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The role of vertical segregation in urban social processes

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It is common knowledge that urban neighborhoods have diverse and unequal social profiles, and this makes a difference for the life prospects of their residents. We know much less about social separation and hierarchies within neighborhoods (micro-segregation), that is, in the micro scale of city blocks and apartment buildings. Vertical segregation is a form of micro-segregation embodied by positions of advantage or disadvantage according to the floor of residence. Is vertical segregation exceptional or can we locate it in many different cities? Does it make a difference for the life prospects of urbanites if they live in the advantaged or disadvantaged parts of such micro-segregated spaces?

Segregation, a term coming from biology, deals with the residential separation of different social groups in urban space and has become a central topic for urban studies since the 1920s. This separation in space was deemed very important and, according to the Chicago School, it could be used as a proxy to study social distance[1]. Segregation has always been considered negative for the social reproduction of those in less advantaged spaces. At the same time, unequal neighborhoods, in the form of socially and/or racially homogeneous residential communities, were the expected outcome under the term 'natural areas'[2]. The remedy against this assumingly natural negative process would be either to increase the social mix of segregated neighborhoods or, in less socially regulated contexts, to act individually and move out from disadvantaged/segregated spaces.

The main issue for this Review is that segregation studies have always focused on the neighborhood as the obvious spatial unit of reference and analysis, neglecting the importance of social hierarchies within it. This unilateral focus on the neighborhood level was in accordance with urban studies' preferential attention to the US urban context and its features (low-rise, sparsely built, expanding and unregulated cities). Eventually, these contextual features were implicitly universalized[3] by a discipline not operating in isolation and not presuming that its own context was unique[4], but as pioneering the universal way of urban development. The term 'micro-segregation' indicates that social hierarchies often exist within neighborhoods, even at the level of single apartment buildings. Questions about the forms and impact of separations and hierarchies at the micro scale came much later and mainly from outside the English-speaking urban world.

Vertical segregation is a form of micro-segregation in the micro-space of individual apartment blocks within the high-rise neighborhoods of a city. At the aggregate level, it embodies the social hierarchy within the vertically stratified social milieus it creates in the high-rise housing stock of a city, where individuals occupy unequal but spatially proximate positions according to their socioeconomic status or ethno-racial identity.

Vertical segregation is probably the most common form of micro-segregation. The question is whether this form of micro-segregation—as well as the others that also socially shape urban micro-spaces—are important for social reproduction and consequently for urban policies.

Causes, forms and visibility of vertical segregation

Vertical social hierarchies within high-rise blocks are formed when housing quality is unequally distributed among floors and are empowered when the housing market is not regulated. The unequal quality of housing by floor differentiates housing cost and therefore brings wealthy households to the floors with the highest quality and relegates poor ones to the floors with the lowest. This spatial ranking is a result of the shifting and sorting function of the housing market, notwithstanding relevant contextual features related to historical institutional legacies and to local market regulation. The same applies to other forms of micro-segregation within apartment blocks (for example, between advantageous dwellings at the front versus disadvantageous ones at the back or between recently refurbished versus poorly maintained dwellings[5]).

Different forms of vertical social differentiation can reasonably be expected in any high-rise urban area where housing quality and price are related to floor level and where housing allocation is sufficiently commodified. This social differentiation is often contained within

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a relatively narrow segment of class hierarchy, for example, among residents of luxurious apartments in waterfront-development condos in Vancouver or Buenos Aires. Although it is important to explore the social significance of such separations within narrow segments of the social hierarchy, the discussion in this Review is mainly focused on the less frequent interclass vertical segregation.

Vertical segregation is sometimes labeled 'vertical social differentiation'. The two terms are not completely interchangeable, although they are often used to designate the same phenomenon. White[6] uses 'vertical segregation', whereas Leontidou[7] and Grafmeyer[8] prefer 'vertical social differentiation', considering that this vertical social cohabitation opposes, or at least mitigates, neighborhood segregation. According to their understanding, vertical social differentiation compared to horizontal segregation denotes class cohabitation in the same neighborhood, and somehow implies that this cohabitation is voluntary, resulting from a common urban culture[7]. In this text I use 'vertical segregation' and thus prioritize social distance at the micro scale rather than social mix at the neighborhood level.

Vertical segregation may have been neglected by urban studies, but it has not gone unnoticed by artists, novelists and journalists. Emil Zola, in the novel *Pot-Bouille*[9], deals with the social profile and functioning of the bourgeois apartment building in Paris at the end of the nineteenth century. In 1975, James Graham Ballard described, in the novel *High-Rise*[10], dystopic life in a modern housing tower, where the vertical residential hierarchy summarizes capitalist social relations. The novel inspired a film of the same name in 2015, directed by Ben Wheatley, focusing on the vertical hierarchy of social positions and land uses, the functioning of which eventually became extremely conflictual and unsustainable. A very graphic description of vertical segregation, describing the combined lives of masters and servants in South Korea, living respectively above and below ground, is central to the movie *Parasite* by Bong Joon-ho, winner of the 2019 Palme d'Or award at the Cannes Festival. In a more persistent way, Greek popular cinema of the 1960s frequently dealt with the typical apartment block of Athens[11] and its internal vertical social hierarchy, opposing those at the top and the bottom to designate privilege and stigma, respectively.

Academic interest about micro-segregation remains rather scarce and segmented. Some cities have attracted more attention than others due to both their socio-spatial structure enabling micro-segregation and the research performed on this topic (for example, Naples[12–17]). The challenge is to bring the segmented research on micro-segregation together.

A brief history of vertical segregation

There are several dimensions in the history and the functioning of densely built vertical cities, including the varying symbolic use of their vertical (third) dimension[18] and the sustainability planning issues for high-rise neighborhoods[19]. This Review focuses on the vertical social geography of high-rise urban areas. Vertical segregation first appeared in the high-rise areas of ancient Rome[20]. Poor residents were driven to the less accessible apartments at the top, which were also less protected from rain and cold.

In modern times, the best-known example of vertical segregation was developed in central Paris[6,21] during the nineteenth century. The Parisian model of vertical segregation followed the social pattern of ancient Rome. Affluent households lived in the high-ceiling and well-equipped apartments with all the available amenities on the first or second floor. Moving up, the social positions of the residents declined. At the very top (under the roof), tiny servants' rooms, with areas of less than 10 m^2 and no amenities, accommodated female servants (*bonnes*), who provided domestic work in the large bourgeois apartments on lower floors. The coexistence of bourgeois households and servants in the same city building was a condensed version of the complex division of labor in manor houses. The many servants in former *chateaux* were replaced by a single female servant (*bonne* (*à tout faire*, that is, able to do all domestic tasks previously allocated to different servants)). The vertical difference in housing quality and the social profile of residents in the apartment blocks of central Paris is depicted in the gravure *Coupe d'une maison Parisienne le 1e Janvier 1845*, explained by Thierry Aprile[22] (http://grial4.usal.es/MIH/parisBuildings/resource1.html).

Vertical segregation in Paris and some other European cities, like Naples and Montpellier, where the same model was followed, has been considered a disappearing relic of urban history[23]. Along the same lines, White[6] described vertical segregation in Paris as a residue of the pre-industrial, mercantile city, where there was 'coexistence, within single houses, of individuals and families at different positions in the class hierarchy'.

Gradually, this vertical social cohabitation declined with the decrease in domestic work for bourgeois households, and even more so with the disappearance of low-quality housing, affordable for the lower part of the social ladder in central Paris. Massive *embourgeoisement* and gentrification have eradicated vertical segregation in the increasingly unaffordable center of Paris[24,25].

Vertical segregation in the contemporary city

Evidence from many other cities across the world shows that vertical segregation—as well as other forms of micro-segregation—does not only belong to the past. Twenty years of research work on vertical segregation in Athens has recently attracted some attention to this topic. This work provides strong evidence of a clear vertical hierarchy among residents in Athenian apartment blocks in terms of class and ethnicity[26,27]. Two main reasons delayed the attention to vertical segregation in Athens. First, vertical segregation in Athens was initially perceived and investigated as a particularity of the social geography of a regional metropolis in Southern Europe. Second, the significance of what happens in a city like Athens must be strongly argued to attract global attention in urban studies.

In recent years, several research projects have progressively revealed that many other cities have a stock of apartment blocks with diverse dwelling quality within them that fosters, at the same time, social mix and segregation at the micro scale. In central Naples, for example, segregation in the city's vertically differentiated apartment blocks has been a widespread phenomenon for a long time[15,17]. At the same time, other forms of micro-segregation have been investigated, such as the invisible enclaves of manual workers within the city's most expensive neighborhoods[13]. Ethnic vertical hierarchies have been detected in neighborhoods of London[28] and Malaga[29]. Evidence of vertical hierarchies within apartment blocks comes also from Eastern European cities existing under state socialism (for example, Bucharest and St. Petersburg[30]), when market mechanisms were not supposed to be reproducing social hierarchies. There is also evidence from the post-socialist period in Budapest, where vertical segregation is more prominent in the old high-rise stock of the city center compared to the housing estates built during state socialism[31,32].

Vertical segregation is also present in diverse forms in the housing stock of many large cities outside the 'Western world', in East Asia, Latin America and the Middle East. Housing towers in Hong Kong, Seoul and São Paulo provide housing at different prices by floor. Hierarchies within such towers are usually contained within a narrow segment of the city's social hierarchy, but sometimes they are more socially diverse than expected[33]. Vertical segregation is also witnessed in Beijing, where rural migrants (without *hukou* formally permitting their permanent urban residence) are often living in basement apartments constructed as air-defense shelters in the 1980s and illegally converted to rental properties, and in Guangzhou, where rural migrants are often tenants in low-quality dwellings in the informally enlarged properties of local urban villagers[34]. In the urban environment of highly unequal cities—like the cities of Brazil—high-rise apartment residences often separate middle-class households from a surrounding mass of working-class low-rise housing. Separation is very clear in this

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case—especially when residential towers are organized as gated communities—but the spatial proximity with the groups living in adjacent low-rise housing is reason enough to consider their coexistence in residential space as micro-segregation[35]. Although vertical segregation does not seem to be present within such high-rise bourgeois apartment blocks, according to evidence from Rio de Janeiro[36], it is important to investigate the potential effect of the proximity of middle-class towers to low-rise working-class areas for social reproduction, drawing inspiration from research on the impact for poverty of spatialized social networks[37]. Moreover, vertical segregation is also present within the steep favelas of Rio, where the physically less accessible housing units are occupied by the most deprived[26]. Furthermore, invisible spaces within bourgeois high-rise neighborhoods in Beirut informally create an unexpected social mix[38].

At the same time, steep vertical urbanity has attracted attention due to the concentration of very wealthy people in exclusive towers, either for living in 'luxified skies' or for investment, as in London or New York, where some neighborhoods have turned to 'urban necrotextures'[39,40] due to the purchase of apartments as investment objects rather than as living space. Similar hierarchies are sometimes witnessed unexpectedly, as in the case of the few housing towers in Vienna, which operate in a very different way from the city's strongly regulated housing market and attract an affluent clientele that are used to this type of housing investment product[41]. Moreover, new regulations, bypassing the long-term existing tenement regulations in Vienna, have liberated/deregulated a considerable part of the housing market (the top floors of the old housing stock—*Zinshäuser*) in the city center[42], eventually promoting social mix and vertical social hierarchies at the micro scale.

All the evidence from recent forms of vertical segregation in recently built or refurbished apartment blocks shows that the traditional Parisian model has been turned upside down, with affluent households now inhabiting the top and poor ones the bottom. The vertical distribution of housing quality has changed over time. Lifts have been introduced, making upper floors more easily accessible, and construction technology sufficiently protects them from the cold and rain. Also, growing density in high-rise quarters has blocked the view from lower floors and made them darker and noisier, whereas upper floors enjoy panoramic views, a feature increasingly appreciated in today's real-estate markets.

Most of the aforementioned evidence about the form, the processes and the social content of micro-segregation in Europe, Latin America, East Asia and the Middle East is provided in the edited volume *Vertical Cities*[43]. Moreover, a special issue of the journal *Bulletin de Correspondance Hellénique—Moderne et Contemporain* discusses different forms of micro-segregation in Naples[12,44], Venice[45] and Athens[46–48], and a special issue on urban micro-segregation in *Land* (https://www.mdpi.com/journal/land/special_issues/938S2A99L1) discusses this issue in Paris and Malmö[49], Naples[19], Fuzhou[50], Szeged[51] and Rome[52].

Vertical segregation and the cities of the English-speaking world

As mentioned, the interest in urban segregation originated in and focused on cities in the United States. Thus, segregation studies were directed primarily to the low-rise, low-density, sprawling US urban context, and, to some extent, the United Kingdom, Canada and Australia. This led to the production of research tools such as neighborhood segregation indices, and fueled debates such as those on the neighborhood effect. Eventually, this approach to segregation and the methods associated with it dominated urban sociology across the globe and implicitly universalized the US urban model[35].

Cities in much of the rest of the world have always been more compact and socially mixed, making neighborhood segregation a less powerful tool for the analysis of socio-spatial hierarchies and inequalities. These cities are the outcome of urbanization paths where the elites did not massively move to the periphery to avoid the negative effects of industrialization[53]. The choice of the elites not to abandon city centers—as in Paris[54], Madrid and Vienna—and subsequent policies to (re)locate industrial activities and workers to the urban periphery, contributed greatly to preserving a dense built form, and its inherent and constantly reproducing social and functional mix. Moreover, the weaker and comparatively belated development of the automobile industry compared to the United States, as well as the more regulated tenure laws, planning regimes, and land and property markets have also contributed to preserving and reproducing rather dense and compact urban forms in most of the rest of the world.

Cities of the English-speaking world are present in the literature on urban verticality, but mainly when it addresses issues of green sustainability through densification (for example, ref. 19) or complex and often socially exclusive vertical forms of housing and real estate (for example, ref. 39). These cities are usually missing from the developing literature on micro-segregation. To some extent, this is understandable, because they offer no physical support for micro-segregation, especially those of the new English-speaking world, being comparatively recent without a complex old urban tissue and having a stock of single and low-rise houses in suburban neighborhoods with relatively homogeneous social and racial profiles.

However, there are two reasons why the cities of the English-speaking world should be included in the study of micro-segregation. First, micro-segregation is present in their past. Recent research and publications by John Logan and other scholars geolocalized the data of US censuses of 1880 and 1900 in several major cities of the East Coast of the United States and showed a clear pattern of racial micro-segregation separating affluent white people in big houses on avenues from poor black people squeezed in small back streets and alleys[55,56]. This evidence overturns the dominant impression that segregation was developed in parallel with the expansion of US cities, leaving behind a much more racially (and socially) mixed context. Neighborhoods may have been more racially mixed, but the evidence of micro-segregation reveals a completely different situation from what a racially mixed neighborhood implies. Second, gentrification – a process firstly developed and mainly analysed in the cities of the English-speaking world – usually increases the social and racial mix at the neighborhood level, but also creates hierarchies at the micro scale, especially in the unregulated context of US metropolises. The question of social mix is widely discussed in relation to gentrification (for example, ref. 57), but the debate focuses mainly on the outcomes of the recipe of attracting middle-class groups to working-class areas, and rarely deals with the forms and impact of segregation at the micro scale. Therefore, both the past and present of cities in the English-speaking world indicate that research on micro-segregation is relevant and important in addressing issues of social reproduction, even in the less compact and dense cities of the United States, Canada, Australia and the United Kingdom.

The example of vertical segregation in Athens

Vertical segregation in Athens refers to social stratification by floor in the typical apartment building there, which has five storeys or more. These dominate the housing stock in the broad city center, having been built using the land-for-flats system (*antiparochi*) from the early 1950s to the late 1970s. *Antiparochi* was a barter system operated by two small agents (an owner of a small plot and a petty builder-contractor). They produced single apartment buildings and split the ownership of the apartments, offices and shops according to their initial agreement[58]. A large part of the city's booming population (increasing from 1.5 to 3.5 million between 1951 and 1981) was housed in the ~35,000 apartment blocks built during that period[26]. In the early 2010s, the same stock still hosted ~70% of the broad city center's population (Municipality of Athens).

The great success of the land-for-flats building system was due to (1) the huge demand for cheap and modern apartments by the city's soaring population; (2) its suitability for joint ventures between

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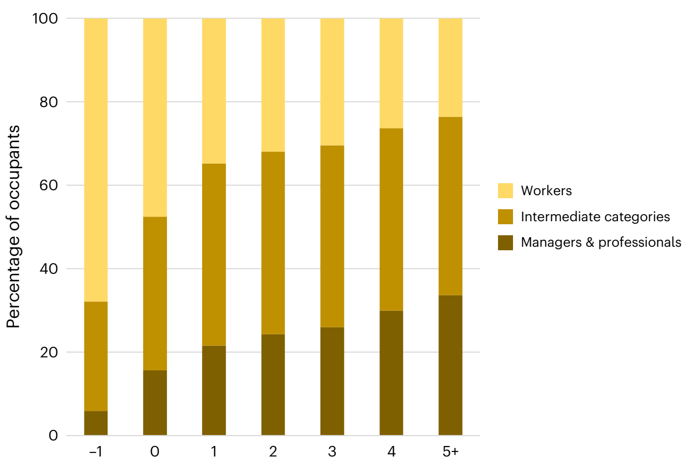

Fig. 1 | Percentage distribution of occupants by floor of residence and broad occupational category of households' reference person in the Municipality of Athens in 2011. The reference person is the first adult on the household's census registration form. Figure adapted with permission from ref. 27, Athens Social Atlas.

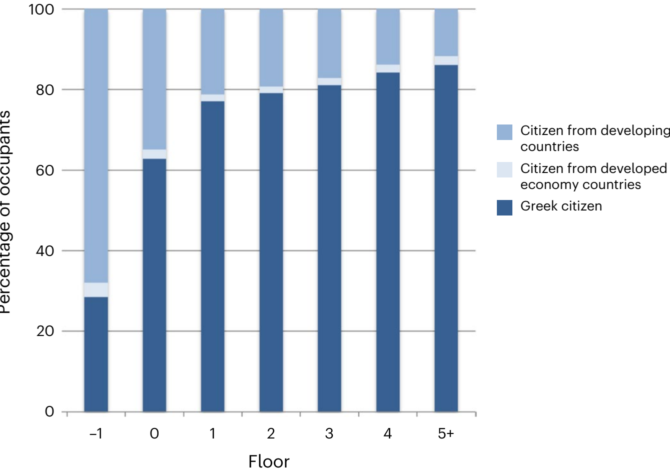

Fig. 2 | Percentage distribution of occupants by floor of residence and broad citizenship category of households' reference person in the Municipality of Athens in 2011. The reference person is the first adult on the household's census registration form. Figure adapted with permission from ref. 27, Athens Social Atlas.

the numerous small urban landowners and petty builders; and (3) the special tax reliefs this system enjoyed that made it impossible to compete in terms of production costs using any other procedure.

Restructuring of the city's housing stock by the land-for-flats system made central neighborhoods more dense and socially mixed, especially after the massive inflow of poor migrants from the early 1990s[27]. This rapid and unregulated densification deteriorated environmental and living conditions in the city center and led to the gradual outmigration of a substantial proportion of the middle- and upper–middle-class households to the suburbs.

Vertical segregation was triggered by the substantial difference in housing quality among floors, which was related to the structure of such land-for-flats apartment blocks, which had better conditions on the upper-floor apartments (more housing space, openness and better views, less noise, more light, better aeration, large balconies that were usable almost all year round) and clear disadvantages on the lower floors. Moreover, the impact of increasing building density was much more detrimental to lower-floor apartments, where noise and darkness increased disproportionally, especially in the many narrow streets.

Vertical segregation in Athens was fully documented only recently using the micro-data of the 2011 Population Census, where—for the first time—the apartment floor could be linked to the profile of its occupants. This is summarized in Figs. 1 and 2.

Mapping vertical segregation on a two-dimensional map presents a substantial challenge. The depiction of vertical differentiation needs a third dimension, because different social or ethnic groups literally live one on top of one another and not in different neighborhoods.

Two recent attempts to map vertical segregation in Athens (only the second one is presented in this Review; Fig. 3) illustrate its complexity. The first map[27] (not shown) separates the broad city center into three parts. The first part comprises the spatially concentrated and socially mixed areas of strong or very strong vertical segregation, and includes two-thirds of the city center coinciding with most of the areas where the land-for-flats system was particularly developed during the 1960s and 1970s. The second comprises areas where higher, intermediate or lower social categories are over-represented on all floors, mitigating the presence of vertical segregation. These areas, mainly neighborhoods where lower social categories are over-represented on all floors, form the remaining third of the city center built with the land-for-flats system. They are spatially concentrated areas that have experienced 'white'/middle-class flight and increased inflow of migrant working-class households since the early 1990s. The third part is much smaller, spatially dispersed and is atypical in terms of vertical segregation. The second map[59] (shown in Fig. 3) is an attempt to combine vertical and neighborhood segregation, depicting the intensity of vertical segregation together with the differentiation between areas of vertical advantage or disadvantage (expressed by the high concentration of higher or lower social categories in the upper or lower floors, respectively). These two maps indicate that vertical segregation is a prominent feature of the social geography in the high-rise residential areas of Athens.

Social mix and the effect of micro-segregation for social reproduction

Does it really matter if, in a socially (or racially) mixed neighborhood, people are segregated at the micro scale? Is micro-segregation important for social reproduction?

The focus on neighborhood segregation has drawn a lot of attention to the importance of spatial distance for reproducing social inequality and has initiated a debate on neighborhood effects[60]. Eventually, the assumed negative effects of concentrated poverty and the fear of ghettoization became universal concerns, leading to the development of urban policies promoting social mix[61]. To attenuate the sorting effect of the housing market and the displacement risk of low-income residents, urban policies were developed to protect social mix or increase it in poor neighborhoods. Policies imposing a minimum percentage of affordable housing in new developments were adopted in several countries (for example, in France[62], the United Kingdom[63] (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/7606/1775206.pdf) and the Netherlands[64,65]). Moreover, social mix has been a strategic element in flagship urban development projects across Europe[66]. However, in the long run, policies to increase social mix in deprived neighborhoods or to escape from them with the help of spatial mobility programs like *HOPE IV* or *Moving to Opportunity* in the United States[67] (www.huduser.org/publications/fairhsg/mtofinal.html)[68] produced ambiguous results and are still under debate[57,69]. Moreover, if social hierarchies are constantly (re)built at the micro scale, and if no further policies are developed to oppose their potential negative impact, the promotion of social mix at the neighborhood level is not enough to confront the problems assumed to be produced by segregation.

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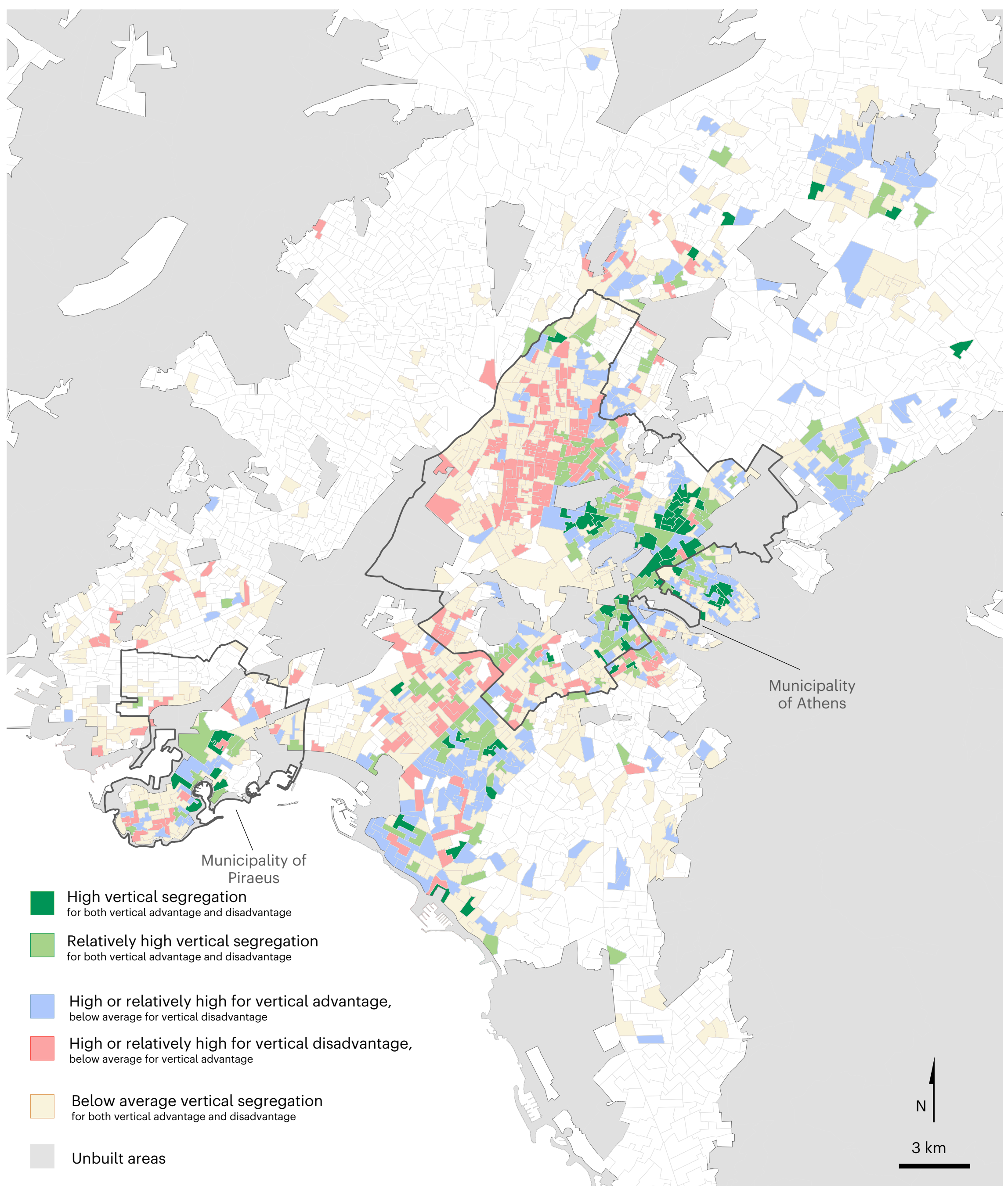

Fig. 3 | Advantage and disadvantage in the vertically segregated high-rise areas of Athens in 2011. Advantage is measured by the degree of concentration of higher occupational categories in the upper floors and disadvantage by the degree of concentration of lower occupational categories in the lower floors. The concentration of advantage or disadvantage is divided into two categories—high (>1 s.d.) or relatively high (0 to 1 s.d.)—of the average concentration of higher occupational categories in upper floors or the concentration of lower categories in lower floors, respectively, in the city's high-rise areas. Figure reproduced from ref. 59 with permission of the licensor through PLSclear.

Vertical segregation increases social mix in a micro-segregation form at the neighborhood level compared to the benchmark context where the unequal groups in vertically segregated areas would be living in their separate and socially/racially homogeneous neighborhoods. Regardless of the causes increasing social mix and, at the same time, producing micro-segregation, the following fundamental questions remain:

1. Is bringing unequal social groups closer in space producing positive effects for the conditions and life prospects of the more deprived?
2. Is micro-segregation (vertical segregation or any other form) inevitable when unequal groups are brought together in space?
3. How and to what extent is the social hierarchy formed in residential micro-spaces (vertical or other) negatively affecting the conditions and life prospects of the groups at the bottom of the hierarchy?
4. Are the observed negative effects on those in disadvantaged positions in residential micro-segregation produced by their positions in micro-space, or should they be attributed to their personal/household features (occupational position, ethnic identity and so on)?

The answer to the first question is that the policy of simply bringing unequal groups closer in space is a kind of social engineering, which mistakes symptoms for causes[70] and does not improve the situation of the deprived. Further critical scholarship claims that the spatial concentration of poverty is not the major cause of negative social effects[71–74]. The effect of concentrated poverty may not be insignificant, but its impact is comparatively small[75] and context-dependent[76]. On the other hand, bringing different social groups closer in space does not mean that they will necessarily interact positively[77] and that the reduction of their spatial distance will also decrease their social distance[78,79].

The second question needs more research evidence corroborating the existence of micro-segregation forms in different contexts, although existing evidence already shows that micro-segregation is inevitable if policies to oppose it are not developed. The third and fourth questions need answers similar to those concerning the neighborhood effect: unequal conditions in (micro)space have significant effects that should be addressed, but the main causes of the observed negative conditions are related to inequalities linked to personal/household features (occupational position, ethnic identity and so on) that need to be resolved in ways beyond spatial policies. This means that there is a need for comprehensive policies addressing social and spatial inequalities at the same time.

Moreover, vertical segregation (and other forms of micro-segregation) has social effects that are highly context-related. Policies to bridge inequalities by increasing social mix were functioning much more effectively in the era of strong welfare states when combined policies addressing social and spatial inequalities were deployed, compared to the more recent era of neoliberal policies where policies to increase social mix were rather isolated and eventually became part of gentrification processes[80]. Along the same line, recent agendas to densify cities, founded mainly on environmental concerns, may not lead to socially sustainable outcomes, even when they are developed within contexts where awareness about the danger of gentrification is increased[81,82]. The de-segregation of working-class neighborhoods by the market-oriented redevelopment of social-housing estates is a recurrent policy to increase social mix. This may well lead to better housing conditions for the beneficiaries of the renewed social rental and affordable housing stock, but it carries the risk of displacement and decreases the accessibility of local services[57,83].

Context is important across both time and space. Therefore, dense and compact cities may be more socially mixed, but not necessarily more equal. Immigrant groups in southern European cities, for example, are not particularly segregated at the neighborhood level, but are highly deprived and excluded[84]. In Hong Kong, extremely high levels of inequality do not translate to high levels of neighborhood segregation[85]. This means that simply mixing social groups in space does not lead to social integration. Segregation is more an outcome and less a cause of urban social inequalities.

Moreover, neighborhoods that become socially mixed through rapid gentrification processes are usually lacking the traditional functional social mix built through the long and gradual processes of urbanization. This traditional mix involved mutually helpful links creating community bonds and ties based on employment relations and family networks. The absence of such links in gentrification areas nurtures antagonistic interactions among completely unrelated groups seeking to appropriate or retain the contested territory, preserve or modify its profile, and built their own sense of belonging. Residential areas with a conflictual social mix are usually spaces where the co-presence of unequal and diverse social groups is simply antagonistic and not functional, reducing the desired level of social cohesion. A gentrified neighborhood in London or a public housing complex in a *banlieue* of Paris with old native and new immigrant households are hosting groups with different positions in the social hierarchy, without functional relations or ties between them. These groups have antagonistic perceptions and practices regarding the shape of the space they share, without any common ground for mutual understanding and compromise. In contrast, servants and bourgeois families in the apartment buildings of Paris at the end of the nineteenth century shared an unequal but long-lasting functional relation in the local labor market. The same applies to the very unequal groups in the mixture of lower-class enclaves in Naples within the city's aristocratic strongholds, as well as to the old manual workers and the young professionals and managers, socially distant but related by kinship, in the upwardly mobile traditional working-class neighborhoods of western Athens. In these last three cases, functional relations and kinship enable social mix to provide some positive interaction between unequal groups. This positive interaction may not be challenging their unequal social relations, but enables the mutual acknowledgment of the other's presence and of the minimum requirements for reproducing their coexistence in the shared common space. A reconsideration of the literature on urban communities since the work of Tönnies on the transition between *Gemeinschaft* and *Gesellschaft* is needed[86].

Micro-segregation will become an important research topic for urban studies if its relevance can be demonstrated for policies that aim to promote social and ethno-racial mix, highlighting that these policies need to go beyond the simple social and racial mix in space[87–90]. Policies for social or ethno-racial mix are not effective if they miss micro-segregation in presumably diverse neighborhoods[91] (https://paa2015.populationassociation.org/abstracts/153646) or if they only improve the mix without promoting meaningful relations between the groups involved (https://shelterforce.org/2016/05/04/addressing-diversity-segregation-in-mixed-income-communities/). Recent work at the micro scale of segregation in Athens has hinted at detrimental spatial effects (dropping out early from school) 'over and above' the personal characteristics of residents—like class, ethnicity and gender—for children growing up in the disadvantaged small apartments on lower floors[92]. Much more evidence is still needed from research in diverse micro-segregation contexts. The fact that social mix does not necessarily put an end to the issue of negative neighborhood effects reveals the social significance and the complexity of micro-segregation. Micro-segregated social mix can comprise unbearable co-presence and conflict, acceptance of unequal conditions and opportunities, social interaction producing positive or negative effects for the disadvantaged, a showcase and a challenge for reproducing or reducing inequalities. Social mix is not a condition; it is a process at stake.

Concluding remarks

Micro-segregation, with vertical segregation being an important part of it, is a persistent form of social hierarchy and inequality expressed in the spatiality of everyday life for most of the world's urban population. It affects the ways in which people perceive, reflect, decide and act. Micro-segregation effects should not be considered as independent parameters of social reproduction, but as integrated complementary features inevitably modifying the effects of primary individual characteristics, like class and ethnicity, in the logic of intersectionality.

At the same time, bringing together all the different forms of vertical segregation (and all other forms of micro-segregation) remains a challenge and an issue. It is a challenge because it requires sorting out the different forms of vertical segregation processes, their transformation during their (re)production, the agents involved and their role, as well as the ways segregation at the micro scale affects social reproduction in different contexts. It is also an issue, because stretching too much the mid-range concept of micro-segregation and bringing under a common umbrella (as in the case of gentrification[93]) all forms of segregation at the micro scale, regardless of the sociopolitical context in which they operate, leads to reducing the concept's rigor by focusing on similarities in outcomes rather than on the much more meaningful common functions of micro-segregation processes within comparable contexts. On the other hand, discussing vertical segregation and all

other forms of segregation at the micro scale as a common research topic enlarges participation and potentially enriches the debate. The choice is open.

References

1. Park, R. E. The city: suggestions for the investigation of human behaviour in the urban environment. *Am. J. Sociol.* **XX**, 577–612 (1916).
2. Park, R. E. Human ecology. *Am. J. Sociol.* **XLII**, 1–15 (1936).
3. Maloutas, T. in *The Routledge Handbook of Comparative Global Urban Studies* (eds Le Galès, P. & Robinson, J.) 323–332 (Routledge, 2023).
4. Jones, G. A. & Rodgers, D. in *The Routledge Handbook of Comparative Global Urban Studies* (eds Le Galès, P. & Robinson, J.) 33–47 (Routledge, 2023).
5. Meyer, A. & Pfirsch, T. in *Vertical Cities. Micro-segregation, Social Mix and Urban Housing* Markets (eds Maloutas, T. & Karadimitriou, N.) 39–56 (Edward Elgar, 2022).
6. White, P. *The West-European City. A Social Geography* (Longman, 1984).
7. Leontidou, L. *The Mediterranean City in Transition* (Cambridge Univ. Press, 1990).
8. Grafmeyer, Y. *Habiter Lyon. Milieux et Quartiers du Centre-Ville* (CNRS-Presses Univ. de Lyon, 1991).
9. Zola, E. *Pot-Bouille* (G. Charpentier, 1882).
10. Ballard, J. G. *High-Rise* (Johnathan Cape, 1975).
11. Poupou, A. The rhetoric of reconstruction. Themes of the transformation of urban space in the Greek cinema of the 1960s. *Archiotaxio* **13**, 39–50 (2011).
12. Laino, G. The building where I live: a social mapping of the city. *Bull. Corresp. Hellénique Moderne Contemporaine.* **7**, 113–136 (2022).
13. Pfirsch, T. Controlling the proximity of the poor. Patterns of micro-segregation in Naples' upper-class areas. *Land* **12**, 2005 (2023).
14. Pfirsch, T. La localisation résidentielle des classes supérieures dans une ville d'Europe du Sud. Le cas de Naples. *Espace Géogr.* **40**, 305–318 (2011).
15. Laino, G. in *Post-metropolitan Territories: Looking For a New Urbanity* (eds Balducci, A. et al.) 138–161 (Routledge, 2017).
16. Dines, N. & Mattiucci, C. in *Vertical Cities. Micro-Segregation, Social Mix and Urban Housing Markets* (eds Maloutas, T. & Karadimitriou, N.) 23–38 (Edward Elgar, 2022).
17. Dines, N. *Tuff City: Urban Change and Contested Space in Central Naples* (Berghahn Books, 2012).
18. Lichtenberger, E. Wem gehört die dritte Dimension der Stadt?. *Mitt. Osterr. Geogr. Ges.* **143**, 7–34 (2002).
19. Webb, B. & White, J. T. (eds) Vertical cities: the development of high-rise neighbourhoods. *Urban Plan.* (2022); https://doi.org/10.17645/up.i278
20. Storey, G. in *The Cambridge Companion to Ancient Rome* (ed. Erdkamp, P.) 151–168 (Cambridge Univ. Press, 2013).
21. Pinçon-Charlot, M. & Pinçon M. *Dans les Beaux Quartiers* (Seuil, 1989).
22. Aprile, T. *L'immeuble de Paris au XIXe Siècle* (Univ. of East Paris Créteil, 2011).
23. Hall, P. *Cities of Tomorrow: An Intellectual History of Urban Planning and Design Since 1880* (Wiley, 2014).
24. Tabard, N. & Aldeghi, I. *Transformation Socio-Professionnelle des Communes de L'Île-de-France Entre 1975 et 1982* (CREDOC, 1990).
25. Préteceille, E. *Mutations Urbaines et Politiques Locales. Ségrégation Sociale et Budgets Locaux en Île-de-France* (CSU, 1993).
26. Maloutas, T. & Karadimitriou, N. Vertical social differentiation in Athens: alternative or complement to community segregation? *Int. J. Urban Reg. Res.* **25**, 699–716 (2001).
27. Maloutas, T. & Spyrellis S. N. Vertical social segregation in Athenian apartment buildings (*Athens Social Atlas*, 2015); https://www.athenssocialatlas.gr/en/article/vertical-segregation/
28. Flint Ashery, S. *Micro-Residential Dynamics* (Springer, 2019).
29. Natera-Rivas, J. J., Larrubia-Vargas, R. & Navarro-Rodríguez, S. Evidencias sobre la segregación vertical en ciudades del Sur de Europa. El caso de la ciudad de Málaga. *Papeles Población* **23**, 185–216 (2017).
30. Marcińczak, S. & Baldwin Hess, D. Vertical segregation of apartment building dwellers during late state socialism in Bucharest, Romania. *Urban Geogr.* **34**, 327–352 (2019).
31. Kovács, Z., Székely, J. & Szabó, B. in *Vertical Cities. Micro-segregation, Social Mix and Urban Housing Markets* (eds Maloutas, T. & Karadimitriou, N.) 189–203 (Edward Elgar, 2022).
32. Maloutas, T., Spyrellis, S. N., Szabo, B. & Kovacs, Z. Vertical segregation in the apartment blocks of Athens and Budapest: a comparative study. *Eur. Urban Reg. Stud.* **30**, 72–90 (2022).
33. Forrest, R., Tong, K. S. & Wang W. in *Handbook of Segregation* (ed. Musterd, S.) 346–365 (Edward Elgar, 2020).
34. Lin, S. & Li, Z. in *Vertical Cities. Micro-Segregation, Social Mix and Urban Housing Markets* (eds. Maloutas, T. & Karadimitriou, N.) 139–153 (Edward Elgar, 2022).
35. Marques, E., Bichir, R. & Scalon, C. in *Residential Segregation in Comparative Perspective: Making Sense of Contextual Diversity* (eds Maloutas, T. & Fujita, K.) 135–152 (Routledge, 2012).
36. Netto, M. N., Carvalho, C., Fiszon, M. & Couto, Y. in *Vertical Cities. Micro-Segregation, Social Mix and Urban Housing Markets* (eds Maloutas, T. & Karadimitriou, N.) 154–171 (Edward Elgar, 2022).
37. Marques, E. Social networks, segregation and poverty in São Paulo. *Int. J. Urban Reg. Res.* **36**, 958–979 (2012).
38. Faraj, J. & El-dinn Sadeck, S. in *Vertical Cities. Micro-Segregation, Social Mix and Urban Housing Markets* (eds Maloutas, T. & Karadimitriou, N.) 57–72 (Edward Elgar, 2022).
39. Graham, S. Luxified skies: how vertical urban housing became an elite preserve. *City* **19**, 618–645 (2015).
40. Atkinson, R. Necrotecture: lifeless dwellings and London's super-rich. *Int. J. Urban Reg. Res.* **43**, 2–13 (2018).
41. Matznetter, W. & Musil, R. in *Vertical Cities. Micro-Segregation, Social Mix and Urban Housing Markets* (eds Maloutas, T. & Karadimitriou, N.) 332–348 (Edward Elgar, 2022).
42. Musil, R., Brand, F. & Punz, S. The commodification of a rent-regulated housing market. Actors and strategies in Viennese neighbourhoods. *Housing Stud.* https://doi.org/10.1080/02673037.2022.2149707 (2022).
43. Maloutas, T. & Karadimitriou, N. (eds) *Vertical Cities. Micro-Segregation, Social Mix and Urban Housing Markets* (Edward Elgar, 2022).
44. Froment, P. Pratiques habitantes, lieux de production et (il-)légitimités spatiales dans le centre historique de Naples. *Bull. Corresp. Hellénique Moderne Contemporaine* **7**, 67–90 (2022).
45. Fregolent, L. & Basso, M. Venise aux prises avec le tourisme. 'état d'urgence' et politiques d'intervention. *Bull. Corresp. Hellénique Moderne Contemporaine.* **7**, 31–42 (2022).
46. Siatitsa, D. Re inhabiting central Athens: urban planning, housing and the claim for socio spatial justice. *Bull. Corresp. Hellénique Moderne Contemporaine.* **7**, 7–29 (2022).
47. Dimitrakou, I. Vacancy, access to housing and micro-segregation. Exploring the fragmented geographies of inhabitation in Athens. *Bull. Corresp. Hellénique Moderne Contemporaine* **7**, 43–66 (2022).
48. Balampanidis, D., Polyzou, I. & Spyrellis, S. N. Enjeux résidentiels à Athènes: (micro)ségrégation dans deux immeubles typiques du centre-ville. *Bull. Corresp. Hellénique Moderne Contemporaine.* **7**, 91–111 (2022).

49. Grundström, K. & Lelévrier, C. Imposing 'enclosed communities'? Urban gating of large housing estates in Sweden and France. *Land* **12**, 1–19 (2023).
50. Zhang, X., Tang, Y. & Chai, Y. Spatiotemporal-behavior-based microsegregation and differentiated community ties of residents with different types of housing in mixed-housing neighborhoods: a case study of Fuzhou, China. *Land* **12**, 1654 (2023).
51. Vámos, R., Nagy, G. & Kovács, Z. The construction of the visible and invisible boundaries of microsegregation: a case study from Szeged, Hungary. *Land* **12**, 1835 (2023).
52. Crisci, M. & Santurro, M. Micro-segregation of ethnic minorities in Rome: highlighting specificities of national groups in micro-segregated areas. *Land* **12**, 1870 (2023).
53. Fishman, R. *Bourgeois Utopias*: *The Rise and Fall of Suburbia* (Basic Books, 1987).
54. Préteceille, E. Is gentrification a useful paradigm to analyse social changes in the Paris metropolis? *Environ. Plan. A* **39**, 10–31 (2007).
55. Logan, J. R. & Bellman, B. Before The Philadelphia Negro: residential segregation in a nineteenth-century northern city. *Soc. Sci. Hist.* **40**, 683–706 (2016).
56. Logan, J. R. & Martinez, M. J. The spatial scale and spatial configuration of residential settlement: measuring segregation in the Postbellum South. *Am. J. Sociol.* **123**, 1161–1203 (2018).
57. Bridge, G., Butler, T. & Lees, L. (eds) *Mixed Communities*: *Gentrification By Stealth*? (Policy Press, 2012).
58. Antonopoulou, S. *The Post-War Transformation of the Greek Economy and the Housing Phenomenon 1950-1980* (Papazisis, 1991).
59. Maloutas, T., Spyrellis, S. N. & Karadimitriou, N. in *Vertical Cities. Micro-Segregation*, *Social Mix and Urban Housing Markets* (Maloutas, T. & Karadimitriou, N.) 88–97 (Edward Elgar, 2022).
60. Ellen, I. G. & Turner, M. A. Does neighborhood matter? Assessing recent evidence. *Hous. Policy Debate* **8**, 833–866 (1997).
61. Lupton, R. 'Neighbourhood effects': can we measure them and does it matter? Case Paper 73 (LSE, 2003).
62. Fauconnier, G. *Loi SRU et Mixité Sociale*: *le Vivre Ensemble en Échec*? (Omniscience, 2020).
63. Tunstall, R. & Lupton R. *Mixed Communities*: *Evidence Review* (UK Department for Communities and Local Government, 2010).
64. van Kempen, R. & Bolt, G. Social cohesion, social mix and urban policies in the Netherlands. *J. Hous. Built Environ.* **24**, 57–75 (2009).
65. van Gent, W., Hochstenbach, C. & Uitermark, J. Exclusion as urban policy: the Dutch 'Act on Extraordinary Measures for Urban Problems'. *Urban Stud.* **55**, 2337–2353 (2017).
66. Karadimitriou, N., de Magalhaes, C. & Verhage, R. *Planning*, *Risk and Property Development*: *Urban Regeneration in England*, *France and the Netherlands* (Routledge, 2013).
67. Orr, L. et al. *Moving To Opportunity for Fair Housing Demonstration Interim Impacts Evaluation* (US Department of Housing and Urban Development, 2003).
68. Goering, J. & Feins, J. (eds) *Choosing a Better Life*? *Evaluating the Moving to Opportunity Experiment* (Urban Institute Press, 2003).
69. Fraser, J., DeFilippis, J. & Bazuin, J. in *Mixed Communities. Gentrification by Stealth*? (eds Bridge, G. et al.) 209–229 (Policy Press, 2012).
70. Cheshire, P. in *Mixed Communities. Gentrification by Stealth*? (eds Bridge, G. et al.) 17–24 (Policy Press, 2012).
71. Musterd, S., Murie, A. & Kestelot, C. (eds) *Neighbourhoods of Poverty*: *Urban Social Inclusion and Integration in Europe* (Palgrave, 2006).
72. Cheshire, P. *Segregated Neighbourhoods and Mixed Communities* (Joseph Rowntree Foundation, 2007).
73. Manley, D., van Ham, M. & Doherty, J. in *Mixed Communities*: *Gentrification by Stealth*? (eds Bridge, G. et al.) 151–167 (Policy Press, 2011).
74. van Ham, M., Manley, D., Bailey, N., Simpson, L. & Maclennan D. (eds) *Neighbourhood Effects Research*: *New Perspectives* (Springer, 2012).
75. Wu, F., He, S. & Webster, C. Path dependency and the neighbourhood effect: urban poverty in impoverished neighbourhoods in Chinese cities. *Environ. Plan. A* **42**, 134–152 (2010).
76. Maloutas, T. in *Residential Segregation in Comparative Perspective. Making Sense of Contextual Diversity* (eds Maloutas, T. & Fujita, K.) 1–36 (Routledge, 2012).
77. Blokland, T. *Urban Bonds* (Polity Press, 2003).
78. Chamboredon, J. C. & Lemaire, M. Proximité sociale et distance spatiale: les grands ensembles et leur peuplement. *Rev. Fr. Sociol.* **11**, 3–33 (1970).
79. Bourdieu, P. Social space and the genesis of appropriated physical space. *Int. J. Urban Reg. Res.* **42**, 106–114 (2018).
80. Ley, D. in *Mixed Communities. Gentrification by Stealth*? (eds Bridge, G. et al.) 53–68 (Policy Press, 2012).
81. Cavicchia, R. Urban densification and exclusionary pressure: enquiring patterns of gentrification in Oslo. *Urban Geogr.* https://doi.org/10.1080/02723638.2022.2100174 (2022).
82. Cavicchia, R. & Cucca, R. In *The Palgrave Encyclopedia of Urban and Regional Futures*. pp. 1–14 (Palgrave Macmillan, 2022).
83. Lees, L. Gentrification and social mixing: towards an inclusive urban renaissance. *Urban Stud.* **45**, 2449–2470 (2008).
84. Arbaci, S. *Paradoxes of Segregation*: *Housing Systems*, *Welfare Regimes and Ethnic Residential Change in Southern European Cities* (Wiley, 2019).
85. Yip, N. M. in *Residential Segregation in Comparative Perspective*: *Making Sense of Contextual Diversity* (eds Maloutas, T. & Fujita, K.) 89–110 (Routledge, 2012).
86. Tönnies, F. *Community and Civil Society : Community and Civil Society* (ed Harris, J.) (Cambridge Univ. Press, 2001).
87. Musterd, S. Housing mix, social mix and social opportunities. *Urban Aff. Rev.* **40**, 761–790 (2005).
88. Ostendorf, V., Musterd, S. & De Vos, S. Social mix and the neighbourhood effect: policy ambiguities and empirical evidence. *Hous. Stud.* **16**, 371–380 (2010).
89. Tach, L. M. Diversity, inequality and microsegregation: dynamics of inclusion and exclusion in a racially and economically diverse community. *Cityscape* **16**, 13–45 (2014).
90. Hyra, D. *Addressing Social Segregation in Mixed-income Communities* (Shelterforce, The Original Voice of Community Development, 2016).
91. Thomas, T. & Gabriel, R. Segregation within integration: exploring micro-level segregation in Seattle's integrated tracts using spatial and qualitative analysis. In *Proc. Annual Meeting of the Population Association of America, Session 107: Spatial Dimensions of Residential Segregation* (PAA, 2015).
92. Maloutas, T. & Botton, H. Vertical micro-segregation: is living in disadvantageous lower floors in Athens' apartment blocks producing negative social effects? *Housing Stud.* **38**, 1955–1972 (2021).
93. Maloutas, T. Travelling concepts and universal particularisms. A reappraisal of gentrification's global reach. *Eur. Urban Reg. Stud.* **25**, 250–265 (2018).

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