Chapter 2
Re-Theorising Spatial Segregation: A European Perspective

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Abstract Research on segregation is traditionally associated with studies on residential segregation and the patterns of spatial clustering of minority ethnic groups or residents with immigrant backgrounds. This chapter examines European research on spatial segregation through various social science disciplines, including urban studies, sociology, psychology, spatial and human geography. It presents the range of theoretical approaches employed to explain why people who belong, or are perceived to belong, to dissimilar social categories or to hold different identities become spatially separated from each other, and ways in which this may change. Factors that influence segregation are interrelated. A holistic, interdisciplinary approach to spatial segregation is, therefore, essential to understand such mechanisms and then design policies to counter any negative impacts of segregation. Individual and group experiences are shaped by varied contexts, whether residential, work, leisure, transport and daily encounters. This chapter examines approaches to spatial segregation from a variety of disciplinary perspectives and indicates possible directions for future research.

Keywords Residential segregation · Non-residential segregation · Ethnic segregation · Domains of segregation · Measuring segregation

2.1 Introduction

Understanding the patterns of residential segregation and spatial clustering of minority ethnic groups or residents with immigrant backgrounds has been a key focus of research on segregation in the last century. More recently, however, there has been growing recognition in the scholarship on segregation that people's social lives are not constrained to one dominant space, such as where they live. Spatial segregation might happen in various types of spaces, in living places, work, leisure, means of transport and daily encounters. Many places of everyday social practices shape

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social relations, and more importantly, can impact individual and group behaviours and experiences (Van Kempen and Wissink 2014). We can only begin to grasp the full effects of spatial separation if we concurrently examine conditions both within and outside the residential space (Van Ham and Tammaru 2016). By looking at approaches from different disciplines, this chapter aims to identify the potential for further innovations in conceptualising and measuring spatial segregation.

Some scholars conceive spatial segregation as a neutral concept, which simply refers to 'the unequal distribution of a population group over a particular area (a city, for example)' (Bolt et al. 2010: 171). Seen from this perspective, segregation simply involves the over-representation of some groups and under-representation of others in relation to their overall share in a larger social space. Spatial segregation exists in all societies, and the perfect equal distribution of various groups across specific spaces is almost impossible to achieve. Other scholars, however, argue that spatial segregation reflects wider social inequalities and should not be seen as a neutral process. Spatial separation mirrors the way societies are organised, produce and distribute resources (Arbaci 2019). Researchers who specifically explore income inequalities and socioeconomic segregation notice that it is 'an involuntary concentration of a social group in a particular area due to their disadvantaged position within society.' Consequently, it is used as an intended and deliberate strategy by the more powerful and affluent for 'conscious socio-spatial distancing' (Sykora 2009: 432).

In this chapter, spatial segregation is approached in the first sense, in a demographic manner, as an unequal representation of some groups across various spaces. Yet, some forms or thresholds of segregation might originate from unequal access to social resources, and hence represent societal inequalities. The chapter will cite sources that demonstrate this to be the case.

The focus is on the lack of physical interaction between groups classified as dissimilar at different *levels*: individual contact, working in different locations, residing in different neighbourhoods. I draw predominantly on literature published in English, which analyses inter-ethnic relations. This means that sources are inevitably *selective* and chosen to show the variety of theoretical approaches in European scholarship on spatial segregation.

2.2   Traditional Approaches to Studying Segregation

Those studies that explore residential segregation for pre-defined administrative areas, and then quantify findings using segregation indices, belong to 'traditional' approaches to research of this kind. They developed from the pioneering studies of the Chicago School, which considered the spatial dispersion of population with more recent immigration experience as an indicator of their economic integration (Burgess 1923). This model has become known as the *spatial assimilation* or *spatial integration* model and was extensively tested in studies on segregation in the USA.

Later U.S.-based research questioned the dominant role of socio-economic factors, such as income and education, in areas with a high concentration of black

American and Hispanic residents. They demonstrated that even after the mitigation of such factors, ethnic segregation remains high among lower status groups (Massey 1979). The extremely high concentration of black Americans in cities after the Second World War was a result of a 'vicious circle' of racist attitudes, individual behaviour and institutionalised exclusion (Massey, Denton 1993).

Past American research perceived the lack of residential mobility among minority populations as an indicator of the lack of integration and inclusion, and consequently, segregation was cast as a negative phenomenon. Many subsequent studies in both the USA and Europe endorsed this approach, linking the spatial concentration of some vulnerable populations with their lack of cultural assimilation and integration in the labour market, low social mobility, and other negative consequences (for review, see Musterd 2003; Phillips 2007). As Sako Musterd reflected at the beginning of the present century:

> … many studies that were carried out on both sides of the Atlantic contained an underlying philosophy that mixed neighbourhoods offer the best opportunities for integration and full participation in society (Musterd 2003: 624).

The straightforward link between integration and residential segregation has since been widely questioned by European scholars, who recognised different factors in their own context than applied to white-black segregation in the USA (Arbaci, Malheiros 2010; Bolt et al. 2010; Musterd 2003). The 'classic' spatial assimilation model does not recognise that some groups might either have different preferences or there might be structural barriers limiting their spatial mobility. Spatial dispersion might not be the desired state for some groups, and they might prefer to remain in a neighbourhood where other members of their social networks live in order to support each other, have easier access to specific services and networks, or feel safer (Peach 1996).

Such an 'ethnic minority choice' approach overtly focuses on the one side of the choice—the minority group, whereas 'white segregation'—or segregation of any other majority group—is rarely seen as problematic (Phillips 2007). While self-selection into segregation, reflecting a preference for living in more homogenous areas, is usually connected with ethnic minority or immigrant communities, research shows that it is in fact more common among the majority group, usually white and/or indigenous (Harris and Johnston 2018). Studies in the UK and Sweden demonstrate that the main driving force behind segregation between ethnic minority and majority groups is 'white avoidance', that is the preference among the majority white population to settle in neighbourhoods, which are not ethnically diverse (Andersen 2017; Kaufmann and Harris 2015).

Spatial mixing does not directly translate into social integration for migrant communities. Integration in the spheres of the labour market, education and political participation of Turkish, Moroccan and Surinamese in Amsterdam in the 1990s was found not to correspond with their level of segregation (Musterd 2003). By contrast, a study exploring immigrant concentration in Southern European countries demonstrated that de-segregation processes were neither a result of more social inclusion of immigrants nor were they followed by integration understood in terms of parity in

quality of life and housing conditions (Arbaci and Malheiros 2010). In fact, policies that support the spatial dispersal of immigrant populations might worsen their living conditions, as there is often a lower quality of affordable and available accommodation in peripheral areas. However, in many European cities, it is the inner city that is the least affordable and dominated by affluent households (Brueckner et al. 1999), a pattern that is also becoming increasingly recognisable in cities in the UK and USA due to urban regeneration and the decentralisation of poverty (Zhang and Pryce 2019; Keebone and Berube 2013).

While social segregation is usually associated with spatial separation between people of dissimilar ethnicity, race or migrant status, it often overlaps with socioeconomic divisions. Income inequalities are the driving forces behind residential socioeconomic segregation, yet the concentration of migrant communities in more disadvantaged areas, as most initially lack resources to live elsewhere, fuels further spatial separation (Tammaru et al. 2019). Although income inequalities may reduce over time, ethnic segregation can persist and even be transmitted between generations. A U.K. study demonstrated that, even after accounting for differences in socioeconomic status and childhood neighbourhood characteristics, second-generation ethnic minorities, especially Pakistanis, Bangladeshi and Africans, were still less likely than White British to reside in areas of low segregation (Zuccotti 2019).

Growing income inequality might not always lead to increased residential segregation. In the post-socialist societies of Eastern Europe, the growth of inequality was actually accompanied by more social mixing as a result of gentrification, with wealthier groups moving to areas of lower social status (Sýkora 2009). But this finding might be contingent on the spatial scale at which segregation is measured; there may, for example, have been a rise in segregation at the more fine-grained local level. Similarly, Southern European cities have rather low or moderate levels of spatial segregation between native and foreign-born groups in comparison to Northern Europe. However, ethnic minority groups have become more marginalised over time, through exclusion from homeownership for instance (Arbaci 2019). Both studies point to the different nature of segregation in Eastern and Southern Europe, which manifests more as forms of 'mosaic' or micro-segregation, harder to capture with indices of segregation.

In summary, the process of spatial segregation is contextual and driven by varied factors across different societies (Arbaci 2019). A range of factors lie behind segregation, both at the micro and macro levels and extend beyond 'choice versus constraint' arguments, such as institutionalised discrimination and hostility from the majority group or inequality of access to power and resources, including housing, education or political representation (Peach 1996). Despite that, the 'minority choice argument' has often been accommodated in popular debates, and the voluntary 'self-segregation' of some minorities has become associated with issues of security and national unity, leading to the stigmatisation of some ethnic groups (Phillips 2007). The following sections of this chapter will examine research on spatial segregation across various levels and spaces, to challenge this simplistic perspective.

2.3   Relational Perspectives: The Scale and the Distance

Research into spatial segregation during the twentieth century drew predominantly on aggregated data for predefined spatial units, such as administrative or statistical regions. Over the last two decades, academics have increasingly recognised that such borders rarely overlap with people's local social lives or subjectively constructed boundaries between communities. It could be, for example, that a community composed of a minority ethnic group spreads across two or three administrative regions but only comprises a small fraction of their population. In these instances, commonly applied segregation measures will not capture their spatial clustering. This is symptomatic of a wider problem that has become known as the modifiable areal unit problem (MAUP). Point-based data on individual residential locations are typically aggregated to areal units. The difficulty posed by MAUP is that the results of a particular segregation measure will vary depending on the size and shape of the areal units (Nielsen and Hennerdal 2017). Arbitrarily redrawing areal unit boundaries, while keeping their size the same, can lead to significantly different segregation results from standard measures. This is also true of shifting to a larger or smaller geographic scale, though this may also be the result of genuine differences in the nature of segregation at different scales.

2.3.1   Multiple Scales

Segregation at different scales may be driven by different mechanisms and might have different consequences for minority groups and for inter-group relations (Andersson et al. 2018). By analysing levels of segregation at a smaller scale, such as walking distance, we can identify areas of everyday interactions between neighbours, and the implications for social cohesion, community attachment and belonging, local support and trust, volunteering and community initiatives (Catney 2018). Easton and Pryce (2019) also argue that xenophobia and processes of White Flight are likely to be more potent at the micro-neighbourhood level: 'social connections and interactions are more likely to occur in close proximity—residents' awareness of other households is likely to be greatest with respect to those who live closest. One might therefore expect the effect of incomers on the moving decisions of existing residents to decay with distance—the impact of changes in close neighbours will likely be much greater than changes a block or two away.' There is also evidence that homophily—the tendency for movers to be drawn to areas with a high proportion of people with the same ethnic/social characteristics as one's own—is more potent at the local scale (Bakens and Pryce 2019).

Meanwhile, degrees of segregation on a larger scale might represent processes at the level of an institutionalised community environment, such as local councils responsible for schools and services, or even larger government or regional zones

with their own public transport and budgeting (Reardon et al. 2008). In such cases, segregated groups have lower chances to meet each other and share activities.

Work on more spatially defined segregation measures has laid foundations for research by analysing it at multiple scales simultaneously. Using a spatial theory information index developed by Reardon and O'Sullivan (2004)—which computes spatially weighted and scale sensitive segregation measures—a study by Reardon and colleagues (2008) demonstrated how micro- and macro-level segregations behave differently, although they still might be interlinked. They computed micro/macro segregation ratios for 40 metropolitan areas in the USA, in the period 1980–2000, which revealed that micro-scale segregation was in some areas largely due to macro-scale segregation between white and black populations. They concluded that this relationship between levels of segregation is 'a distinct dimension of segregation patterns than that measured by the segregation level alone' (Reardon et al. 2008: 500).

However, as Harris (2017) explains, past research has not separated the higher-level segregation from divisions at lower levels, and the former is automatically included when calculating the degree of segregation at the finest levels. He advocated disaggregating the traditional segregation indices into a series of localised values using multilevel modelling. By employing this technique, a study in Leicester, UK, contradicted many previous findings by revealing greater levels of segregation among residents with Indian ethnicity at the largest rather than the smallest measured scale (Jones et al. 2018).

Multiscalar research provides various methods to measure degrees and levels of segregation and the interconnections between them. A study based on individual-level register data in the Netherlands treated the scale as a continuous variable, assuming that the closest areas—the immediate neighbourhoods—are 'the keystones that drive spatial patterns at both smaller and larger scales' (p. 1069). They generated bespoke neighbourhoods (see *egohoods* below) at 101 spatial scales and created profiles of ethnic exposure for each 100 m x 100 m cell (Petrović et al. 2018). This innovative approach showed how different scales of ethnic exposure are affected by the city's form and layout, affecting issues like the level of polycentricity and fragmentation. They also detected 'social cliffs' in the segregation continuum, with sudden changes in ethnic exposure between majority to non-Western minority populations. As such, this research has brought together the three concepts central to current research on segregation: multiple scales, the centre and the border. The latter two are discussed further below.

2.3.1.1   The Centre: Egohoods

Researchers studying community social relations and the social effects of neighbourhood attributes emphasise that people perceive themselves as centres of the neighbourhood. They coined the term *egohood* to describe a concentric area around someone's residential location. It is an individualised, egocentric neighbourhood (Andersson and Malmberg 2015). More importantly, they argued that individual

households do not belong to a single meaningful area, but to multiple egohoods serving numerous functions at the same time: school catchment areas, housing estates, shopping and leisure time areas, a political ward and larger municipal area (Hipp and Boessen 2013).

Egohoods have been defined in multiple ways:

(1) as a pre-defined radius, where an individual or address is taken as the central point (Reardon et al. 2008; Bakens and Pryce 2019);
(2) in relation to a density of population around a person/household, i.e. using the number of nearest neighbours—the k-nearest neighbour method (Malmberg et al. 2018);
(3) using specified travel time buffers to account for access to local services and resources (Petrović et al. 2018).

Still, the process of circling one-size-fits-all individualised neighbourhoods has limitations. In reality, they might be irregular in shape, vary in size and form for different groups and depend on activity patterns, neighbourhood attachment and social position (Van Gent et al. 2016).

Such a fine-grained statistical analysis of segregation is only possible if data are available at the individual or very small-scale level. Only then can data for specific points or tiny areas be flexibly aggregated into egocentric neighbourhoods. Researchers have usually computed segregation indices for egohoods of different sizes, thereby allowing for the analysis of segregation at multiple scales simultaneously.

Two separate studies in Sweden—based on register data for 1990, 1997, 2005 and 2012—demonstrated that segregation was both higher at the smaller-scale egohoods and had increased over time (Malmberg et al. 2018; Nielsen and Hennerdal 2017).[1] While segregation was on the decline according to the results computed with the dissimilarity indices, the analysis for smaller egohoods exposed emerging new clusters of non-European migrants in areas of previously lower segregation (Malmberg et al. 2018). Lower segregation at the larger scale areas might be the result of housing policies as shown by a comparative study in Belgium, Denmark, Netherlands and Sweden (Andersson et al. 2018). While, at the smallest scale areas, patterns of segregation were quite similar among the four countries, the Belgian results differed at the larger scale. Belgium was the only studied country that did not use housing dispersal policies to manage refugee settlement and this may account for the disparity.

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[1] Nielsen and Hennerdal (2017) undertook a slightly different approach to measuring egocentric segregation: the share of immigrant population in the k-nearest area was compared to the share in the larger population K.

2.3.2   The Periphery: Borders

An important limitation of simple distance-based egohood approaches is that an individual may not, however, perceive themselves to be at the centre of a neighbourhood—they may recognise that they live at its periphery. The disciplines of criminology extend the pattern outwards by exploring the importance of liminal areas, the peripheries and boundaries of a community. These include both administrative borders and physical barriers, and studies can demonstrate how their existence can often translate into deviant or illicit behaviours. Borders between communities might be physical, such as streets, rivers, rail tracks, unoccupied land or walls, yet some might be 'merely' symbolic and subjective (Legewie 2018).

The presence of environmental barriers is often associated with different blends and representation of racial groups, resulting in a higher level of spatial segregation in a given area (Noonan 2005). Patterns of behaviour can be influenced by proximity to environmental barriers, as residents are less likely to interact with each other and less attached to neighbourhoods (Hipp et al. 2014). A study on how public space is used by Protestants and Catholics in Belfast also revealed how physical boundaries, including the Peace Walls, stimulated further self-segregation. They encouraged people to travel in ways that avoided contact with members of the other group (Abdelmonem and McWhinney 2015). Finally, inter-communal violence can cluster around such territorial boundaries, if they separate gangs and groups, which retain hostile relations with each other (Brantingham et al. 2012).

Studies have employed the 'aerial wobbling technique' (borrowed from ecology) to detect steep changes between neighbourhoods and identify areas of meaningful separation between social groups. As argued by Legewie (2018), past segregation research largely ignored areas of transition between relatively homogenous populations and spatial inequalities within neighbourhoods. Dean and colleagues named such boundaries 'social frontiers', as they 'represent cliff edges in the complex landscape of segregation' (Dean et al. 2019: 272). As residents who live in close proximity to a social frontier are likely to be located on the periphery of their community, they are not so strongly governed by the mechanisms of group social control. Such boundaries often do not overlap with any physical barriers but are rather perceived subjectively, reflecting sudden changes in population composition by ethnicity/race and socioeconomic status, or a combination of each.

It is possible to detect such boundaries in instances where low-level geocoded data have yet to be extensively applied. Using incident-level crime data, Legewie (2018) analysed the relationship between racial neighbourhood boundaries and violent crime in Chicago. In another study, Legewie and Schaeffer (2016) explored antisocial behaviour in so-called 'transition/contested zones' in New York using geocoded data from emergency calls. In Sheffield, UK, Dean et al. (2019) found higher levels for various crimes, such as violence, burglary, shoplifting and vehicle crime, in neighbourhoods adjacent to social frontiers than in neighbourhoods alongside administrative borders. Chapter 13 of this book describes further research on 'social frontiers'.

2.4 Beyond Residential Segregation

The focus on residential segregation can be attributed to the fact that individual life choices and social lives were once more dependent on longer term residence in particular neighbourhoods. A few decades ago, people were more likely to spend their entire lives in one or two areas rather than growing up in one neighbourhood and then move to another. The neighbourhood, although still important, is not the only area where people spend their time. For those who are less mobile, the neighbourhood might indeed be the main space that shapes their daily activities, providing social support and networks. For other people—especially those who spend less social and leisure time in their immediate locality—it could be a less important space. The pitfalls of focusing on residential segregation were explained by Ronald Van Kempen and Bart Wissink:

> People have multiple identifications and a varying part of these relate to the neighbourhood. (…) they receive stimuli from a lot of different people in numerous settings, of which the neighbourhood is only one. We should therefore not only study people as residents of neighbourhoods, but also as workers, visitors, long-distance travellers, shoppers, commuters, and so forth. These different roles potentially support new meetings and new identifications beyond the residential neighbourhood. At the same time, we should have special attention for variations between groups: some people might be "more" neighbours than others (Van Kempen and Wissink 2014: 103).

Van Ham and Tammaru (2016) urged social scientists to study multiple domains of segregation simultaneously, considering the linkages between them, and how they change over time. They identified five major domains for the study of ethnic segregation: home, leisure, work, school and travel. Such a multi-domain approach—they stressed—is vital to develop relevant policies to counter the negative effects of segregation as these might not be possible if we only concentrate on the residential settings. The recognition of a multiplicity of places where people develop social networks is not new in urban studies; however, such research could flourish given more availability of data beyond the place of residence (Van Kempen and Wissink 2014).

2.4.1 School Segregation

Schools—like neighbourhoods—are spaces of resources: physical facilities,[2] human capital from teachers and other staff, and social capital from other students. If the allocation of resources across schools is correlated with their racial composition, segregation will affect students' outcomes (Reardon and Owens 2014).

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[2] School Segregation has received a lot of attention in past decades in the USA, where laws enforced separation between white and black pupils until 1954 (i.e. Supreme Court's *Brown v. Board of Education* decision).

We would expect that ethnic segregation at the *primary* school level[3] to be related to the composition of the school catchment area. Yet, various European studies demonstrated that this might not be the case. An analysis based on 2001 School Census and 2001 Population Census in the UK confirmed a high correlation between school and residential segregation (Burgess et al. 2005). It was, however, higher in the case of some minority groups, such as Indian, Pakistani and Bangladeshi. Interestingly, the deprivation level of the local education area was accompanied by segregation of Black Caribbean pupils only, but not by Indian.[4] However, another study found no relationship between school segregation and school deprivation (measured by the number of free school meals; Burgess, Wilson 2005).

Free school choice that permits self-selection by some groups into more desirable schools leads to higher school segregation. The introduction of an open enrolment system in Sweden has allowed more privileged and better-off parents to choose schools outside their area of residence. A shorter distance to school was more important for less wealthy families, single parents and minority households (Malmberg et al. 2014). A study in Amsterdam revealed that some parents even decided to move to less ethnically diverse school catchment areas (Boterman 2013). Similarly, a Danish study conducted in Copenhagen demonstrated that primary school segregation would be lower if students attended only schools in their catchment area (Rangvid 2007). The gap between ethnic segregation in residential areas and higher levels of school segregation was largely due to parental socioeconomic status. A more recent study in Copenhagen showed that despite an overall slight decrease in segregation across state-run schools, segregation increased across the private school sector (Skovgaard Nielsen and Andersen 2019). This pattern might not be universal and depends on the size of the minority group. In countries with lower immigration, like the Czech Republic, the concentration of pupils without Czech citizenship in schools in the period 2005–20013 was largely an outcome of higher regional concentration (Hasman et al. 2016).

Another common question raised in the school segregation literature is its effect on performance. Pupils with migrant backgrounds, such as Turks in Germany, fare worse in schools with high concentrations of students with similar origins. This could be due to their undertaking education in schools with less resources and levels of support (Söhn and Özcan 2006). In Sweden, in regions with high or medium levels of visibly non-European ethnic minorities, pupil performance substantially varied across schools (Andersson et al. 2010). This was partially explained by students' socioeconomic status, but many inter-school variations remained unexplained (Andersson et al. 2010). A U.K. study demonstrated that the school effect might be very different across migrants from different backgrounds. Indian pupils

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[3] The particular structure of the educational system and institutional discrimination might be to blame for school segregation at higher levels. At varying transitional stages, minority students might be encouraged to select schools with specific profiles, e.g. of vocational not academic profile (Söhn and Özcan 2006).

[4] A Birmingham based study revealed that higher levels of school concentration among Black Caribbean pupils are partially explained by their preference of faith schools (Harris and Johnston 2017).

in Leicester achieved good test scores in all types of school, while Pakistanis in Bradford had higher scores only if they attended schools with lower segregation and more white students (Johnston et al. 2007).

When it comes to measuring levels of segregation, studies of this kind usually calculate an index of dissimilarity across educational areas using data for schools as smaller units (i.e. evenness of distribution of a minority group across schools within a given education area). An index of isolation is also used to explore the probabilities of meeting students with the same ethnicity or studies calculate percentages of ethnic minority groups within schools. Leckie and Goldstein (2015) used a multilevel random-coefficient model to study multigroup segregation among London secondary schools. They found that segregation levels between cohorts of White, Black, and Asian pupils remained stable over a decade, 2001–2010 (see multiscale segregation, Chap. 10).

2.4.2 Workplace Segregation

The workplace constitutes an important arena for social relations and inter-group contact outside the residential neighbourhood for adults active in the labour market (DiTomaso et al. 2007). Residential and work lives might be interconnected through different mechanisms:

(1) the proximity of both locations resulting in the similarity of co-workers, as people might prefer to work close to where they live;
(2) the network effect: when a neighbourhood support-base may facilitate finding employment through social networks (Granovetter 1995; Ioannides and Loury 2004);
(3) discrimination against immigrant/minority population living in stigmatised areas of high concentration, pushing them into jobs with a high proportion of migrant workers (Strömgren et al. 2014).

These three effects will vary across groups depending on their minority/majority status, gender and socioeconomic position. Some groups such as recent migrants may rely more heavily on local networks or prefer to work closer to home due to caring responsibilities.

One of the main questions in workplace segregation research, as in school-based studies, is the level of correlation with residential segregation. Do people living in ethnically segregated neighbourhoods also work in ethnically segregated workplace areas? A U.S. study has revealed that although workplace segregation is lower than residential segregation, both were in a strong, positive correlation (Ellis et al. 2004). The same was found in Sweden (Marcińczak et al. 2015), meaning that immigrants living in areas of higher segregation were also more likely to work in more segregated workplaces. This was more apparent for immigrant women, who might depend more on residential networks. Gender differences in workplace segregation did not exist for sectors requiring higher qualifications, like education (Tammaru et al. 2016).

Studies in Sweden and Germany have shown that workplace segregation between immigrant and non-migrant workers was common across all industries, but more pronounced in low-skill intensive sectors, such as agriculture, construction or small services (Åslund and Skans 2010; Glitz 2014).[5]

Status inequalities within the workforce will depend on, but also strengthen, existing structural relationships within society (DiTomaso et al. 2007). Segmentation of the labour market along ethnic lines is considered to be the driving force behind workplace segregation and 'is unlikely to be the result of a completely voluntary sorting process' (Åslund and Skans 2010: 489). An analysis based on linked employer–employee data in Sweden (1985–2002) demonstrated that the lower economic status of migrants was one of the most important factors explaining the high concentration of immigrants in some workplaces. A similar analysis for Germany (1975–2008) revealed that although ethnic workplace segregation declined with time spent in the labour market, it still remained high for some immigrant groups, such as those from Asian countries or Turkey, and very low for those from other European countries such as Austria (Glitz 2014).

2.4.3 Other Domains of Segregation

Spatial segregation is not limited to residential and institutional spaces, such as schools and employment. Not all people are employees: some are self-employed working off-site, some work at home taking care of the family, some are unable to work due to health conditions, unemployment or retirement, or are too young to work. For such groups, segregation in other activity domains, where they socialise and spend leisure time, might be more important. Such out-of-home and out-of-work segregation between Estonians and Russians was a topic of study in Tallinn, Estonia (Kamenik et al. 2015; Kukk et al. 2019). Based on the Estonian Time Use Survey for 2000 and 2010 and qualitative interviews, these studies demonstrated that although both groups were engaged in similar types of leisure activities, they practised them in different places and different times. Leisure time segregation was connected to residential segregation, as most participants claimed to have spent free time in the vicinity of their homes. Hence, although the study originated from the need to concentrate on issues other than the domestic and employment domains, it also demonstrated the significance of the neighbourhood as a site for inter-ethnic encounters, translating into segregation in leisure time spaces.

The level of ethnic segregation across voluntary organisations was indirectly a topic of Achbari (2015) study. It surveyed 400 participants in 37 organisations in

[5] Segregation was defined in terms of levels of separation between workplaces, i.e. minority or majority workers not working together in one registered unit (so the actual daily exposure was not tested). Glitz (2014) also computed a conditional segregation measure, which accounted for skills level of workers.

the Netherlands to explore whether homogenous Turkish or ethnically mixed organisations supported higher levels of political engagement. The study found that both attracted participants who were already more politically engaged. A comparative study of associations from Mannheim, Germany, Enschede, the Netherlands and Aberdeen in Scotland (van der Meer 2016) surveyed 3166 active participants in 645 organisations of different ethnic make-up. It revealed that more trusting and tolerant citizens participate in organisations with higher proportions of minority ethnic groups, which could be seen as a form of self-segregation.

In summary, compared with 'traditional' segregation research on residential areas, studies in these other domains have not developed innovative measures to assess spatial segregation. Instead, segregation has been conceptualised as the exposure to minority/majority group members and consequently systems to monitor more complex patterns of separation/contact—such as people working at different floors, coming to different meetings, etc.—have yet to be devised.

2.5 Segregation at the Micro-Ecological Scale

There is another level of segregation, which has not been considered by research based on multi-scalar and multi-domain perspectives: the individual. Psychological research on the so-called micro-ecological scale of segregation, or micro-segregation, has focused on 'the everyday, interpersonal interactions between people in informal settings' (Tredoux and Dixon 2009: 761). This research has argued that even in settings, which have low levels of segregation at home or work, people might still avoid contact with one another in shared everyday spaces. A great deal of micro-ecological research has been conducted not only in educational spaces, such as university dining halls, university stairs/sitting areas, university theatres or classrooms, but also in various urban public and leisure spaces, such as public transport, parks, squares and streets, beaches and nightclubs. Researchers have recorded and analysed the spatio-temporal position of individuals, such as sitting patterns, and the extent of interactions between individuals perceived to represent visibly different groups.

A micro-ecological approach to segregation arose from the rich research tradition on inter-group contact in psychology, starting with the influential work of Gordon Allport and his contact hypothesis (Allport 1954). This theory posits that prejudice can be challenged and reduced by positive face-to-face interaction if the status of involved members of different groups is equal and they have a common goal to pursue. Micro-segregation research in psychology has its origins in recognising the importance of space for daily human interactions, and that contact without a contextualised spatial layer would become a merely neutral act:

> … space is highly significant for human interaction; we interact rather differently in the "spaces" of funerals and weddings. Various kinds of space either enable or constrain particular kinds of action. Places have specific meanings for people; they resonate with symbolic and emotional significance. We all carry with us various senses of "place identity". Spaces

are anything but mere inert backdrops, as we may immediately recognise in "home" and "away" sporting records. When space is allowed to disappear so too do two other features integral to the analysis of space: bodies and temporal sequences. When bodily processes, space and temporal sequencing are faded into the background, then "contact" just becomes an apparently neutral event, hollowed out from the very bodily practices which constitute it and which endow it with different meanings (Foster 2005: 498).

Psychologists argued that macro-level segregation, albeit important and driven by policies and other macro-level mechanisms, cannot explain how people interact with each other on a daily basis, and macro-scale research misses the 'boundary processes unfolding within the most intimate domains of everyday life' (Tredoux and Dixon 2009: 774).

A systematic review conducted by Bettencourt et al. (2019) neatly summarises different, yet inter-linked mechanisms explaining why people self-segregate at the micro-scale. First, the holding of negative attitudes and stereotypes underpins stronger in-group identification and higher perceived threats to the holders' own identity and values. Such individuals are more likely to feel anxious and uncomfortable when meeting dissimilar/other/minority group members (intergroup anxiety); and as a result, may wish to move only within so-called 'spatial comfort zones', which are ethnically or racially homogenous and provide them feelings of safety. This behaviour might finally lead to the development of exclusionist social norms promoting and strengthening micro-segregation patterns.

A micro-ecological perspective does not imply that prejudice operates just at the individual and every day, banal level, and that society is free from racism or other forms of structural inequalities. On the contrary, it recognises that 'space is heavily implicated in persisting forms of oppression such as racialisation' (Foster 2005: 496). Racial evaluation is an 'activity that people do together' (Durrheim, Dixon 2004: 632), and such repeated social behaviours of racial exclusion and micro-segregation represent broader norms and practices operating in a given society.

The main methods of measuring the micro-ecology of segregation involve the observation and mapping of locations. These are then often quantified with indices of segregation to enable researchers to compare how they change over the time involved in data recording. For example, Dixon and Durrheim (2003) plotted the distribution of white and black beachgoers by taking a series of aerial photos over a period of 10 days (two photos a day), then mapped the location of everyone present at the beach and marked whether they were white or black. For each observational time unit, they computed dissimilarity and interaction indices. In a similar fashion, a research team conducted a study on sitting patterns in a multi-ethnic cafeteria (Clack et al. 2005). They recorded specific sitting positions during different lunch times for white and Asian customers on a diagram divided into six sub-sections and then computed the level of segregation through spatio-temporal clustering patterns.

The work of South African psychologist John Dixon and Kevin Durrheim, and specifically their 2003 beach study, demonstrates how segregation in one type of space operates at multiple levels: (1) individual/micro (no contact between any white and black beach users), (2) groups occupying different parts of the beach (sectoral

segregation) and (3) white users responding to the influx of black users by withdrawing from the beach space altogether.[6] Because segregation was institutionalised across all spheres of life in apartheid South Africa (1948-1994), they coined the term 'informal segregation' to describe a form of segregation that operates despite the absence of legally enforced intergroup boundaries (Dixon and Durrheim 2003).

Research on the micro-ecology of segregation has spread to other countries and disciplines. In Chicago, USA, a study conducted on train seating patterns also revealed that segregation persists in everyday life despite the ending of enforced segregation in the 1960s (Swyngedouw 2013). Americans were more likely to sit close to and interact with passengers who were similar to themselves in terms of marks of class and race. A longitudinal study of classroom seating patterns among Protestant and Catholic pupils in three integrated secondary schools in Northern Ireland also demonstrated that segregation is persistent over time, even after formal barriers are removed (McKeown et al. 2016). When asked in a questionnaire, pupils also expressed their own group preferences for extracurricular activities, such as playing or eating. The study of cafeteria sitting patterns in a cafeteria affiliated to a metropolitan university located in a city in the north-west of England—a multi-ethnic and international setting, supporting intercultural mixing—also displayed patterns of micro-segregation between White and Asian students (Clack et al. 2005). Pre-existing social networks, own group preferences and language barriers might be contributing factors here.

2.6 Time-Space Geography of Segregation

While studying inhabitants of gated communities in London, England, Atkinson and Flint (2004) discovered that wealthy residents were not only isolated from other Londoners behind their gates and security technologies but they were also separated from others when travelling to places of work and leisure, using 'tunnel-like trajectories separating class and status categories' (p. 890). They dubbed this form of spatial separation 'space-time trajectories of segregation.' Years later, with the expansion of the 'new mobilities' paradigm—the shift from studying static aspects of social life into studying movement of people, objects and ideas (Sheller and Urry 2006)—geographers have turned attention to the dynamic side of segregation, which is in constant flux as people navigate their daily lives and move between locations (Shen 2019).

While the modifiable area unit problem (MAUP) has been the main concern for residential segregation scholars, temporal geographers face a related challenge known as the Uncertain Geographic Context Problem (UGCoP):

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[6] Additionally, a potential contact was interpreted differently by white and black South Africans—by whites as an 'invasion' and 'being pushed out of space', while black people read this behaviour as an 'avoidance' and white people 'moving away' (Durrheim and Dixon 2004).

This is the problem that findings about the effects of area-based attributes could be affected by how contextual units or neighborhoods are geographically delineated and the extent to which these areal units deviate from the "true causally relevant" geographic context (…) It arises because of the spatial uncertainty in the actual areas that exert contextual influences on the individuals being studied and the temporal uncertainty in the timing and duration in which individuals experienced these contextual influences. The UGCoP is a significant methodological problem because it means that analytical results can be different for different delineations of contextual units even if everything else is the same. It is perhaps a major reason why research findings concerning the effects of social and physical environments on health behaviors and outcomes are often inconsistent (Kwan 2013: 959).

The temporal and dynamic aspects of segregation are approached differently in recent studies. The main approaches involve: analysing segregation across an entire *activity space* of a person during a day/week or computing segregation measures for *different times* of a day/week for various spatial units. They are briefly discussed below.

2.6.1   Activity Space Segregation

As with micro-segregation research, an individual is the key unit of analysis in the activity space approach to segregation. However, exposure to other people is treated as a *person-based measure* not one of place (Kwan 2009). A person is followed across multiple spaces and may spend time in different neighbourhoods or even cities/regions, so their exposure to different populations varies over time.

Wong and Shaw (2011), using travel diary data, computed an exposure index for residents' activity space. In contrast to the traditional exposure index, a residential unit was not the base for calculations, but rather all locations visited by the subject, which were also weighted by time spent in each area visited. The limitation of the method, according to the authors, was reliance on census data for the areal units included in the activity space. It would provide more accurate results if the information on the actual exposure and interactions with other residents could be obtained. Mobile positioning data for city districts, along with data on mobile user age, gender and preferred language of communication, were employed to analyse segregation between Estonians and Russians in their overall activity space (Silm et al. 2018). Russian speakers were found to visit fewer locations, while the Estonians' spatial behaviour was more random. Older Estonians, however, were the most likely to visit more Russian-dominated districts, suggesting higher ethnic segregation among younger age groups.

Such an approach does not, however, overcome the Uncertain Geographic Context Problem. Whilst it does acknowledge that residents are exposed to different socio-demographic contexts as they move throughout the day, the contexts themselves are also dynamic and fluctuate over the daily or weekly cycle (Vallée 2018). Park and Kwan (2018) proposed a measure called the 'individual level spatiotemporal proximity index' (i-STP index) to capture the temporal variation in segregation levels. Like egohoods (see above) it uses the method of k-nearest neighbours to define a

person-specific neighbourhood and it is allowing for changes over time. The measure requires detailed geolocation of all or a sample of 'neighbours' (people met through the day).

2.6.2 Segregation Over Time

Researchers in transport and mobility studies have focused on how segregation changes over time. In another study in Tallin, Estonia, ethnic segregation was computed for different hours of a day, different weekdays and seasons on the basis of mobile phone data (Silm and Ahas 2014). It found that Estonian and Russian speaking residents were more likely to interact with each other during working times and days.

Studies in France and Sweden also revealed lower levels of segregation during daytime than at night. Using a detailed daily travel survey around Paris, Le Roux and team (2017) computed segregation indices for a 24-hour period across different educational and occupational groups. The probabilities for these groups to be present simultaneously were the lowest between low and high-status groups, but lower-middle and higher status groups were more likely to interact during the day than night. The mobility of upper-class members was the most fluid over 24 h, providing them more opportunities for interaction with groups outside their neighbourhood (Le Roux et al. 2017). In a study in Sweden, even smaller units of time were used to explore spatio-temporal segregation. Östh et al. (2018) analysed the trajectories of phone users and their exposure to residents from areas with dissimilar socio-economic status, over a period of 288 five-minute segments (24 h). Even though everyday mobility decreases spatial segregation, it remained quite high for residents from either very poor or very wealthy peripheral areas.

Other research conceptualised daily segregation as the separation between flows of people travelling to/from work. Farber and colleagues (2015) developed a measure called 'social interaction potential' based on the space–time prism framework. The study used origin–destination data between places of residence and work, for white, black and Hispanic populations in Detroit, USA. They identified locations with the highest 'interaction potential' for intra and inter-racial interactions during the day and the night. The study showed that a 'potential' for segregation depends on the time devoted to travel and that more population mixing happens when work commute time is longer. The 'interaction potential' model was further advanced in a British study in London on spatial segregation between occupational groups (Shen 2019).[7] It highlights that high segregation between large employers and casual workers during the day time is largely due to different commuting patterns.

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[7] Commuting flows were conceptualised as networked systems; the 'flow-based spatial interaction potential' between two places measures the cumulative potential of the spatial interaction between the flow occurring between both places and its neighbouring flows happening between any two places (Shen 2019: 13).

In summary, these studies have placed more emphasis on how segregation might change over specific periods of time, such as a day or a week, or across various activity spaces in the city. The remaining limitation is that spatial proximity has been often equated with an interaction between people who are different in terms of ethnicity/race, age or socioeconomic status.

2.7 Geographies of Encounter and Breaking Down Segregation

Research on segregation and contact in human geography arose from criticism of the so-called 'cosmopolitan turn' in urban geography, which celebrated multicultural cities as sites for ethnic mixing, everyday civility and 'living with difference' (Valentine 2008). This research approach has further evolved into the analysis of different spaces of encounter and closer examination of conditions for so-called 'meaningful contact,' which transforms previously held prejudices and improves social relations between groups (Mayblin et al. 2016). While the micro-ecological research explores spatial patterns of distribution for all individuals present in given small-scale locations, in the spaces of encounter approach the emphasis is on the quality of contact which occurs between representatives of dissimilar social categories, and whether the benefits of such contact might be extended beyond this space (Matejskova, Leitner 2011).

Geographies of encounters research draw inspiration from symbolic interactionists, such as Erving Goffman or Lyn H. Lofland, and their micro-sociological analysis of everyday behaviours in public space (Swyngedouw 2013). Like psychologists working on the micro-ecology of segregation, geographers have also been influenced by the Allport's (1954) work on prejudice and inter-group contact. The 'encounter' has been conceptualised as a specific form of contact, 'where difference is somehow noteworthy' (Wilson 2017: 464). Although the word segregation is not often directly used in geographies of encounter literature, these studies de facto explore how segregation might be eliminated and more just societies created (Phillips 2015). They try to understand:

> '… the link between segregation, isolation and social mixing, and the value of interventions that commonly aim to build "communities of place" through a focus on neighbourhood-based encounters with difference (…) [They focus] on the productive intersection of strategies for re-distributional justice, in the face of inequality, the political recognition of unheard voices and the value of opportunities for social encounter between diverse groups for breaking down (unequal) social and spatial segregation' (Phillips 2015: 337, 340).

Spaces that have the potential to lower segregation and bring people together were termed 'contact zones.' Askins and Pain (2011)—drawing on the research of Mary Louise Pratt, a language and linguistics scholar—examined how friendships can be formed between children from the British majority and asylum seekers in the north of the UK. A participatory, art-based research project explored 'productive tensions,'

which could be then scaled up to a wider community level. A study in another northern city further developed the concept of the 'contact zone' by drawing on the work of sociologist Boaventura De Sousa Santos on intercultural communication (Mayblin et al. 2016). This study analysed activities within an interfaith project for Jewish and Muslim youth. It argued that a zone where meaningful contact takes place 'is not a single space of encounter that occurs once. It is a "zone" rather than a space of encounter precisely because contact must occur on multiple occasions, in multiple sites, and with a variety of intensities in order to become "meaningful"' (Mayblin et al. 2016: 216). Both studies concluded that de-segregation is not just about bringing dissimilar groups together via policies of ethnic mixing, but the effectiveness of the 'contact zone' depends on skilful facilitation of the encounter, so that communication and intercultural translations are possible (Askins, Pain 2011; Mayblin et al. 2016).

In contrast with methods of micro-ecology in segregation research, contact and spatial isolation are not quantified with indices of segregation and statistical methods are also rarely used. Many studies deploy ethnographic observations alongside individual in-depth and focus interviews. For example, in a study on encounters between immigrants and German residents in an estate in eastern Berlin, researchers participated in community life through volunteering and attending neighbourhood councils (Matejskova and Leitner 2011). Observations of the conduct and habits of passengers were used in a study of the everyday encounters on a public transport bus in Birmingham, UK (Wilson 2011). A British-Polish study by Piekut and Valentine (2017) based on survey data in Leeds and Warsaw explored the relationship between contact in different types of spaces and attitudes towards minority ethnic groups. The study showed that contact does work differently not only in varied spaces but also in the two national settings. In Leeds, encounters in social spaces (such as community and sports clubs, volunteer organisations, etc.) correlated more closely with tolerance, whereas encounters in eating spaces (i.e. cafes and restaurants) were more strongly linked with positive attitudes in Warsaw.

2.8   Conclusions and Future Directions

Spatial segregation has been studied in social sciences from two different, but equally important, perspectives—*place-based* and *person-based*. While the first can provide a better understanding of spatial separation *within* specific types of spaces, the latter complements the ecological approach with insights into individual-level segregation and how it varies across time and space. It might be possible that whilst some people live and work in unsegregated areas, yet they continue to move in 'space-time trajectories' of segregation (Atkinson and Flint 2004). As such, segregation is not solely an attribute of places or spaces, but it also a characteristic of individual activities.

In summary, we could divide the approaches into four groups, as depicted in Table 2.1:

Table 2.1 Summary of conceptual approaches to spatial segregation

Measure	Conceptualisation of segregation	
	Place-based	Person-based
Static	Residential, workplace, school and other domains of segregation	Egohoods Social frontiers Spaces of encounter
Time-variant	Temporal and flow-based segregation	Micro-ecology of segregation Activity space segregation

Source own elaboration on the basis of literature

(1) *Place-based segregation using static measures of segregation*—studies exploring residential segregation, which were followed by studies employing the same spatial segregation indices for other spaces, such as school or workplaces.

(2) *Person-based segregation using static measures of segregation*—studies that approach segregation by considering the position of an individual in a given space.

(3) *Place-based segregation using temporal measures of segregation*—studies recognising that segregation is not static across any space and varies over the period of a day, week or a year.

(4) *Person-based segregation using temporal measures of segregation*—studies exploring segregation from a perspective of an individual and how its temporal dynamic operates.

The increasing availability of geocoded data at the individual level, coupled with new, rich sources of (big) data, could bring further methodological and conceptual innovations for the joint study of place- and people-based segregation. Cross-disciplinary knowledge exchange has been the bedrock for many methodological or conceptual innovations in social sciences. I conclude this chapter by highlighting potential creative connections between the above approaches and indicate possible directions for future research.

Residential segregation no longer plays such a dominant role in segregation studies and isolation patterns in other types of spaces are increasingly explored. However, the relationship between residential segregation and separation in other domains remains an important topic for enquiry. Some studies demonstrate its conditional effect on segregation within schools, workplace and other domains, whilst others point to different factors and mechanisms that shape non-residential segregation. Socioeconomic deprivation and the lower status of minority groups are recurring causes of segregation, coupled with exclusionary policies, structural racism and individual prejudices among majority or more privileged groups. Studies comparing segregation across more than two types of spaces do not yet exist as far as I am aware, due to the lack of suitable data, which would need to provide information on segregation at the domestic, work and leisure patterns for the same individuals. It would be interesting to see in future studies not only how segregations in various domains interlink

and correlate but also whether the implications of segregation in one space resonate elsewhere, i.e. impact behaviours or inter-group relations.

The complex methodologies developed in studies of residential segregation patterns, such as the focus on multiple scales, the centre (conceptualised as *egohoods*) and the periphery of neighbourhoods (the role of physical barriers and symbolic borders), have yet to be applied to the study of segregation in other domains. In an employment study, for example, most research would either compute segregation indices for workplaces or examine levels of exposure to minority or immigrant workers. As within neighbourhoods, there might be multiple scales of segregation within workplaces: cubicles, offices, floors, buildings and locations, etc. Smaller scale and work activity space segregation within employment could be more easily studied with qualitative methods, such as observation, or by employing some smartphone-based tracking technology, if such was permitted by a large enough sample of individuals. Multiple scales of segregation across other life domains is yet another topic for social scientists.

Micro-ecology, activity space and human geography studies have concentrated on the segregation between individuals during everyday interactions. However, they often rely on a small number of observations. Meanwhile, temporal geography, transport and mobility studies use large datasets, tracking daily routes of residents, and these disciplines have developed complex measures of segregation that acknowledge its dynamic, not static nature. But there has not been enough attention to the quality of such interactions in individual activity spaces. Studies of human geography recognise that some daily, fleeting interactions might have little meaning and may not even have been noticed; such contact might be limited to an exchange of civilities. The visualisation method of socio-spatial isolation as presented by Lee and Kwan (2011), which integrates data on spatial movements with information on the quality of encounters, is a promising perspective. It may yet prove difficult to apply without asking participants to assess their daily interactions. Mobile surveys that use dedicated survey apps, collect geolocations and ask questions about daily experiences might offer another inspiration for this area of study.

Finally, studies on segregation across various domains have determined that a choice of the majority group to avoid spaces perceived to have a too high representation from minority groups is often a driving force of spatial separation. Public and political anxieties about 'self-segregating' minorities, which view the high segregation of some groups as undesirable and a failure of local policies aiming to de-segregate them (Phillips 2007), are often not substantiated (see, for example, U.K. evidence discussed in Catney 2018). A more comprehensive discussion on the dynamics of ethnic segregation across various types of spaces and times could help reduce such bias in public debates. The interdisciplinary literature review in this chapter supports such efforts.

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