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Deurloo, M.C.; Musterd, S.; Sleutjes, B.; Slot, J.

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7. Co-location of different population categories. Micro-level segregation dynamics: the case of Amsterdam

Marinus Cornelis Deurloo, Sako Musterd, Bart Sleutjes and Jeroen Slot

7.1 INTRODUCTION AND QUESTIONS

Spatial segregation, the separation of population categories that differ from each other across space, is a returning topic in societal, political, and academic debates. These debates refer to various population categories that distinguish themselves from each other in demographic, economic, cultural, or social terms. Two dimensions of segregation stand out: 'social class' and 'place of origin'. The first dimension, of social class inequality, addresses gaps between professional classes; the affluent and the poor; debates on social inequality and its translation into social spatial segregation and urban social problems are illustrative (Bischoff and Reardon, 2014; Hamnett, 2019). The second dimension focuses on population categories based on their place of origin, and frequently stretches to debates on integration, racial discrimination, multiculturality, and assimilation, but also associates with issues related to fundamentalism, religion, and nationalism (see Rodríguez-García, 2010; Modood, 2017). Recent research in US cities actually shows that social class and place of origin are far from independent of each other; they are actually becoming increasingly interrelated (Jargowsky, 2020).

Differentiation and integration processes are manifest in various contexts, and cover many domains of life, including the labour market, education, public space, type of transport, the housing market, and others, and all of that has its reflection on space (Musterd, 2020). This bears the question where segregation occurs. The spatial dimension of segregation is particularly important because it materialises and visualises inequality, differentiation, and integration. People who differ in terms of income and wealth, or those who differ in cultural, demographic, and social terms, tend to occupy different spaces, either as a result of choice or because of constraints. This creates the spatial social,

cultural, demographic, and socioeconomic 'fabric' of places in all the domains mentioned. The residential domain has received most of the attention in segregation studies. Here we find distinguishable milieus ranging from affluent gated communities to 'enclaves' of poor immigrants; from white and young gentrified inner-city neighbourhoods to more peripheral concentrations of newcomers from unsafe or poor developing countries. The spatial dimension therefore plays a special role in the debates on inequality and parallel societies (Arbaci and Rae, 2013; Walks, 2020), often followed by policy responses aimed at creating socially and ethnically 'engineered' mixed spaces (Bacqué et al., 2011; Arthurson, 2012; Musterd, 2021).

Such spatial issues and responses boil down to the question to what extent different population categories manage to live a life together. It is key to know where different population categories are located and whether these locations are also the spatial territories of other categories and to what extent. As said, the co-location question can be asked about several domains of life, and about various population categories, on various scales. In this chapter we will focus on co-location in the residential domain; and on population categories that can be distinguished from each other based on their place of origin. We will not start from a neighbourhood perspective, but choose an individual perspective instead, allowing for micro-level and multi-scalar analysis. We will also investigate the dynamics of co-location over time. New data and new methods can be used to measure the spatial structures and dynamics of co-location of different population categories. This enables us to empirically evaluate many elements of the segregation debate, in particular ideas about 'increasing segregation', about the development of parallel societies, about (lack of) spatial integration of newcomers, and about the potential rise and reproduction of 'ethnic ghettoes'.

In the sections to follow, we briefly discuss some of the key debates and literature on spatial segregation and scale, and identify important forces that 'drive' segregation. We then go into the detailed data we used, and the novel methods we applied for the analysis of the micro-level co-location of population categories. This is followed by an empirical section, starting with the formulation of some empirical questions to answer, and followed by a presentation of exemplary micro-level segregation structures and segregation dynamics in the city of Amsterdam. In the conclusions and discussion section we highlight the most important findings and connect these to prevailing policy debates.

7.2 DEBATES AND LITERATURE

In wider public and academic debates in society, we see various representations of multi-scalar segregation processes, some of which are not well-grounded in

empirical findings. There is much populist rhetoric about the development of parallel societies. The main effect of that is its contribution to a climate of fear in society. An illustrative example of this was recently presented by Alan Walks (2020) when he elaborated on the 'meaning and measurement' of the 'ghetto' in Danish cities, in response to 'ghetto-framing' by the Danish government. He showed convincingly that there is limited evidence for arguing that 'ghetto-like' structures and processes really exist in such contexts. There is also rather limited knowledge on the scale at which segregation processes occur. The literature suggests that various geographies may be relevant when segregation and integration issues are being addressed. Sampson (2012) argues that contexts at various scales simultaneously impact on individuals residing somewhere. Research has, for example, shown that it makes a big difference whether migrants start their integration process in an economically strong region with a high share of employed residents with higher education degrees, or in contexts with less human capital and limited employment opportunities. The probability of finding employment – which is often seen as a crucial step into social and cultural integration – turns out to be higher in the first type of regional context than in the second type (e.g. Moretti, 2014). Nevertheless, it is not just the economic perspective in the wider metropolitan area of settlement that is crucial; it seems that in particular the composition of the direct local residential context where migrants settle is key to their integration. It is argued that the share of co-ethnics in their direct residential context potentially plays a big role in increasing the likelihood of becoming integrated. The presence of co-ethnics affects within-group socialisation processes. Similar language and cultural backgrounds may help newcomers to quickly find their way in their new environment (Edin et al., 2003; Galster, 2012). Co-location with 'own-group' migrants, therefore, could be essential for successful integration. However, staying put in their own socio-cultural spatial 'bubble' and not crossing borders to other groups may potentially hinder full integration in the recipient society (Massey and Denton, 1987; Wilson, 1987). In addition, there are indications that 'own-group' migrants may be helpful, but especially if the already settled migrants also occupy a good position in society and are employed (Kadarik et al., 2021).

In debates on segregation we should also bear in mind that segregation is hard to avoid. To the contrary, a growing body of literature has presented evidence that individuals usually search for residential places where they find at least some commonality with other residents. People often move when the 'societal distance' between themselves and their neighbours is getting rather big, and when they move, they try to reduce that distance. In other words, there seems to be a tendency for people, who have sufficient choice, to search for some homogeneity, especially at micro-level (McPherson et al., 2001; Smith et al., 2014; Musterd et al., 2016; Van Gent et al., 2019). That homogeneity

covers social, cultural, demographic, and socioeconomic attributes, and thus (re)produces a certain level of social, cultural, or socioeconomic segregation. So, if such residential processes are 'allowed', which is typical for liberal societies, some segregation should be expected. However, when the homogeneity and concentration of population categories reach very high levels, leaders tend to ask for intervention, almost irrespective of the type of welfare state. This especially happens when segregation levels are seen as problematic, due to segregation's link to social disadvantage; or when integration processes slow down. This is typically the case when negative neighbourhood effects are expected (Galster et al., 2015). Not just the intensity of segregation, but also its spatial scale appears to be relevant. When the scale at which homogeneity is manifest is very large, processes of estrangement may develop, because in such situations there is a risk that people do not encounter people unlike themselves anymore. By studying the spatial concentration of some population categories relative to the spatial distribution of other population categories at micro-level, and other levels, it is possible to develop more detailed insights in segregation processes and of any emerging negative effects. The aim of our analyses is to provide such insights.

7.3 DATA AND METHODS

Individual-level data for the total population of the city of Amsterdam were used. For each resident several attributes are known, including the fairly accurate location by six-digit postcode (a postcode on average only has 40 inhabitants), over a 25-year period (1994–2018). The centroid of the *x* and *y* coordinates of points in each six-digit-postcode are used as point location information for each individual.[1]

Apart from that uniquely adequate data, new methods to handle the data at various levels can be applied. In fact, large and detailed sets of point data for individuals or very small areal units, and representations by *x* and *y* coordinates, combined with rapidly increasing computing power, are game changers for the study of segregation. They enable micro analyses at almost every scale, thus are not plagued by the well-known modifiable area unit problem (MAUP), which typically occurs with research perspectives based on fixed neighbourhood scales (Openshaw, 1984). MAUP created serious problems, because research outcomes were dependent on the choice of scale, and on the exact boundaries of the neighbourhoods. Such problems now seem history because with a research perspective that starts with the individual, spatial detail can be increased immensely, while scale can be approached flexibly as well. This also implies that point patterns can be analysed at different spatial scales simultaneously (see Deurloo and De Vos, 2008; Clark et al., 2015; Jones et al., 2015; Johnston et al., 2016).

Here, we apply the Kullback–Leibler Divergence (DIV) Index also known as Relative Entropy (Mora and Ruiz-Castillo, 2011), and the Local Co-Location Quotient (LCLQ) (Leslie and Kronenfeld, 2011; Cromley et al., 2014; Wang et al., 2017).

The DIV Index applies to multi-group local co-location. It measures the difference between the population composition of a resident's area of residence in terms of country of origin groups, with the composition in the city as a whole. In theory, DIV can vary between zero and infinity, depending on the circumstances. In our practical example (see Figure 7.1) the (unnormalised) DIV values vary between 0.002 and 1.908. We use the normalised version of Divergence by dividing by the maximum value found. This makes it easier to compare the years, by bringing the scores to the [0,1] interval. Scores close to 0 mean that the country of origin composition of the individual's area of residence and that of the entire city are fairly similar. This implies very low levels of segregation. Scores closer to 1 imply very high levels of segregation.

The Kullback–Leibler Divergence Index for location *i* is formally defined as:

$$\mathrm{DIV}_i\left(\mathrm{P} \,||\, \mathrm{Q}\right) = \sum_{m=1}^{M} \mathrm{P}_{im} \log \frac{\mathrm{P}_{im}}{\mathrm{Q}_m}$$

where m is the population category, P_{im} is category *m*'s proportion of the population in location *i*, and Q_m is category *m*'s proportion of the overall population in the study area.

The LCLQ tells us a story about spatial 'living together'. It applies to two-group co-location and therefore is more specific. This starts with selecting a focus group (category A) of individuals of a certain country of origin. For each member of the focus group we then calculate the share of one selected other group (B) in the environment of the focus group member relative to the total population in that environment and compare that share with the share of category B in the entire city or study area. Like DIV values, LCLQ values can also vary between zero and infinity, depending on the circumstances. LCLQ values of category A environments above 1 have a larger proportion of neighbours of the B category than throughout the entire study area, while values below 1 are environments that have a smaller proportion of the B category. In our practical example (see Figure 7.3) the LCLQ values vary between 0.03 and 1.81.

The Local Colocation Quotient for location *i* is formally defined as:

$$\mathrm{LCLQ}_{\mathrm{A_i} \rightarrow \mathrm{B}} = \frac{\mathrm{P}_{iB}}{\mathrm{Q}_B}$$

where P_{iB} is category B's proportion of the population in the environment of location *i* of category A point A_i, and Q_B is category B's proportion of the overall population in the study area.

These indicators include all recent novelties: they use large-scale detailed spatial micro-level point data; they do not start from the neighbourhood as a unit to compare with other neighbourhoods, but start from the location of individuals from a group, and they ask the question in what kind of (segregated) environment the individual finds him/herself? Here, we choose individuals of Moroccan origin; for the LCQL measure this is called the focus group (A). To date, the Moroccan origin group is still the largest single group of immigrants who came to Amsterdam during the city's post-war history. Initially they arrived as 'guest workers'; later, family reunification and family formation became more important factors in the settlement process. In 2018 the city of Amsterdam housed 76,104 first- and second-generation migrants of Moroccan origin (almost 9 per cent of the Amsterdam population). The Moroccan group is generally showing some of the highest levels of segregation.

So, here the DIV Index measures how different two distributions are; here, between the individual Moroccan environments and the entire city. In this study we look at the composition of the population over seven origin categories: 'Moroccan', 'Turkish', Surinamese', 'Antillean', 'Other non-Western', 'Western', and 'Native Dutch'.

The LCLQ measure here compares at each location *i* of a member of the origin category A (here 'Moroccan') the share of one other category B (here 'Native Dutch') in its environment (P_{iB}) with the share of category B in the entire city (Q_B). We compare 'Moroccan' with 'Native Dutch' because, although it is challengeable in a multi-cultural context, this category is often seen as the most relevant reference category.

The area of location i is defined as the population composition within a certain distance *r* from the location of a focus group; or as the population composition based on a specified number of nearest neighbours. We will employ the latter.

7.4 EMPIRICAL ANALYSIS

The following empirical research questions will be answered to provide exemplary insight in the (dynamics of) co-location of Moroccans with members of other groups, 'Native Dutch' in particular, by comparing the composition (and share of 'Native Dutch') of individual Moroccan's direct context with the composition (and share of 'Native Dutch') of the entire city.

Divergence

- Taking unequal distributions across the study area into account, to what extent do we see, for the year 2018, a deviation of each individual Moroccan origin Amsterdam resident's local environment composition in terms of a range of countries of origin, from the composition in terms of the same set of countries of origin in the city as a whole?
- To what extent does the spatial distribution of segregated residents become manifest in segregated *areas*, in spatial clustering?
- How has segregation of residents with a Moroccan background developed over the period 1994–2018?
- Which differences do we see, in 2018, when different sizes of areas are used, measured in terms of the number of nearest neighbours around the individual?

Co-location

- Taking unequal distributions across the study area into account, to what extent do we see co-location of Moroccan origin Amsterdam residents and 'native' Amsterdam residents?
- To what extent are there, in 2018, signs of attraction, clustering, and integration, or signs of repulsion, separation, and segregation?
- To what extent do we see – over a period of 25 years (1994–2018) – processes of stronger or weaker attraction or integration, or processes of stronger or weaker repulsion, separation, and segregation of Moroccan origin Amsterdam residents and 'native' Amsterdam residents?

7.4.1 Answers to Divergence-related Questions

While we experimented with individual environments of different sizes (see hereafter), we start with presenting the multi-group co-location for residents of Moroccan origin investigating segregation levels in individual environments with 220 nearest neighbours. This is the size of environment from which the share of all Moroccan origin residents in low-segregated and high-segregated environments reached a stable level. The normalised Divergence Index scores show us (Figure 7.1) that a majority of 55 per cent of the individual areal units where Moroccan 'Amsterdammers' are living, only marginally deviate from the country of origin distribution across the entire city (Normalised Divergence scores < 0.2); the limited level of deviation thus implies limited segregation for more than half of the Moroccans. Around 9 per cent of all individuals of Moroccan origin are living in environments of 220 neighbours that are relatively highly segregated (Normalised Divergence scores of > 0.6). The choice for 0.2 as the boundary between low and moderate DIV and for 0.6

as the boundary between moderate DIV and high DIV is based on the density function (Figure 7.1).

A cluster analysis of these relatively highly segregated individuals, using the DBSCAN cluster algorithm (Ester et al., 1996), finds areas of arbitrary shape where each Moroccan has many Moroccans as neighbours. This reveals three obvious *areas* with relatively strong concentrations of residents of Moroccan origin. These are marked in Figure 7.1 by an ellipse.[2]

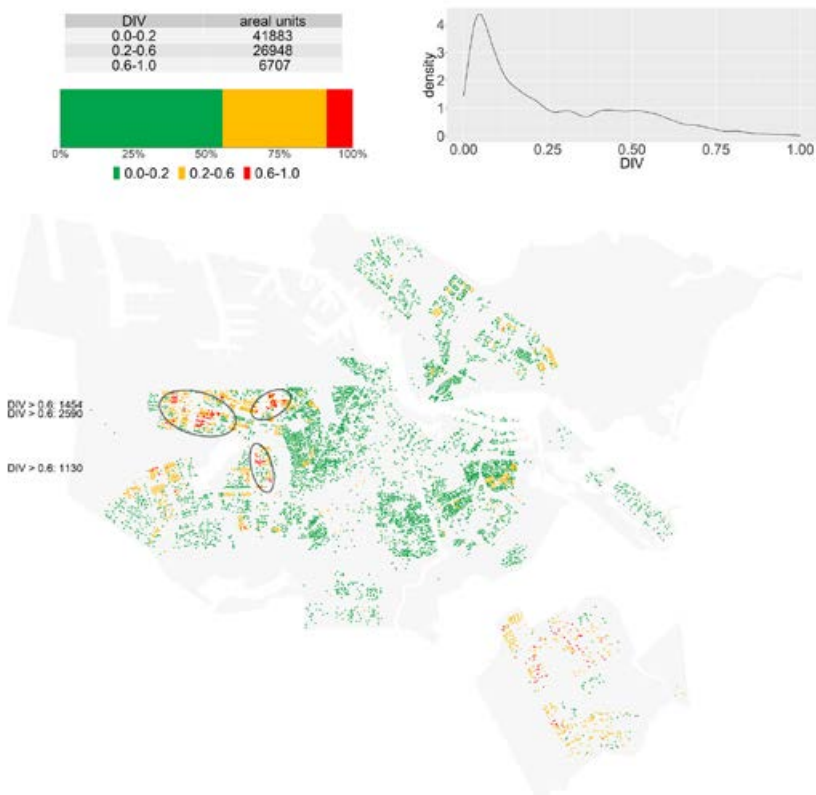

Figure 7.1 *Categorised Kullback–Leibler Divergence (DIV) of all residents of Moroccan origin (based on 220 nearest neighbours) and clusters of relatively strong Moroccan segregation, Amsterdam 2018*

When comparing the 2018 figures with the situation in 1994, we observe that segregation levels used to be lower in 1994 (Table 7.1). In that year, 76.4 per cent of the individuals of Moroccan origin were living in areal units that only to a very limited degree deviated from the city-wide distribution (Normalised Divergence < 0.2), while only 2 per cent were living in relatively highly segregated areas (Normalised Divergence ≥ 0.6). The 2018 distribution shows other figures, with, as said, almost 9 per cent living in relatively highly segregated areas. Nevertheless, even in 2018, still over 90 per cent of the individual Amsterdam residents of Moroccan origin lived in relatively low or moderately segregated residential areas.

Table 7.1 *Kullback–Leibler Divergence (DIV) Index for individuals of Moroccan origin, based on compositions of residential areas with 220 nearest neighbours per individual, 1994–2018*

DIV	1994	%	2018	%
0.0–0.2 (low)	34878	76.4	41883	55.4
0.2–0.6 (moderate)	9824	21.5	26948	35.7
0.6–1.0 (high)	930	2.0	6707	8.9
	45632	100.0	75538	100.0

However, as stated, there may be an effect of the size of the area. To better understand that effect, we analysed the Divergence Index segregation levels for each individual for a range of sizes, starting from 20 nearest neighbours up to 400 nearest neighbours (Figure 7.2). From that analysis we learned that, in 2018, almost independently of the size of area (except for the smallest sizes) around 56 per cent of individuals of Moroccan background live in residential areas that do not deviate much (Normalised Divergence < 0.2) from the distribution for the entire city. Interestingly, only a limited number of residential situations could be found in which the deviation from the city-wide distribution is rather high (Normalised Divergence > 0.6) when investigated for the individuals' most direct areas (20 neighbours). Only 3.4 per cent of the Moroccan origin residents live in such segregated areas. The share is even smaller (around 1.5 per cent) for the three next levels (40, 60, 80 neighbours), but then increases until it reaches a relatively stable level of around 9 per cent from 200 neighbours onwards. The environment defined with 220 neighbours around the individual of Moroccan origin was chosen as most suitable for presenting stable results.

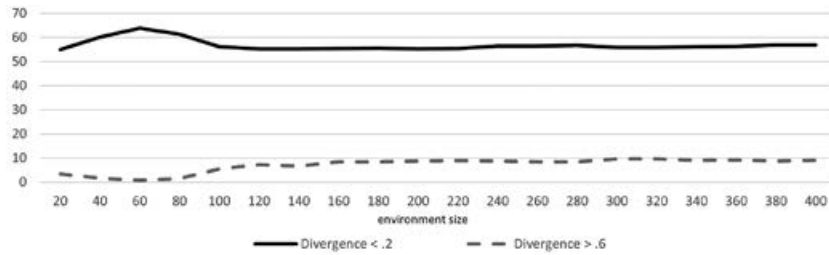

Figure 7.2 *Percentage of Amsterdam residents of Moroccan origin living in areas of relatively low/relatively high levels of segregation (Normalised Kullback–Leibler Divergence), by area size (n neighbours), 2018*

7.4.2 Answers to Co-location-related Questions

In the study of co-location, we focus on comparing two groups at a time. Here the key question is: taking the unequal distributions across the study area into account, to what extent do we see co-location of Moroccan origin residents and so-called 'native' Dutch residents (Figure 7.3)? Since the focus is on those with a Moroccan background, we calculate for each of the residents of Moroccan origin what the share of 'native Dutch' in their area (again measured as 220 nearest neighbours) is, in relation to the share of 'native Dutch' in the city as a whole. We start once again with the year 2018, and specifically search for signals of attraction or integration, and of repulsion or segregation. A DBSCAN analysis detected important clusters of highly segregated individuals of Moroccan origin, who live separated from 'native' Dutch. These clusters are again marked by ellipses.

The map in Figure 7.3 shows the wide variation of situations of local co-location between the two groups, seen from the perspective of those of Moroccan origin. The most balanced situation would be found with an LCLQ value of around 1. This (LCLQ 0.8–1.2) regards 28.1 per cent of the individuals of Moroccan origin. Yet, in 2018 also over a quarter (28.3 per cent) of the residents of Moroccan origin experienced a residential situation of strong repulsion or segregation relative to 'native Dutch' residents. This is indicated by LCLQ values of 0.4 or less.

A little over 8 per cent of people of Moroccan origin lived in residential areas with a relative overrepresentation of 'native' Dutch. These figures are also shown in Table 7.2, where we compare the situation in 1994 with the 2018 situation, that is, over a 25-year period. It shows that the share of individuals of Moroccan background living in a situation where they are firmly segregated from 'native' Dutch almost quadrupled. Yet, also the share of individuals of

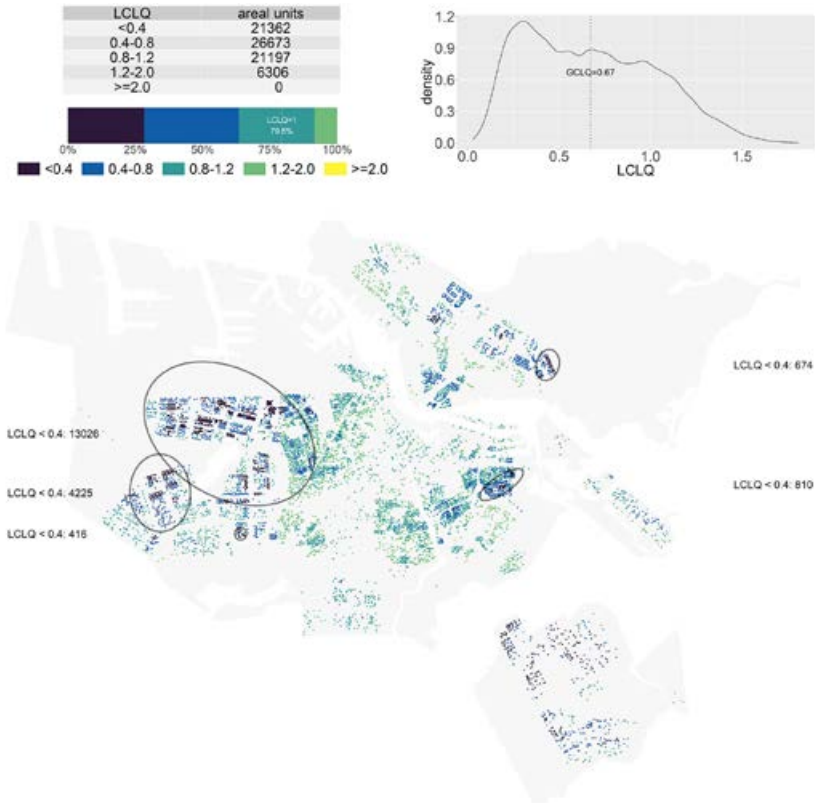

Figure 7.3 *Categorised LCLQ of all residents of Moroccan origin compared to 'native' Dutch (based on 220 nearest neighbours) and clusters of strong segregation, Amsterdam 2018*

Table 7.2 *LCLQ for individual residents of Moroccan origin, with 'native' Dutch*

	1994	%	2018	%
< 0.4 (strong repulsion)	3300	7.2	21362	28.3
0.4–0.8 (moderate repulsion)	21534	47.2	26673	35.3
0.8–1.2 ('balanced')	18523	40.6	21197	28.1
1.2–2.0 (attraction)	2275	5.0	6306	8.3
	45632	100.0	75538	100.0

Moroccan background who seem to be attracted by residential environments with a relative overrepresentation of 'native' Dutch inhabitants, increased somewhat, from 5 per cent to 8.3 per cent.

Situations of moderate repulsion and of 'balance' showed a reduction of their shares. This suggests that some polarisation is developing, albeit that the distribution is skewed in the direction of firm segregation. About a quarter of individuals of Moroccan origin reside in places where they are highly segregated from 'native' Dutch; less than 10 per cent seem attracted by residential areas with a relatively strong presence of 'native' Dutch; the rest live in a situation of moderate segregation or 'balance'. As can be seen from the map in Figure 7.3, the geographical distributions of these situations and dynamics show interesting patterns. This is related to migration histories and a range of other factors affecting location behaviour.

7.5 CONCLUSION AND DISCUSSION

What are the most important findings of the analysis performed in this chapter? How do these connect to prevailing policy debates about segregation and integration? The availability of high-quality data, including very detailed geographical information, enabled analysis of segregation free of neighbourhood sizes and boundaries. The so-called MAUP (modifiable areal unit problem) was avoided. In this chapter we applied micro-geographical methods to investigate the co-location of residents of diverse countries of origin. The methods used include a multi-group Divergence (DIV) Index and a two-group Local Co-Location Quotient (LCLQ), utilised in the analysis of the level of segregation or integration of Amsterdam residents of Moroccan origin. The segregation was first investigated relative to the population composition in terms of seven origin groups; this was followed by a more specific analysis of the share of 'native' Dutch in the individual environment of residents of Moroccan origin. In both analyses the situation in the local environment (here defined as the flexible area with 220 nearest neighbours of an individual Amsterdammer of Moroccan origin) has been compared with the composition in the city as a whole. This approach resulted in detailed geographical patterns, in which various levels of deviation between the local level situation and the city-level situation could be shown.

This study made clear that a general or global measure of segregation is telling only a very limited and crude story on segregation for the entire city. In reality there appears to be much variation between local situations within the city. Moreover, such local situations can cover relatively large parts of the city, in which we find concentrations of individuals who are living in segregated situations; but most of the local situations appear to concern very small areas with various levels of segregation. Because of the simultaneous existence of

local environments in which individuals experience a level of segregation that can be very different from the levels experienced a few blocks away from that location, for many purposes, methods that recognise and consider the heterogeneity of micro-level segregation situations, offer stronger insights. By applying the methods the way we did, and by using adequate and detailed data, we were able to show that urban segregation in reality consists of a wide range of local segregation situations within one city. That heterogeneity should also have implications for future policy interventions. Apart from some global inter-city comparative studies, generic (city-wide) types of intervention generally do not seem to make sense when we find very different local segregation situations based on experiences of all individual residents of a certain population category. People differ from each other; also, people of Moroccan origin differ from each other. That difference is also expressed in their residential situations. In this study we showed the wide variety of co-location situations. Some individuals of Moroccan origin live in a highly segregated situation, but others do not. It also matters whether segregation is measured relative to a population comprising a wide range of categories, or relative to one other population category. To some extent different stories can be told connected to these differences. Nevertheless, the most segregated situations where Moroccan origin residents find themselves in conformance with both types of analysis (DIV and LCLQ) are especially noticeable in the western parts of the city.

A comparison between years, here 1994 and 2018, is also illuminating, since this offers the opportunity to follow the segregation and integration processes with greater rigour. We found that some of the individual residents of Moroccan background in Amsterdam have settled in most-segregated areas. In these areas there seems to be much reliance on own-group residents. This is manifest in some parts of the city, as said especially in Amsterdam west. These parts of the city could be detected in detail through cluster analysis of individuals who find themselves in (nearly) similar situations. We showed that such cases have grown in number over the 25-year period we investigated. Given the literature on 'searching for homogeneity' we discussed before, living in such segregated situations seems to make sense, since co-location with residents from similar origin offers several advantages, especially when those who have settled before and who have already found their way in society can provide support to newcomers finding their way in the new society. Language and cultural barriers are limited, and recent research has shown that very positive effects of such situations should be expected when the already settled individuals have relatively strong economic positions. In other words, the presence of 'own-group' co-residents in their immediate area who are employed themselves would create ideal conditions for newcomers to get access to the labour market as well (Kadarik et al., 2021). Such situations of co-location of individuals of the same country of origin should therefore

not automatically be judged negatively. As to the reasons why we see such specific geographies and why these are becoming increasingly clear over the years, we believe the presence of all sorts of services specifically aimed at specific categories of the population, is important. Yet, most important seems to be access to and affordability of good quality housing. Musterd and De Vos (2007, pp. 348–9) investigated the tenure situations of postcodes of origin and destination of residents of Moroccan origin in Amsterdam who moved to 'Moroccan' concentration areas between 1994 and 2004 and saw a significant shift from private to social rental dwellings, which indicated a clearly positive step in their housing careers.

Yet, there is more; we also could show that next to the segregated residents of Moroccan origin, there is also a majority group who is already living in a much less segregated environment. There, co-location with others sets the tone in daily life. There even appeared to be a small, but growing, share of the group we investigated in local environments that are typically characterised by a relative overrepresentation of 'native Dutch'. The whole set of situations we could show tells us that a wide variety of dynamic residential situations has developed. Some sections of that dynamic variety may ask for some special policy attention for one reason or another; yet others are highly functional and these may possibly benefit from 'no policy'. With the type of analysis we performed, and with elaborations of these analyses, policymakers might eventually make geography-differentiated intervention plans that more precisely connect to certain questions and objectives. In that regard, it would be good to consider how differentiated life is and how that is reflected in local residential space. In some areas, interventions may be helpful, depending on the intensity of problems and on the spatial scale; but in most areas there might be no need for rigorous policy intervention at all.

However, before we jump to conclusions, we first have to engage in additional study to elaborate on some of the findings and interpretations. For example, does a balanced co-location (blending in space) really imply higher levels of integration in practice? Are the own-group-already-settled residents really able and willing to support newcomers of the same origin and in what ways? What are the key conditions for them to do so? Moreover, can we find different dynamics between first- and second-generation migrants that are relevant? Finally, we focused on the Amsterdam population of Moroccan origin. Yet, we also need to know more about how other groups fare in terms of geographic co-location. Are there group-specific aspects we have to face? In short, several questions have to be answered before 'solid' policy intervention recommendations can eventually be launched.

NOTES

1. All residents have been randomly distributed across the convex hull of each PC6 postcode they belong to; the location of the resident whose environment will be investigated is calculated as the centroid of the convex hull.
2. We required a cluster to contain at least 0.5 per cent of the total size of the Moroccan origin resident group, to remove noise from the plot.

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