed. The following chapter illustrates the empirical findings of this study. The importance of quantitative approaches based on the analysis of multisource sociodemographic indicators is outlined in Section 4. Finally, the conclusion in Section 5 proposes an original interpretation of metropolitan decline in the Northern Mediterranean region, considering international migration as the basic engine of urban growth.

Literature Review

“Shrinkage has increasingly become a ‘standard pathway’ of urban and regional development in many European cities and regions” (Camarda et al. 2015). Based on a seminal work by Fol (2012), urban shrinkage was intended as “a multidimensional process that combines multiple factors and has various interrelated manifestations”. Alves et al. (2016) qualified shrinkage as “a natural process in the life cycle of a city, alternating with periods of growth”

or as “an extreme event that places cities into a continuous decline process with no return to population growth”. Shrinking cities were popularized in reference to specific socioeconomic contexts (Ciommi et al. 2018), e.g., when old industrial regions came under extensive privatization or when some large cities started displaying de-industrialization, increased emigration rates, and demographic stagnation (Sevilla-Buitrago 2013; Wolff and Wiechmann 2018; Wang et al. 2020b). Liu et al. (2020) built up “a multi-dimensional conceptual model involving demographic, economic, and social aspects to explore the varied urban development processes in China, and then conducted empirical studies in 269 prefecture-level cities from 2000 to 2010. (. . .) Although an approximate 12% of the cities in the sample experienced urban shrinkage along multiple dimensions, about 20% of the cities experienced population decline combined with economic growth and positive social development. The diverse urban development processes are closely related to the interplay of the central government’s macro-regional development policies and the different local contexts”.

According to Schwarz et al. (2010), urban shrinkage is intimately associated with de-industrialization, massive population loss, and aging, causing “unforeseen (or unexpected) commercial and housing vacancies in cities”. Wang et al. (2020a) indicate “continuous population loss, massive housing vacancy, and under-use of urban infrastructure” as characteristic elements of shrinking cities. Camarda et al. (2015) argued that “shrinking is generally seen in the literature as a negative phenomenon”. In this perspective, Fol (2012) documented the fall in investment “contributing to a decrease in the number of jobs and a rise in unemployment”, as a consequence of urban decline, coming with “a selective migration process, with the most qualified and the youngest leaving first. As a result, the most vulnerable populations (the poorest, the oldest and those with little education and qualification, and the non-native segment) are most affected by the social effects of unemployment and deterioration in their living standard of living, and are left in a situation of ‘captivity’. Within shrinking cities, low-income neighbourhoods are the first to be hit by decline while, on the urban region scale, socio-spatial inequalities tend to increase”.

Urban decline is “typically related to specific national contexts, installed in distinct explanatory frameworks, based around diverging normative accounts, ultimately leading to very different policy implications” (Haase et al. 2014). According to Döringer et al. (2020), “research on urban shrinkage has focused strongly on case studies, which is why we can benefit from a diverse and empirically rich knowledge base on the phenomenon and its regional manifestations”. Socioeconomic forces of shrinkage can be (more or less) easily derived from this kind of investigation (Liu 2005; Lesthaeghe and Lopez-Gay 2013; Li and Mykhnenko 2018). In Portugal, Alves et al. (2016) identified five types of shrinking cities: “Persistent Early Shrinkage” due to exodus from the rural periphery, “Metropolitan Shrinkage” due to the challenges of urban sprawl, “Recent Shrinkage” in de-industrialization hotspots, “Cyclic Shrinkage” occurring in political transformation cores, and “Mild Shrinkage” due to lifestyle disamenities.

Deng et al. (2019) demonstrated that “in recent years, with the extensive expansion of the Chinese High-Speed Railway network, the reduction in travel time has greatly increased the mobility of people across cities, thus affecting the spatial redistribution of the urban population in China”. This article delineated a new form of shrinkage indirectly driven by infrastructural development in other locations (Döringer et al. 2020). At the same time, Wang et al. (2020b) hypothesized how land finance contraction has accelerated metropolitan decline in China. Du et al. (2020) evidenced how export-oriented economy and ‘exo-urbanization’ induced by the financial crisis of 2008 determined urban decline in Pearl River Delta (China), reflecting how “new spatial symptoms related to urban shrinkage, such as factory collapses, job losses, and vacant dwellings, were observed in this area”.

Despite a mass of studies going in other directions, industrial decline remains a relevant motivation behind metropolitan decline (Martinez-Fernandez et al. 2012; Morelli et al. 2014; Elzerman and Bontje 2015; Nelle et al. 2017). For instance, since the collapse of state socialism, “shrinkage has been evident in many Russian cities, especially in small and medium-sized ones” (Batunova and Gunko 2018), delineating the importance of the structural decline

in traditional industries as the main factor at the base of metropolitan shrinkage (Dijkstra et al. 2015; Duvernoy et al. 2018; Du et al. 2020). Wang et al. (2020a, 2020b) also suggested how “industrial diversity is essential in further exploring the reasons for city shrinkage” since “some single-industry cities have experienced a sharp conversion from booms to busts while multi-industry cities are more likely to sustain their prosperity”. Recent studies have increasingly focused on the contribution of population aging, sociodemographic change, migration patterns, and intentional shrinkage to the quality of life in central cities (e.g., Cuadrado-Ciuraneta et al. 2017; Di Felicianantonio et al. 2018; Panori et al. 2019), possibly delineating alternative—less studied—pathways to metropolitan decline (Arbaci 2007; Di Felicianantonio and Salvati 2015; De Rosa and Salvati 2016; Ciommi et al. 2019).

Based on this review, it is clear how no single model fulfills all of the criteria required to interpret urban shrinkage in a spatially explicit way because of the intrinsic multiplicity of development paths in contemporary cities (e.g., Couch et al. 2007; Del Bono et al. 2015; Carlucci et al. 2017). In these regards, the great recession has hypothesized to be a powerful factor of urban shrinkage (Kabisch and Haase 2011; Cecchini et al. 2019; Deng et al. 2019), despite few studies being devoted to describing the prolonged effect of a global economic crisis at the metropolitan level in Europe (Mallach et al. 2017; Krueger et al. 2018; Li and Mykhnenko 2018). Likely for the first time in the literature, Du et al. (2020) specifically delineated the role of sudden (globalization-driven) economic shocks in metropolitan decline, confirming empirically “the complexity and multiplicity of urban shrinkage that emerged in the rapidly urbanizing area of the Global South”. With this perspective in mind, our study investigates the relationship between short-term urban dynamics, immigration, and sociodemographic inequalities in Athens (Arapoglou and Sayas 2009; Carlucci et al. 2017; Perrin et al. 2018). Despite the limited generalization to broader contexts (e.g., Lamonica et al. 2020), analysis of case studies may contribute to conceptualize shrinkage processes into a wider theoretical debate in urban studies, delineating metropolitan decline as an individual (city-based) phenomenon that requires a broad integration of theoretical explanations with apparent trajectories of growth (Arbaci 2008; Pili et al. 2017; Rauhut 2017). Combining these approaches will contribute to portraying a ‘pluralist world of shrinkages’ instead of invariant processes of metropolitan decline (Sevilla-Buitrago 2013; Haase et al. 2014; Salvati et al. 2016).

2. Methodology

2.1. Study Area

We investigated population dynamics in an area coinciding with the geographical region of Attica, Central Greece, covering nearly 3800 km² and corresponding with the NUTS-2 level of the European Nomenclature of Territorial Statistical Units (NUTS). Occupying a strategic position in the middle of the Aegean Sea (Pili et al. 2017), the area extends undulated terrains that alternate coastal and inland plains (the largest is the ‘Lekanopedio Attikis’ hosting Athens, the capital city of Greece) and mountain ranges at 1000 m of elevation (Rontos et al. 2016). Attica is administered by regional units (‘Periferiaki Enotites’) defined with the ‘Kallikratis’ reform of local authorities. Most of the area is gravitated in the regional unit of Central Athens—the economic core of Greater Athens including 9 municipalities, one of which is downtown Athens (Rontos 2007).

Attica concentrates on traditional and advanced services with public administration, although manufacturing, tourism, and construction industries were (and still are) important sectors in the economic base of the region (Di Felicianantonio et al. 2018). Athens’ expansion was basically radio-centric, shifting to moderate settlement dispersion in recent decades (Di Felicianantonio and Salvati 2015). In the 1950s and the 1960s, metropolitan regions in Greece—and mostly Athens—attracted intense immigration flows from rural districts (Maloutas 2007). Spatial divides were particularly evident at that time (Salvati 2016) since the metropolitan regions of Athens and Thessaloniki concentrated together nearly half of the Greek population (Gavalas et al. 2014). While internal migration fueled urban expansion in the 1970s (Gkartzios 2013), migration flows in the 1980s were directed mostly

to peri-urban areas (Arapoglou and Sayas 2009), leading to stagnant population growth in core cities (Gkartzios 2013).

Following a relatively short wave of economic expansion encompassing the late 1990s and the early 2000s (Morelli et al. 2014), Greece underwent a political, economic, and social crisis beginning in 2007 (Remoundou et al. 2016), with rising unemployment and urban poverty, austerity urbanism, reduced public spending, and cuts in primary services (Salvati 2016). As a direct consequence of the recession (Kaika 2012; Dalakoglou 2013; Souliotis 2013), the time interval between 2011 and 2016 corresponded with the first period in the post-war history of Greece showing a negative migration balance at the national scale (emigration flows higher than immigration flows). A slightly positive migration balance was again observed beginning in 2017 (Figure 1).

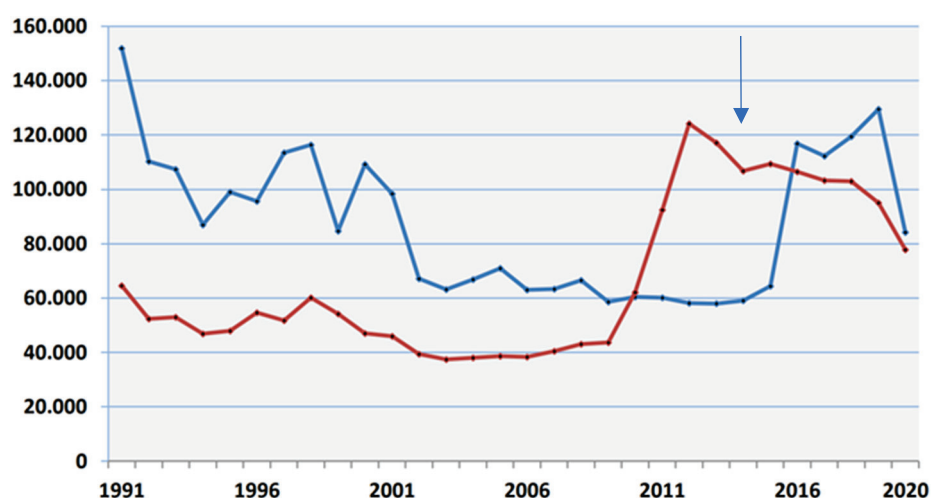


Figure 1. Components of migration balance in Greece, 1991–2020 (number of registered newcomers: blue; people expatriated and cancelled from population register: red); the arrow indicates the time period with a negative migration balance (source: ELSTAT demographic register).

2.2. Statistical Data

We elaborated official statistics from multiple data sources with the aim of providing a refined analysis of demographic trends in the study area (Table 1). While bringing some limitations and difficulties of standardization because of heterogeneous time series and divergent spatial definitions (Di Felicianantonio and Salvati 2015; Di Felicianantonio et al. 2018; Cuadrado-Ciuraneta et al. 2017), use of official statistics from multiple sources is considered an appropriate strategy approaching the intrinsic complexity of metropolitan dynamics in Southern Europe (Serra et al. 2014; Rontos et al. 2016; Salvati and Serra 2016). Indicators derived from official statistics allow a diachronic investigation of demographic patterns and economic processes in highly diversified social contexts (Carlucci et al. 2017; Pili et al. 2017; Zambon et al. 2017). The empirical results of our analysis focused on short-term population trends in the area, considering both structure and dynamics of native and migrant components (Gavalas et al. 2014). A specific investigation of the contribution of natural and migration balances in metropolitan growth and decline (*sensu* Gkartzios 2013) and a refined analysis of selected characteristics of non-native population in the region (*sensu* Panori et al. 2019) completed the study.

Table 1. A summary of official statistics considered in this paper.

Issue	Survey	Spatial Domain	Timetable
Population balance	Eurostat demo. statistics	Regional units (NUTS-3)	1991–2020
Demographic indicators	Eurostat demo. statistics	Regional units (NUTS-3)	2014–2021
Natural pop. growth	Hellenic Ministry of Interior	Regional units (NUTS-3)	2013–2022
Population by citizenship	ELSTAT Labour Survey	Regions (NUTS-2)	1988–2020
Estimation foreign popul.	ELSTAT demo. register	Country	2008–2020
Citizenship requests	Hellenic Ministry of Interior	Regions (NUTS-3)	2011–2021
Immigration flows	Hellenic Ministry of Interior	Regional units (NUTS-3)	2016, 2019
Births from immigrants	ELSTAT demo. register	Regions (NUTS-2)	2004–2020
Unemployment rate	OECD regional statistics	Macro-regions (NUTS-1)	2000–2020
Poverty indicators	Eurostat, EU-SYLK	Regions (NUTS-2)	2003–2020
Price residen. apartments	Bank of Greece	Macro-regions (NUTS-1)	2006–2022

Short-term population data were derived from demographic registers by a regional unit (NUTS-3 level) collected annually by the Greek Statistical Authority (ELSTAT) and released by the European Statistical Office (Eurostat). Selected indicators of age structure for 2014 and 2020 (the maximum length of the available time series on homogeneous spatial aggregates) were derived from the annual estimation of the resident population produced by Eurostat and based on the aggregate information collected in the national register (ELSTAT) at the same spatial scale (Salvati et al. 2018a). The exercise was refined with a descriptive analysis of natural and migration balance disseminated annually by Eurostat for each regional unit and covering a time interval between 2000 and 2019 (<https://ec.europa.eu/eurostat/data/database>, accessed on 9 November 2022). This analysis was aimed at delineating the specific contribution of migration balance to population growth (Salvati et al. 2019).

Additional migration statistics were derived from Eurostat and ELSTAT and elaborated at the highest available spatial scale (Rontos 2007). These data encompass Attica regional units and cover a time period between 2000 and 2020 (Panori et al. 2019). Total population stock by aggregated groups of citizenship (Greek, European non-Greek, and non-European) was estimated using data from the annual Labour Force Survey carried out in Greece by ELSTAT (Gavalas et al. 2014). An annual estimation of the resident population by broad groups of citizenship (Greek, other European countries, and non-European countries) disaggregated at the regional scale (NUTS-2 level) was provided for a relatively long time series (between 1988 and 2020). The number of incoming residents with non-Greek citizenship (European and non-European countries) registered in Greece between 2000 and 2020 was estimated from disaggregated data derived from the national population register (ELSTAT). The total number of births by mother's citizenship (Greek, European non-Greek, and non-European) in Attica was finally quantified between 2004 and 2020 from vital statistics (ELSTAT).

Descriptive statistics of residency permits, released in Athens over the years 2016 and 2019, were calculated on the basis of aggregated official data released by the Hellenic Ministry of Migration Affairs. The inherent diversification of immigrants obtaining a residency permit was derived considering their citizenship. Shannon diversity (H') and Pielou evenness (J) indexes were calculated on these data to delineate ethnic diversification over both time (2016 vs. 2019) and space (Attica prefectures vs. the rest of Greece). The year 2016 reflected economic conditions at the end of the Great Recession in Greece, with emigration rates significantly overpassing immigration rates (see Figure 1). The year 2019 reflected a moderate economic recovery, with immigration rates slightly overpassing emigration rates in Greece (Panori et al. 2019). Athens was representative of a relatively large territory including compact and dense settlements with a service-oriented economic base gravitating on the capital city municipality (Chorianopoulos et al. 2014) where the upper administrative and socioeconomic functions of Greece are concentrated (Kandylis et al. 2012). Piraeus was instead representative of dense and semi-dense settlements with a

predominant industrial base gravitating on the main Greek harbor (Kandylis 2015). Pallini was finally representative of peri-urban contexts in both Western and Eastern Attica (Salvati and Serra 2016).

The time series of an official index of residential dwelling prices released quarterly by the National Bank of Greece since 2006 and distinguishing metropolitan Athens from the rest of the country was also considered in this study with the aim of delineating specific economic dynamics with a supposed impact on urban shrinkage (Carlucci et al. 2018). This standardized index estimated an average house price by surface (m²) considering new dwellings with comparable characteristics only, in order to delineate variability in the house price structure over time and space in a fully comparable way (e.g., Salvati et al. 2019). An index of severe material deprivation (measured as a per cent share of people living in such conditions in the total population) released by Eurostat exploiting the national EU-SILC sampling survey, carried out annually by ELSTAT, was also tabulated distinguishing metropolitan Athens from the whole of Greece (Rontos et al. 2016). Changes over time in unemployment rates (%) separately for Attica and Greece between 2006 and 2019 were calculated for three population segments (native Greek, European non-Greek, and citizens outside Europe) from aggregated data collected from ELSTAT (Labour Force Survey) and released by OECD regional statistics (e.g., Strozza et al. 2016). Taken together, these analysis dimensions are intended to provide a comprehensive overview of medium- and short-term metropolitan dynamics in the study area (Gavalas et al. 2014), resembling similarities and differences with other case histories in Europe (Arbaci 2008), and thus clarifying the net impact of economic crisis in urban decline processes (Martori and Apparicio 2011).

3. Results

After continuous growth lasting for more than one century, the results of a preliminary analysis of the most updated statistical data demonstrated how the total population in metropolitan Athens grew from 1991–2001 (from 3,562,233 to 3,858,454 inhabitants). Population growth turned to slightly negative rates between 2001 and 2011 (from 3,858,454 to 3,793,066 inhabitants), shifting toward a more evident decline between 2011 and 2021 (from 3,793,066 to 3,759,669 inhabitants). In both decades, and especially in the last one, population growth rates assumed negative values at all the geographical partitions for the first time in the history of contemporary Athens, as the population censuses since 1821 clearly demonstrate. Such dynamics may delineate an incipient urban shrinkage. Comparing a slightly wider administrative region (Attica) than metropolitan Athens with the whole of Greece, and focusing on the last phases of economic expansion and recession, the total population in Attica increased during economic expansion, reaching a peak of nearly 4 million inhabitants in 2010, and declining slowly to 3.7 million inhabitants in the following decade (Figure 2).

The per cent share of (non-native) population with non-Greek citizenship in the total population increased from 2% in 1988 to 11% in 2009, decreasing to 7% in 2019. Inhabitants with non-European citizenship were predominant especially during the 2000s, reaching the highest peak in 2008. The subsequent decline in this population segment was quite rapid. A slight recovery has been observed since 2017. Inhabitants with European (non-Greek) citizenship increased substantially in the 2000s, reaching a peak in 2008—almost unaltered up to 2012—and declining more evidently afterward. Post-crisis dynamics (2016–2019) were positioned in between an early immigration wave typical of the 1990s (and characterized by the rapid increase in migrants from Balkan countries or the Middle East) and a late, pre-crisis wave characterized by huge migrant in-flows from sub-Saharan, and Asian and Latin America countries. Based on the data presented above, ethnic diversification in Attica increased between 1988 and 2010 (Pielou's evenness index), decreasing rapidly in the next decade and stabilizing since 2017, while anticipating a similar trend for the rest of Greece.

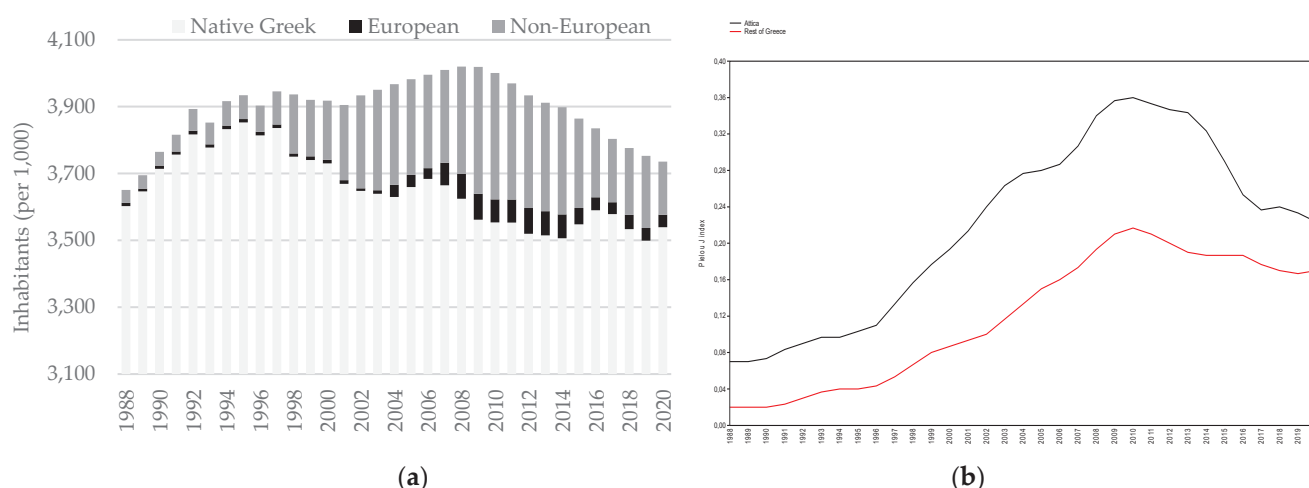


Figure 2. (a) The evolution of total population by citizenship over time in Attica, 1988–2020 (the ‘European’ class excludes all native ‘Greek’ citizens); Labour Force Survey estimation, ELSTAT; and (b) Pielou J evenness index of diversification in population composition by place of birth comparing Attica and the whole of Greece over time (source: ELSTAT Labour Force Survey).

3.1. The Evolution of Population Balance in Athens

Figure 3 compares natural and migratory balance (expressed as annual rates of population growth) in Attica and Greece as a whole, over both the 2000s and the 2010s. Although with different intensities, crude rates of net migration and natural population change showed similar dynamics over time, with a spatial polarization in demographically dynamic and shrinking districts. In general, crude rates of natural change in population were honest indicators of short-term trends in urban expansion. In a ‘close system’ (i.e., assuming a ‘neutral impact’ of migration flows), they contribute directly to delineating future scenarios of urbanization patterns and processes. Positive and negative values of natural population balance were observed in Attica, respectively, for the 2000s and 2010s. Following the intrinsic dynamics of natural balance, migration rates were positive in the 2000s turning to negative values in the 2010s (Figure 4).

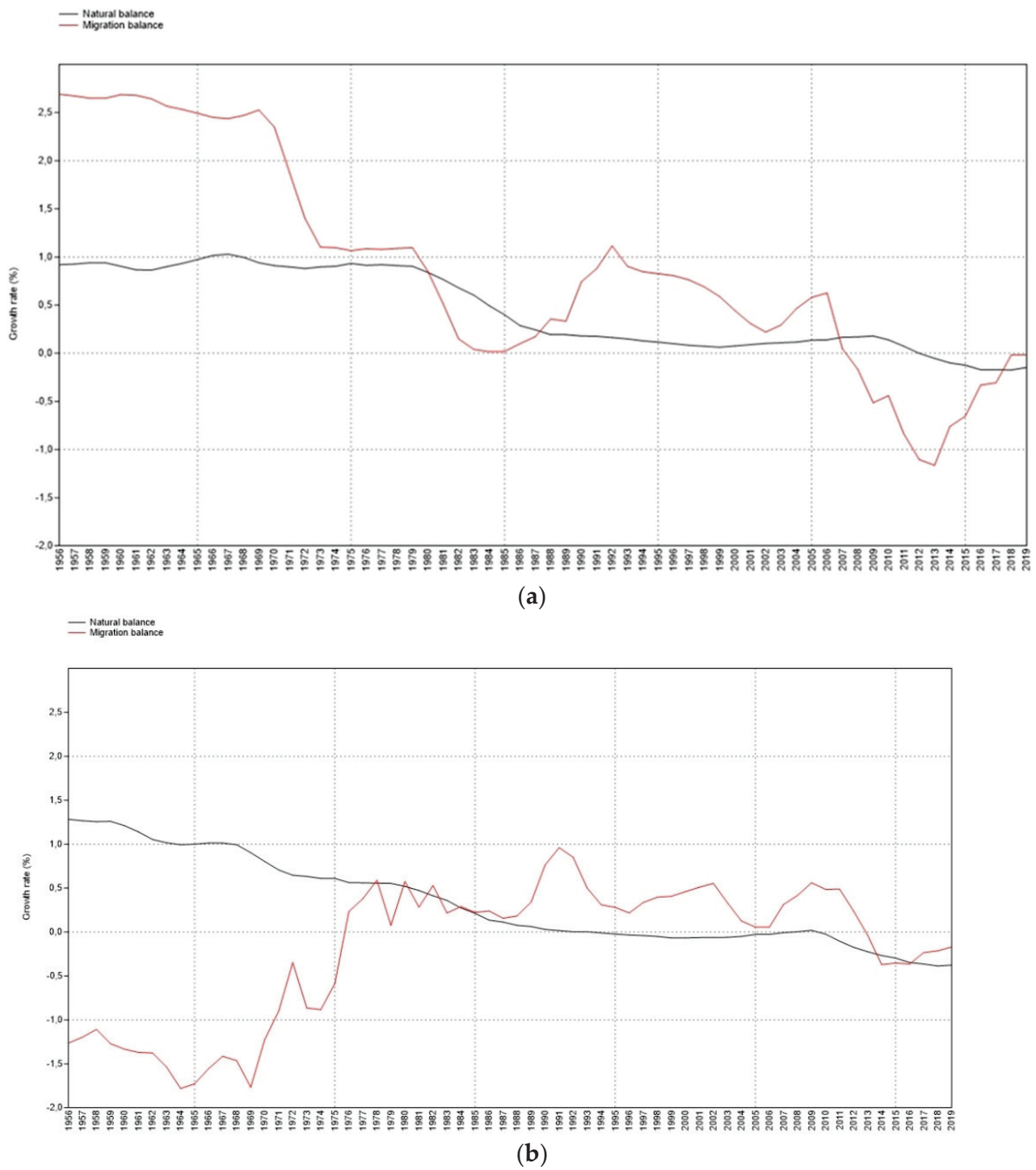
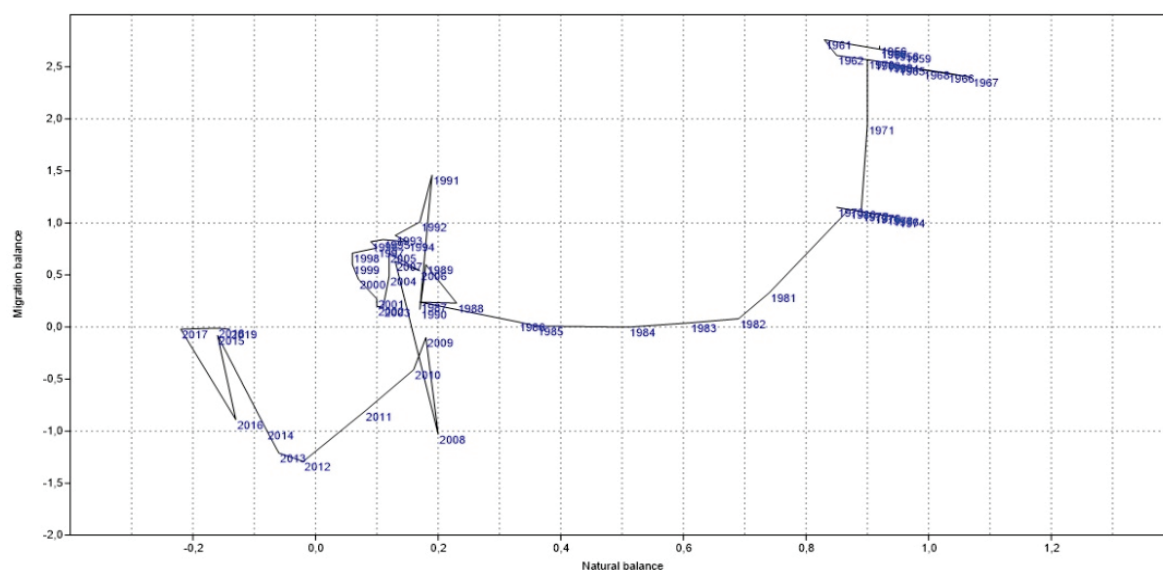
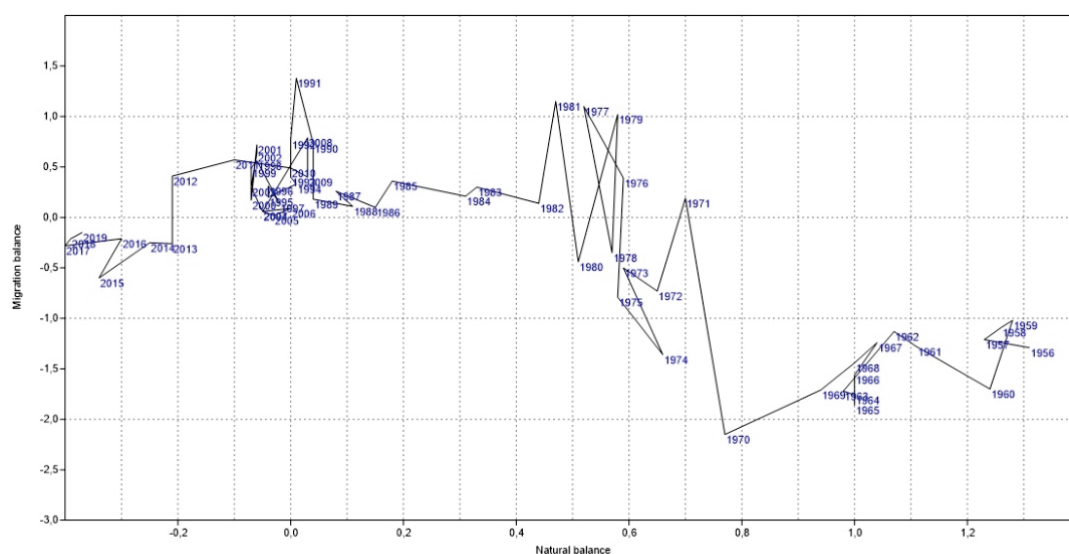


Figure 3. Trends over time in natural population balance and migration balance (a) in Attica and (b) in the rest of Greece (source: our elaboration on Eurostat regional statistics).



(a)



(b)

Figure 4. Scatterplots correlating natural and migration balances in Attica (a) and in the rest of Greece (b) over time (source: our elaboration on Eurostat regional statistics).

In Central Athens and Piraeus, the natural balance of population was negative in the two decades, outlining the shrinkage of inner cities. Western and Southern Athens revealed similar trends, although with a less intense demographic decline during the recession. A residual growth was observed in peripheral areas: natural balance was positive in the Northern Athens district as well as in Western and Eastern Attica (Figure 5). A negative migration balance was observed in both decades in Central Athens only. In the 2000s, positive rates were observed in all the remaining urban and non-urban districts, and reflect a residual growth of the metropolitan region at large. In the 2010s, migration balance was negative at all urban districts, being positive only in Western and Eastern Attica. As a consequence, total population growth was the highest in Eastern Attica and, subsequently, in Western Attica, owing to the contribution of immigration and fertility, respectively, in the former and latter cases.



Figure 5. The relationship between natural balance (x-axis) and migration balance (y-axis) by year and regional unit in the study area (2000–2020) taken as a proxy of urban growth or decline (source: our elaboration on ELSTAT demographic register).

3.2. A Summary Profile of Foreign Citizens in Athens

Individual records of residence permits released to non-EU foreigners in Greece, dated, respectively, 2016 and 2019, document (i) a slight increase in the number of applications accepted and (ii) heterogeneous socioeconomic profiles of applicants. These results are in line with the aggregate statistics presented in Figure 1, which document a moderate recovery of migration flows in the last observation years. Residence permits for working increased substantially, and reflect modest improvements in social conditions (and a slight recovery in the economic attractiveness of Athens) between 2016 and 2019. Albanian was the dominant citizenship of origin, albeit declining over time.

Other nationalities widely represented in residence permits were Ukraine, Pakistan, and Georgia. The per cent share of immigrants in Athens, Piraeus, and Pallini in the total stock of immigrants (40%) was a bit higher than the per cent share of metropolitan Athens' population (native Greek and non-native) in the Greek population, suggesting that the capital city attracted, on average, more immigrants than the rest of the country (Table 2).

Ukraine and Pakistan immigrants settled more frequently in metropolitan Athens than elsewhere in the country. Conversely, Albanian immigrants settled preferentially outside metropolitan Athens, in both urban and rural prefectures of the remaining part of Greece. For both observation years, the inherent diversification of foreign population requesting a residence permit by citizenship was particularly evident moving from the rest of Greece to downtown Athens. Both absolute (Shannon) and relative (Pielou) diversification were observed in Athens, reflecting the metropolitan gradient since both indexes decreased linearly moving to Piraeus and the suburbs (Pallini).

Figure 6 illustrates changes over time in unemployment rate (%) comparing Attica with the whole of Greece and distinguishing native Greeks from the European (non-Greek) population and the foreign (outside Europe) population. Following moderate rates of unemployment measured at the end of economic expansion (approximately up to 2008) for all population segments in both Attica and Greece, unemployment increased suddenly within the population contingent of people with non-European citizenship, reaching 35% in 2013 in both geographical partitions compared with 24% of native Greeks. Europeans

(non-Greek) experienced an intermediate unemployment rate in both partitions, being slightly higher than the rate of non-European foreign population only in Attica in the last two–three years. Interestingly, unemployment rates of native Greeks declined substantially with economic recovery since 2015. On the contrary, the unemployment rate of foreign population segments declined slightly and less rapidly over time.

Table 2. Statistics of the requests of residence permits by year, citizenship, and district in Greece.

Citizenship	2016				2019			
	Athens	Piraeus	Suburbs	Rest of Greece	Athens	Piraeus	Suburbs	Rest of Greece
<i>The most frequent nationality</i>								
Albania	55.4	62.1	63.8	77.8	48.9	53.2	57.2	74.0
Ukraine	9.0	7.3	5.4	3.3	4.5	4.6	3.7	2.5
Pakistan	5.5	5.7	5.9	0.9	6.0	5.2	6.4	1.7
Georgia	3.4	2.3	2.2	3.6	4.9	3.7	2.1	4.2
<i>General data</i>								
Share (%) in total immigrants	26.3	8.6	8.2	56.9	28.1	8.3	5.7	57.9
Shannon H diversity index	2.04	1.79	1.67	1.20	2.22	2.10	1.93	1.37
Pielou J evenness index	0.42	0.38	0.36	0.24	0.45	0.44	0.41	0.28

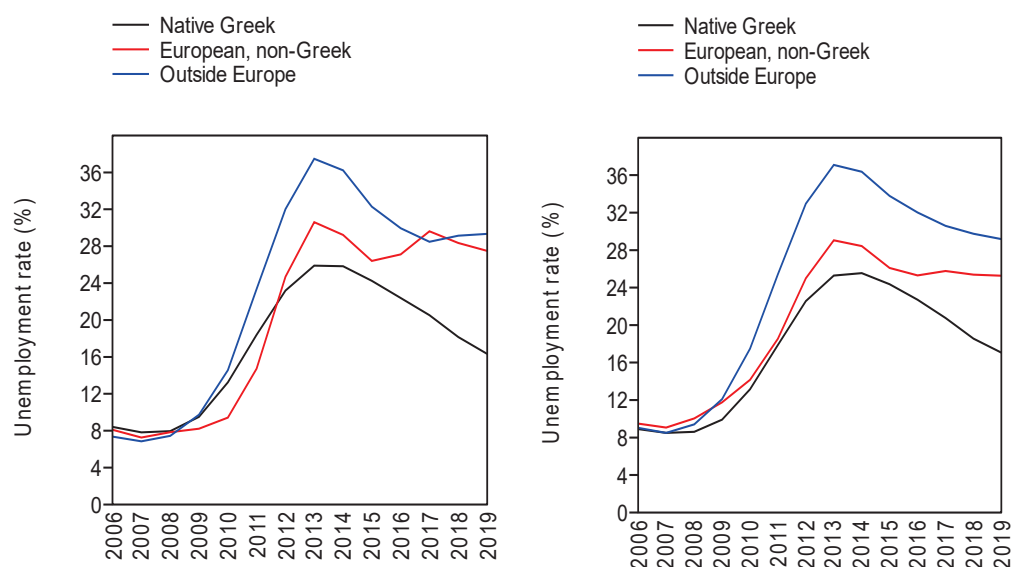


Figure 6. Unemployment rate (%) over time (2006–2019) in Attica (**left**) and Greece (**right**) as a whole by citizenship (source: our elaboration on OECD regional statistics).

3.3. Fertility, Population Aging, and Material Deprivation in Athens

As an early signal of demographic decline, the number of births in Attica decreased substantially between 2004 and 2020. The contribution of immigrants' fertility was relatively high at the beginning of the study period (18% of births from mothers with non-European citizenship in 2004, increasing to 20% in 2007). On average, this percentage dropped down to 13% in 2020 with 10,000 births less than in 2004 (Table 3).

These findings corroborate official statistics highlighting a general trend towards aging in the Greek population. The median population age increased systematically in Attica (2014–2020), in line with what has been observed for the rest of Greece (Table 4). A similar trend was observed for the old dependency ratio. The elder population concentrated in the Greater Athens area; Central Athens and Piraeus had slightly younger population structure, which was a counter-intuitive result if compared with the negative natural population balance observed in the same period. At the same time, significantly younger age structures have been observed in suburban districts.

Table 3. Live births in Attica by mother's citizenship, 2004–2020.

Year	Total Births	Mother's Citizenship			Per cent Share in Total Births		
		Native Greek	European Non-Greek	Outside Europe	Native Greek	European Non-Greek	Outside Europe
2004	38.901	31,392	543	6966	80.7	1.4	17.9
2008	42.899	33,965	610	8324	79.2	1.4	19.4
2012	37.266	30,856	1036	5373	82.8	2.8	14.4
2016	34.571	29,464	894	4205	85.2	2.6	12.2
2020	31.256	26,639	592	4025	85.2	1.9	12.9

Table 4. Demographic indicators in the study area by regional district and year.

Regional Unit	Median Population Age		Young Age Dependency Ratio		Old Dependency Ratio	
	2014	2020	2014	2020	2014	2020
Central Athens	43.4	45.0	18.0	21.2	30.5	34.8
Northern Athens	43.7	47.0	22.3	22.8	30.6	37.6
Western Athens	41.6	43.4	21.8	22.9	25.1	27.8
Southern Athens	43.6	46.2	20.8	21.8	29.5	35.0
Piraeus	42.9	45.6	20.7	21.7	29.4	33.6
Eastern Attica	40.2	42.5	24.7	22.7	24.4	28.2
Western Attica	36.6	38.1	26.0	24.8	20.2	21.6
Attica	42.4	44.6	21.2	22.2	28.2	32.4
Greece	42.9	45.2	22.6	22.4	31.6	35.1

In line with both unemployment statistics and demographic dynamics, the index of severe material deprivation indicates a complete shift from low deprivation to high deprivation rates moving from economic expansion (2000s) to recession (2010s). House prices followed the opposite pattern, with a moderate recovery at the end of the 2010s. Attica and the whole of Greece showed rather similar trends for both indicators, delineating a persistent condition of unemployment, poverty, and material deprivation at the base of the urban shrinkage observed in Athens in the 2010s (Figure 7). This was possibly aggravated by the long-term impacts of demographic dynamics, including total fertility decline and aging.

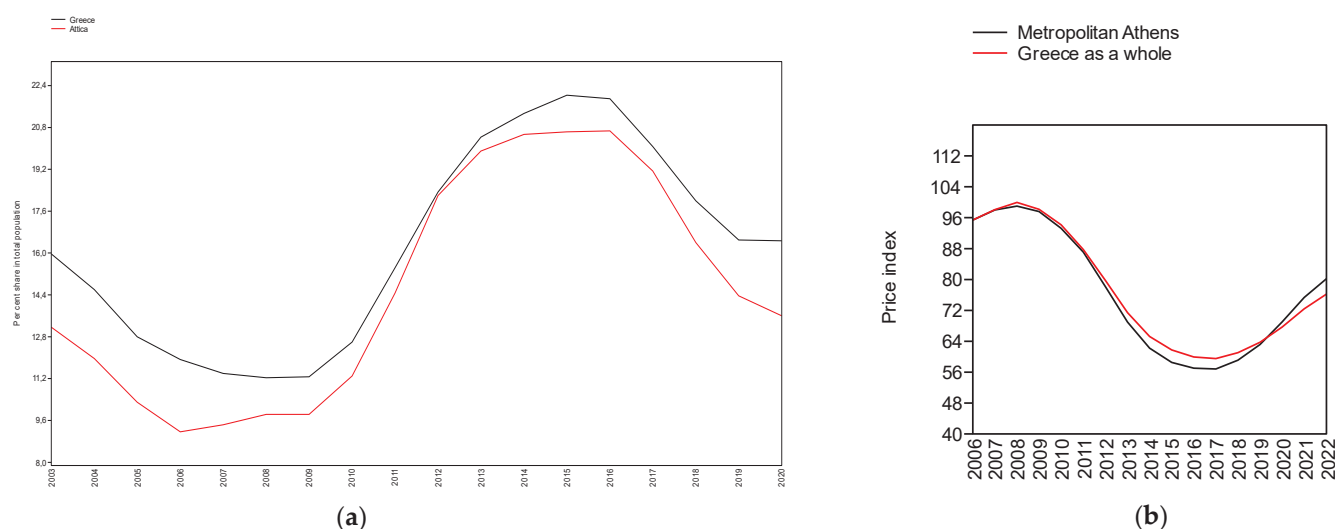


Figure 7. (a) Index of severe material deprivation (per cent share of people living in such conditions in total population) in metropolitan Athens and Greece as a whole (source: Eurostat regional statistics); (b) average price index (2008 = 100) of residential apartments over time (2006–2022) in the same spatial partitions (source: Bank of Greece).

4. Discussion

An integrated perspective on the context-specific dynamics of metropolitan decline was provided in the present study focusing on crisis-driven shrinkage and the relation with international migration (Haase et al. 2017). After uninterrupted demographic growth, the 2007 recession—for the first time in more than one century—led to metropolitan decline in Mediterranean Europe (Ciommi et al. 2018; Perrin et al. 2018; Salvati et al. 2019). Following one decade after the breakdown of the Great Crisis, its outcomes in terms of urban shrinkage can be adequately evaluated considering changes over time in sociodemographic indicators (Wang et al. 2020a, 2020b). Our study, based on a diachronic analysis of pertinent indicators derived from official statistics, aims at defining more precisely the (crisis-driven) sociodemographic mechanisms at the base of recent urban decline in Southern Europe (Zambon et al. 2018). The extensive use of multisource statistical indicators, supported by a systematic review of pertinent literature and an informed knowledge of relevant case studies, allows a dynamic representation of recent processes of metropolitan decline based on the interplay of long-term factors (e.g., population aging and low fertility) and short-term disturbances (e.g., counter-urbanization and crisis-driven emigration). In this perspective, the present study documents—likely for the first time in Mediterranean Europe—the demographic decline in a large metropolitan agglomeration in response to the 2007 recession, after a long-lasting population growth sustained by immigration flows—both internal and international (Kandylis 2015; Cecchini et al. 2019; Panori et al. 2019).

Managing increasingly complex metropolitan dynamics requires holistic governance of the intrinsic relationship between location factors, land-use, spatial planning, and sociodemographic trends (Seto et al. 2010; Bocquier and Costa 2015; Salvati et al. 2018b). Delineating opportunities for spatial planning opened up by new demographic scenarios is a key issue in urban science (Scott and Storper 2015). In line with the working assumption presented in the introductory chapter, our study links urban growth and the inherent changes in local demographic profile characteristics of metropolitan Greece with short-term economic dynamics from the end of the 1990s to nowadays (Carlucci et al. 2017). The empirical results of our analysis contribute to a broader interpretation of metropolitan decline in Mediterranean Europe as a result of migration patterns, distinctive population changes, and settlement preferences during economic expansions and recessions (Hondroyannis and Papapetrou 2002; Kasimis 2008; Kashnitsky et al. 2017; Ciommi et al. 2018).

Athens' development highlights how the concept of 'urban shrinkage' in contemporary societies was associated with multiple economic and non-economic transformations (Rontos 2007; Souliotis 2013; Kandylis 2015), being intimately recognized as a multidimensional phenomenon associated with migration patterns, social inequalities, and possibly, ethnic segregation (Buzar et al. 2007; Kandylis et al. 2012; Maloutas and Spyrellis 2019). The progressive abandonment of dense settlements has led to an incomplete gentrification of city cores, which has been offset by falling house prices only partially (Pili et al. 2017; Di Felicianantonio et al. 2018; Panori et al. 2019). A progressive economic marginalization in the European arena (Chorianopoulos et al. 2014), the persistent lack of mega-events after the 'gold' age of the 2004 Olympics (Chorianopoulos et al. 2010), and austerity urbanism (Kaika 2012), may justify the economic and demographic decline in a region well beyond the boundaries of Greater Athens (e.g., Bayona-i-Carrasco and Gil-Alonso 2013; Salvati et al. 2016; Benassi and Naccarato 2018).

The inherent complexity of local-scale demographic dynamics makes the analysis of the current demographic framework even more complicated (e.g., Ciommi et al. 2019). In Eastern Attica, population growth was basically a consequence of short-range residential mobility, representing the late stage of a long-lasting suburbanization (Salvati and Serra 2016). In Western Attica, the contribution of natural balance was still important because of a young population age structure and locally high fertility rates (Gavalas et al. 2014). These contrasting trends consolidated a traditional polarization in urban, suburban, and rural settlements (Rontos et al. 2016). In this framework, the most relevant contribution to urban

decline came from international migrations (Arapoglou and Sayas 2009), slowing down during crisis (Vinci et al. 2022). After twenty years with huge and continuous migration inflows—both medium-range (Balkans and the Middle East) and long-range (Africa, South Asia and China, and Latin America)—the foreign population declined for the first time since 2010 in Attica (Salvati 2016).

The (non-Greek) European-native population had the most evident reduction in the first years of the 2010s, likely testifying to the negative impact of the economic crisis on the higher segments of the labor market and the reduced attractiveness of the Greek capital city in a supranational context (Casado-Díaz et al. 2004; Del Bono et al. 2015; Stergiou et al. 2017). Experiencing degraded housing provision, unemployment, and poverty, as well as bureaucratic constraints to relocation outside Greece, the extra-communitarian population segment was forced to live in a sort of ‘migrant trap’ for years (Kaika 2012; Souliotis 2013; Panori et al. 2019). Moreover, assuming the inherent contribution of foreign population to overall fertility (Rontos 2007; Bagavos et al. 2018; Tragaki and Bagavos 2019), the decline in immigration flows—combined with the reduction in birth rates (both from native and non-native mothers) between 2004 and 2020—delineated a possibly unsustainable demographic context (Maloutas and Spyrellis 2019) supposed to accelerate metropolitan shrinkage if not regulated with specific policies supporting childhood (Gavalas et al. 2014).

Based on these premises, the last decade in Athens provided a dynamic representation of metropolitan decline grounded in the interplay of long-term factors and concomitant short-term disturbances (Alexandri 2015; Mallach et al. 2017; Gounaridis et al. 2018). More specifically, the 2007 recession leveraged urban poverty and unemployment, negatively impacting immigration rates and fueling the sudden increase in working poor (Salvati et al. 2019). As a relevant short-term disturbance, economic stagnation triggered population shrinkage and a spatial polarization of economic activities and social functions (Di Felicianantonio et al. 2018), depressing both internal and international migration inflows (Maloutas and Spyrellis 2019). Long-term factors, such as aging and low fertility, had a further negative impact on natural population growth (e.g., Lesthaeghe and Lopez-Gay 2013).

Post-crisis development may lead to latent changes in housing preferences, with younger people moving to smaller households (Kandylis 2015). Since inner cities offer more work opportunities, better public transport, cheaper housing, and easier networking, the young population (re)concentrates downtown, suggesting a (renewed) preference for urban lifestyles, with an indirect effect on local demography (Kaika 2012; Strozza et al. 2016; Pili et al. 2017). More flexible work arrangements with temporary jobs and lower income have exalted these processes in European cities (Rees et al. 2017; Sabater and Graham 2019; Tragaki and Bagavos 2019). However, such dynamics seem to have counterbalanced only partially the decline in labor-related foreign immigrant flows settling in central neighborhoods (Chorianopoulos et al. 2010; Morelli et al. 2014; Panori et al. 2019). As a matter of fact, the decline in downtown Athens was evident also in the last decade (2011–2021: -0.4% by year) after two decades of continuous population shrinkage (1991–2001: -0.34% ; 2001–2011: -1.58%).

By providing an informative base for regional science, the empirical results of our study provides a refined knowledge for implementation of more effective policies that strengthen local competitiveness, sustainability, and resilience of shrinking cities (Chorianopoulos et al. 2014). If regulating long-term demographic dynamics (e.g., population aging and fertility decline) is quite difficult in a local perspective (Salvati et al. 2018a), unemployment reduction and containment of poverty gaps appear particularly appropriate, together with coordinated development policies for inner cities (Dura-Guimera 2003). In line with other Mediterranean cities, signs of a demographic recovery, still far from being extensively recorded in Athens, may testify to how a ‘crisis-driven’ shrinkage can be managed with multi-target and multi-scalar strategies associated with migration policies (Carlucci et al. 2018; Duvernoy et al. 2018; Perrin et al. 2018). These measures should value the implicit advantages of the new (post-crisis) socioeconomic context, e.g., exploiting opportunities

derived from the collapse in land and house prices, and trying to regulate (and, possibly, stabilize) migration flows (Salvati et al. 2019).

Our study finally suggests how metropolitan systems' resilience can be effectively managed (and, possibly, reinforced) with an appropriate governance of the 'demographic engine' of cities. On the one hand, it is documented how demographically declining cities are typically associated with stagnant economies (Haase et al. 2010), being unable to engage global competition dynamics (Salvati 2016). On the other hand, spatial planning in Mediterranean Europe should explicitly recognize the legacy of traditional settlement forms in modern (peri-urban) landscapes, taking the promotion of life quality as the main target of a truly sustainable (local) development path (Repetti et al. 2008; Salvati et al. 2016; Rees et al. 2017). This framework gives room to a more effective interpretation of complex processes of urban shrinkage (Nelle et al. 2017), delineating resilient solutions to a finely tuned city growth with present (and future) population dynamics (e.g., De Rosa and Salvati 2016).

Measures counteracting urban decline should promote local development and sustainable city planning, benefiting from a tighter integration with policies containing urban poverty, supporting ethnic diversification and social cohesion (Maloutas 2007; Salvati and Serra 2016; Di Felicianantonio et al. 2018; Panori et al. 2019). Being required to provide differentiated services for a declining population, social policies should finally reconcile demographic dynamics with the specificity of local contexts, promoting appropriate spatial infrastructures in metropolitan areas (Rontos 2007; Giner-Monfort et al. 2016; Liu et al. 2020). Comparative research in this direction may benefit from the results of methodological approaches integrating quantitative analysis, statistical indicators, economic modeling, literature review, and field surveys (Arbaci 2007, 2008) aimed at capturing the specificity of urban decline paths and processes.

5. Conclusions

Declining immigration flows, reduced fertility rates, and population aging lead to spatially heterogeneous living conditions and suggest a thorough rethinking of sustainable urbanization. Resulting to be progressively more influenced by external shocks, recent demographic dynamics seem to leave cities as more fragile and unequal than before, and stimulate a complete rethinking of spatial planning and developmental measures for local communities exposed to decreasing immigrant flows, low fertility, and aging. A comparative analysis of (local-scale) population dynamics allows a comprehensive understanding of the latent re-organization of metropolitan spaces during recessions. With this perspective in mind, the empirical results of our study add to the traditional literature on 'industrial cities shrinkage' in Europe and contributes to (re)formulate short- and medium-term development scenarios in large agglomerations, shedding further light on the role of migration in crisis-driven processes of urban decline in Mediterranean Europe.

Place-specific and multi-scale measures promoting sustainability and resilience targets are demonstrated to be key tools influencing the (post-crisis) developmental path of competitive and equal cities. In this vein, measures promoting local development and city planning could benefit from a tighter integration with policies containing urban poverty, supporting ethnic diversification, and orienting spatial transformations toward social cohesion, e.g., mitigating economic polarization over space. Based on these findings, planning strategies coping with the sustainable development of large Mediterranean cities should create the appropriate conditions for equity, cohesion, competitiveness, and environmental security.

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