5 Trajectories of ethnic neighborhood change: Spatial patterns of increasing ethnic diversity

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§ 5.1 Introduction

The share of ethnic minority residents has been increasing in many major European cities during the past two decades and these cities are experiencing increasing ethnic diversity (Vertovec, 2007). For example: In 1999, non-western ethnic minorities, such as Turks, Moroccans, Antilleans, and Surinamese, comprised 8.5% of the Dutch population. By 2015, the share of the same groups had increased to 12.1%, which, in absolute numbers, means that the number of ethnic minorities in the Netherlands has increased by almost 700,000 people in 16 years (Statistics Netherlands, 2017). About 62.5% of this increase in the number of ethnic minorities is the result of natural growth (Statistics Netherlands, 2017). Geographically, members of ethnic minorities tend to be overrepresented in large cities because of the services and the availability of affordable housing (cf. Borjas, 1999) and the presence of immigrant networks (Logan et al., 2002). Studies on ethnic segregation have focused on the question of how ethnic minorities are sorting into different neighborhoods in these cities and to what extent they live together or apart from the native population (e.g. Bolt & Van Kempen, 2010a; Johnston et al., 2009; 2010; Poulsen et al., 2011). Although segregation is most often viewed as a condition of neighborhoods and cities at a certain point in time, ethnic segregation is not a static phenomenon but is a dynamic process that develops through time without a specific end point (Johnston et al., 2010). An emerging body of research is therefore focused on investigating segregation from the perspective of the changing ethnic population composition in neighborhoods (e.g. Johnston et al., 2009; Poulsen et al., 2011). Analyzing what types of neighborhoods experience change in the ethnic population composition and identifying the drivers of these changes is crucial to our understanding of processes of ethnic segregation.

There are two main drivers of ethnic neighborhood change. The first is residential mobility. The selective moving behavior of different ethnic groups can affect ethnic neighborhood change in different ways. Studies on segregation have argued that ethnic heterogeneity in neighborhoods stimulates the out-mobility of the native (majority) population to more White neighborhoods (e.g. Clark & Coulter, 2015; Kaufmann & Harris, 2015). 'White avoidance' theories, however, argue that the native population avoids ethnically diverse areas in the first place (Clark, 1992; Quillian, 2002). In both cases, the moving behavior of the native population affects the ethnic population composition in neighborhoods. With regards to the residential mobility of ethnic minorities, studies on spatial assimilation have argued that as ethnic minorities become more assimilated into the host society over time, they tend to move away from concentration areas developing similar residential mobility patterns as the native population (Bolt & Van Kempen, 2010a; Sabater, 2010; Simpson & Finney, 2009; Simpson et al., 2008). However, there is evidence that indicates that ethnic minorities are less likely to leave and more likely to move into ethnically concentrated neighborhoods (e.g. Bolt & Van Kempen, 2010a), as a result of a lack of financial resources (Clark & Ledwith, 2007), institutional constraints (Galster, 1999; Musterd & De Winter, 1998), or specific ethnic preferences (Bolt et al., 2008).

A small body of research highlights a second driver and has argued that ethnic neighborhood change is the result of both residential mobility and demographic change (Finney & Simpson, 2009; Simpson, 2004; 2007; Simpson & Finney, 2009). The share of ethnic minorities in a particular neighborhoods can change without residential mobility. Demographic events such as birth and deaths can influence ethnic neighborhood change in different ways. The relatively young age structure of many migrant groups often implies higher fertility rates when compared with the majority population (Finney & Simpson, 2009). When ethnic minorities have disproportionally more children than natives, the share of ethnic minorities in a neighborhood increases irrespective of mobility patterns. Similarly, higher mortality rates among the native population as a result of ageing might lead to high natural decline among natives, thereby reducing the share of the native population in a neighborhood (Finney & Simpson, 2009; Simpson & Finney, 2009).

Residential mobility and demographic change are important drivers of ethnic neighborhood change, which affect ethnic segregation. In the context of growing ethnic diversity in many cities, it is important to question the extent to which this growth is evenly distributed over neighborhoods within these cities. Are there, for instance, particular neighborhoods that experience above average increases in their share of ethnic minorities, and if so, is this increase driven by selective sorting processes or natural growth? Or are ethnic minorities increasingly integrated, showing more variation in their residential mobility patterns over time? The present study aims to answer these

questions by analyzing full trajectories of ethnic neighborhood change in the four largest cities in the Netherlands between 1999 and 2013. We employ a Latent Class Growth Model (LCGM) to categorize neighborhoods based on their unique growth trajectories of the ethnic population composition over time. This modelling strategy offers an empirical contribution to segregation research by categorizing patterns of ethnic neighborhood change, contributing to our understanding of diverging processes of ethnic segregation over time. Theoretically, this paper bridges two important fields of literature on the drivers behind ethnic segregation: residential mobility and natural growth. By integrating these theories, we seek to better understand the relative impact of both mechanisms on various levels of ethnic neighborhood change.

§ 5.2 Ethnic neighborhood change

Many studies on the spatial distribution of ethnic groups in urban areas have focused on the clustering of ethnic minorities in particular (often disadvantaged) neighborhoods and the potential hampering effects of segregation on social integration, mobility, and interethnic contact, posing a threat to inclusive diverse societies. An overwhelming body of research on ethnic segregation has used single-number indices to express the level of uneven spatial distribution of ethnic groups, or their isolation, centralization, concentration, or clustering. These indices have been criticized for failing to provide insight into contemporary patterns and varying degrees of population mix (Johnston et al., 2010; Poulson et al., 2011). To better understand to what extent different ethnic groups live together or apart in different urban areas, researchers have created typologies of neighborhoods based on the ethnic population composition (e.g. Johnston et al., 2010; Marcuse, 1997; Poulsen et al., 2001; Simpson, 2007). These typologies are based on different percentages of ethnic minorities or natives in neighborhoods (Poulsen et al., 2001; 2011; Simpson, 2007). Although these typologies provide more insight in the population composition in neighborhoods than indices, these typologies have been criticized for exaggerating segregation by using arbitrary thresholds (Peach, 2009). The present study therefore uses an alternative method to classify neighborhoods: we categorize neighborhoods that follow the same pattern of change in the ethnic population composition over time. As a result, we present an empirical typology of ethnic neighborhood change that does not rely on predisposed definitions. A focus on ethnic neighborhood change allows for a better understanding of the role of residential mobility and demographic change in reproducing or changing the ethnic geography (Simpson & Finney, 2009).

Residential mobility has long been seen as the most important driver behind ethnic segregation. The selective sorting of ethnic minorities can mostly be explained by the availability of affordable housing and the presence of ethnic networks. Researchers have argued that ethnic minorities tend to move to ethnically-dense neighborhoods after recent immigration, because of the benefits in terms of social networks and support from other co-ethnics (Dunn, 1998; Peleman, 2002). However, over time, ethnic minorities tend to move away from concentration areas showing similar residential mobility patterns as the native population (Bolt & Van Kempen, 2010a; Sabater, 2010; Simpson et al., 2008; Simpson & Finney, 2009). This process of spatial assimilation is arguably the result of increasing socioeconomic and cultural assimilation (Alba & Logan, 1993; Fong & Wilkes, 1999; South & Crowder, 1998). Indeed, empirical research has shown that ethnic minorities are increasingly moving into high-status, native-majority neighborhoods (Bader & Warkentien, 2016; Hussain & Stillwell, 2008; Sabater, 2010; Simpson et al., 2008) and are more likely to move away from concentration areas when their socioeconomic situation improves (Bolt & Van Kempen, 2010a; Catney & Simpson, 2010; Simpson et al., 2008; South & Crowder, 1998). However, spatial assimilation seems to be dependent on socioeconomic status: after controlling for socioeconomic differences, ethnic minorities continue to be more likely to move into concentration neighborhoods (Bolt & Van Kempen, 2010a; South & Crowder, 1998) and the existence of neighborhoods characterized by concentrations of ethnic minorities and disadvantage seems to be persistent (Bolt & Van Kempen, 2010a; Jivraj & Khan, 2015; Lymperopoulou & Finney, 2017).

The residential mobility behavior of the native population also plays a role in the process of place stratification. Although the dominant theory has long been that natives tend to move away from ethnic minority neighborhoods, the so-called process of 'White flight' (Crowder & South, 2008; Galster, 1990; Massey & Denton, 1993), researchers have also focused on processes of 'White avoidance' where natives tend to avoid minority populated neighborhoods (Farley et al., 1994; South & Crowder, 1998). Research has shown that it is not 'White flight' or 'White avoidance' per se, but 'wealth flight', arguing that high-income groups - regardless of ethnicity - tend to move away from, or avoid, disadvantaged areas (cf. Johnston et al., 2015; Bråmå, 2006; Erdosi et al., 2003; Mezetti et al., 2003).

The effects of residential mobility on segregation, however, need to be understood in relation to demographic developments (e.g., Bader & Warkentien, 2016; Simpson et al., 2008). The population composition of neighbourhoods can change without in- and out-migration. Fertility rates are generally higher among immigrants, because of their relatively young age structure. In particular, the fact that ethnic minorities tend to have more children than natives, combined with a native population that is ageing, implies that ethnic minorities have a relatively high rate of natural increase (Simpson & Finney,

2009). Processes of family formation in the years after immigration can therefore lead to increasing ethnic concentrations in particular areas (Finney & Simpson, 2009). At the same time, residential mobility is not indifferent to demographic events. Research has shown that the native population is more likely to move out of diversity neighborhoods as ethnic heterogeneity increases (Clark & Coulter, 2015; Crowder et al., 2012; Kaufmann & Harris 2015). However, over time, fertility rates are likely to decline as a greater spread of family stages can be expected among next generations (Simpson et al., 2008). As such, the effects of natural growth among minority populations on increasing or maintain levels of segregation is likely to decrease over time.

A recent body of research in the United Kingdom has analyzed stability and change in the ethnic neighborhood composition (e.g. Catney, 2016; Johnston et al., 2015; 2016; Simpson & Finney, 2009). These studies have generally found evidence of increased ethnic diversity on the neighborhood level and declining levels of ethnic segregation, mainly as a result of ethnic residential mobility (Simpson & Finney, 2009). There appears to be a tendency towards increased spatial mixing of different ethnic groups, showing that ethnic minorities are increasingly moving into White neighborhoods, suggesting a process of spatial assimilation. At the same time, processes of 'White flight' seem to have declined, meaning that the native population is less likely to move away from these neighborhoods when ethnic minorities move in (Johnston et al., 2016; Simpson & Finney, 2009). These processes together lead to declining levels of segregation over time. In addition, as the role of natural growth in increasing or maintain levels of segregation will most likely decrease over time among later generations of ethnic minorities, a further decline in segregation levels can be expected (Simpson et al., 2008). However, on the other hand, studies have shown that there continues to be persistent segregation at the top and bottom ends of the distribution, illustrated by the persistent existence of concentration neighborhoods that are characterized by either a large native population or a large ethnic minority population (cf. Jivraj & Khan, 2015; Johnston et al., 2015; 2016; Lymperopoulou & Finney, 2017). The existence of these concentration neighborhoods seem to be the result of processes of 'White avoidance' on the one hand, and socioeconomic disadvantage among ethnic minorities on the other.

There are two gaps in the literature that the present study aims to address. First of all, most studies investigating ethnic segregation have either focused on the degree of segregation at one point in time, or decreasing or increasing levels of segregation between two points in time. Studies in this vein have been limited by a lack of longitudinal studies, failing to consider trajectories of ethnic neighborhood change. Changes between two points in time provide insight in declining or increasing shares of ethnic minorities in neighborhoods, but do not tell us anything about changing trends over time. As such, our understanding of changing spatial patterns of ethnic population change remains limited (Catney, 2015). By analyzing full neighborhood trajectories over

time, the present study aims to provide a longitudinal view on segregation by identifying distinct spatial trajectories of ethnic population change. Second, most studies have focused on residential mobility patterns as the main driver behind ethnic neighborhood change. However, as ethnic neighborhood change takes time to take effect, it is likely that births and deaths play an important role in changing the population composition of neighborhoods (Finney & Simpson, 2009). Especially, the combination of specific patterns of residential mobility and natural change of different ethnic groups could have important effects on ethnic neighborhood change. It is therefore necessary to analyze how different pathways, driven by different residential and/or demographic processes that occur simultaneously, affect segregation in cities.

§ 5.3 Data and methods

This study used longitudinal register data from the System of Social statistical Datasets (SSD) from Statistics Netherlands providing data on the full Dutch population from 1999 to 2013. Neighborhoods are operationalized using 500 by 500 meter grids. The use of 500 by 500 meter grids ensured the comparability of geographical units, keeping geographical boundaries constant over time and allowing for a detailed analysis of neighborhood change on a low spatial scale. Individual-level data has been aggregated to the level of 500 by 500 meter grids. We focused on the share of ethnic minorities in 500 by 500 meter grids in the four largest cities in the Netherlands: Amsterdam, Rotterdam, Utrecht and The Hague, leading to a total of 1,496 grids. Grids with less than 10 residents have been excluded from the analyses for privacy reasons.

We concentrated on the four largest non-western migrant groups in the Netherlands: the Moroccans, Turks, Surinamese and Antilleans. Moroccans and Turks immigrated to the Netherlands in the 1970s, mainly due to labor migration, whereas the post-colonial migration of the Surinamese and Antilleans largely occurred in the 1980s and 1990s. These four groups are often overrepresented in particular disadvantaged neighborhoods, and academic and political debates on ethnic segregation have focused on the spatial concentration of these four ethnic groups in particular neighborhoods (Van Kempen & Bolt, 2009).

In the Dutch context, a person is considered to belong to an ethnic minority when he/she has at least one parent born abroad, differentiating between those born abroad themselves (first generation) and those born in the Netherlands (second generation) (Statistics Netherlands, 2016a). We focused on the share of non-western ethnic

minorities relative to the total population in a neighborhood. Native Dutch and ethnic residential mobility is measured by net migration rates (number of people moving in minus the number of people moving out). In this study, migration is defined as the move out of a neighborhood into a different neighborhood (so moves within the neighborhood are ignored). We compared the population composition at the beginning of each year (January 1st) to the population composition at the beginning of the following year. This implies that, in the case of multiple moves in a year, we focus on a household's residence on January 1st. Natural growth is defined as the number of births minus the number of deaths. We calculated the number of ethnic minority children born and the number of ethnic minorities that died in a neighborhood for each year. In addition, individual-level income information has been aggregated and added to our dataset to analyze the share of households at risk of poverty (household income 60% below the median), the average household income, and the average house prices.

How to classify neighborhoods according to their ethnic composition has been a methodological challenge in many studies. Many studies on ethnic neighborhood change have created typologies based on population thresholds (e.g. Poulsen et al., 2001), however, the relatively arbitrary definition of these typologies dependent on group sizes and composition remains a problem (cf. Farrell & Lee, 2011). To overcome this problem, we employ a LGCM to create an empirical typology of ethnic neighborhood change over time. Our modelling strategy can be seen as an alternative to the classification scheme as developed by Poulsen and colleagues (2001) that allows for the identification of trends in the ethnic population composition over time. Instead of using arbitrary cut-off points, our approach facilitates the empirical categorization of neighborhoods based on their unique growth trajectories of the ethnic population composition. This means that our modelling strategy allows us to identify neighborhoods that follow similar developments in the ethnic population composition over time.

LGCMs enable the analysis of longitudinal data where there may be qualitatively different trajectories over time that are not identifiable ex ante (Nagin, 2005). As such, LGCMs overcome the issue of arbitrary classifications but instead allow for the identification of common trajectories based on the timing and pace of ethnic neighborhood change. LCGMs are finite mixture models that utilize a multinomial modelling strategy (Jones & Nagin, 2013). Where growth curve models assume that all individual units of analysis are drawn from the same population with the same growth trajectory over time, LGCMs are based on the idea that individual units belong to different subpopulations (latent classes) that each have a unique growth trajectory (Nagin, 2005; Perelli-Harris & Lyons-Amos, 2013). The main assumption is that the outcome variable is conditional on time and that there are a finite number of different outcome trajectories of unknown order (Jones & Nagin, 2013).

The dependent variable in this study was the share of ethnic minorities in a neighborhood. Because of the large number of zeros in the data, a zero-inflated Poisson model provided the most appropriate specification:

$$\ln(\lambda_{it}^{j}) = \beta_0^j + \beta_1^j t + \beta_2^j t^2 + \beta_3^j t^3 + \beta_4^j t^4$$

where is the expected share of ethnic minorities of neighborhood *i* at time *t*, given membership in group *j*. The coefficients determine the shape of the trajectory and can be estimated up to a fourth-order polynomial (Jones & Nagin, 2007).

Model selection is a well-known issue with trajectory models (Bauer & Curran, 2003; Warren et al., 2015). The estimation of the correct number of latent classes together with the assignment of individual units to the trajectory groups can be problematic. Nagin (2005) advises that the most parsimonious model that provides distinctively different trajectory groups should be selected. In this study, model selection was determined in two stages with the initial stage used to assess the optimal number of classes by comparing the Akaike Information Criterion (AIC), the Bayesian Information Criterion (BIC) and the Sample-Size Adjusted Bayesian Information Criterion (SSBIC). Model fit was compared after adding a trajectory in a stepwise approach. The model with the lowest fit statistics is preferred (Nylund et al., 2007). Although the BIC has been found to be a good indicator for determining the number of classes when the sample size is large enough (N > 1,000) (Nylund et al., 2007)[1], model convergence is a well-known problem with these statistical criteria (Jung & Wickrama, 2008; Warren et al., 2015). An additional statistic to analyze model fit is the average posterior probability (AvePP). The AvePP reflects the average probability that individual units belong to a trajectory group. A high AvePP implies a high probability of group membership (Nagin, 2005). We have compared the BIC and AvePP for multiple models, ranging from models with three trajectory groups to models with eight trajectory groups (see Table 5.1).

We have selected a five-class model. Although the six- and seven-group models have lower BIC values and high AvePP's, these additional trajectories did not substantially differ from those in the five-class model. The four-class model proved inappropriate because of a lack of model fit. Our five-class model produced well-populated classes (each class consists of more than 5% of all cases; Warren et al., 2015) and showed qualitatively different trajectories.

1 Some researchers favor the use of the Bootstrap Likelihood Ratio Test (BLRT) for identifying the optimal number of classes (Nylund et al., 2007), however, this test was computationally too intensive for our servers.

TABLE 5.1 Average posterior probabilities of group assignment and Bayesian Information Criterion (BIC) statistics of model fit

	GROUP 1	GROUP 2	GROUP 3	GROUP 4	GROUP 5	GROUP 6	GROUP 7	GROUP 8	BIC N=21,733)	BIC (N=1,496)
3 groups	0.998	0.997	0.996						-76889.4	-76878.7
4 groups	0.997	0.994	0.994	0.997					-68143.1	-68128.3
5 groups	**0.992**	**0.992**	**0.991**	**0.995**	**0.998**				**-63393.2**	**-63374.5**
6 groups	0.996	0.986	0.982	0.992	0.992	0.996			-60828.6	-60805.9
7 groups	0.989	0.997	0.979	0.983	0.974	0.992	0.990		-59184.6	-59157.9
8 groups	0.982	0.988	0.966	0.967	0.983	0.979	0.989	0.996	-58147.7	-58116.9

Source: System of Social statistical Datasets (SSD)

Although we cannot be certain about the 'true' number of latent trajectories, descriptive statistics (see Table 5.4) and geographical maps (see Figures 5.2 and 5.3) of our five classes correspond to the known ethnic distribution in Dutch cities. The uncertainty around the true number of latent trajectories is especially problematic when trajectories are used as dependent or independent variables in subsequent analyses (Warren et al., 2015). The goal of the present study is however mainly descriptive, and although we cannot be certain about the true number of trajectories, four- and six-class models showed similar trajectories over time. As such, we believe that our five-class model can be used to describe general patterns of ethnic neighborhood change in Dutch cities.

The second stage of model assessment relates to the shape of each of the six trajectories. This was estimated by specifying the order of the polynomial (see Nagin, 2005).[2] The model output is presented in Table 5.2. The estimated trajectories are illustrated in Figure 5.1. The predicted trajectories for each of the five classes are presented in Table 5.3. We estimated our model in Stata 14 using the package "traj" (Jones & Nagin, 2013). We have checked the robustness of our findings by conducting the analyses on different subsets of the data, for each city separately, and by reproducing our full analyses in Mplus (version 6.0.0.1). All analyses yield similar results.

To explore the role of population dynamics in each of the identified trajectories, we have created a series of profile plots. We visualized the net migration rates and natural growth rates of ethnic minorities and the net migration rates of the native Dutch for each of the trajectories (Figure 5.4 to 5.6). In addition, we have created maps of the trajectories for each of the four cities (Figures 5.2 and 5.3).

2 The final model will have lower BIC values as a result of specifying the shape of the appropriate polynomials.

§ 5.4 Results

In 1999, the number of ethnic minorities in the four largest Dutch cities was 430,616, comprising 21.2% of the total population. In 2013, the number of ethnic minorities rose to 536,307, comprising 23.9% of the total population. In absolute terms, the rise in the number of ethnic minorities reflects a 24.5% increase. Despite this absolute increase, we generally find stable neighborhood trajectories in terms of the relative ethnic population composition over time. Table 5.2 presents the maximum likelihood estimates from the zero-inflated Poisson LCGM. The five trajectories are illustrated in Figure 5.1.

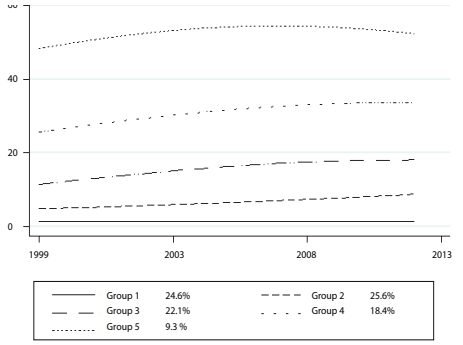

FIGURE 5.1 Trajectories of the five neighborhood groups
Source: System of Social statistical Datasets (SSD)

The first trajectory group accounts for 24.6% of the neighborhoods in the four largest cities and is characterized by an intercept-only polynomial ($b = 0.354$, $p < 0.001$). This means that, unlike the other trajectory groups, there has been no change in the share of ethnic minorities in this group of neighborhoods over the entire 15-year observation period. Despite the general increase in the number of ethnic minorities in these four cities, this first trajectory group consists of neighborhoods with hardly any ethnic minorities. The second trajectory group is estimated to account for 25.6% of the neighborhoods and follows a linear trajectory of an increasing share of ethnic minorities, albeit slightly ($b = 0.043$, $p < 0.001$). The third trajectory group shows an increasing linear trajectory ($b = 0.067$, $p < 0.001$) together with a quadratic trajectory ($b = -0.002$, $p < 0.001$).

TABLE 5.2 Maximum likelihood estimates for a zero-inflated Poisson Latent Class Growth Model

GROUP	PARAMETER	ESTIMATE	SE	T-VALUE
1	Intercept	0.354	0.016	22.153***
2	Intercept	1.561	0.013	116.991***
	Linear	0.043	0.001	31.692***
3	Intercept	2.440	0.012	205.527***
	Linear	0.067	0.003	19.215***
	Quadratic	-0.002	0.000	-10.653***
4	Intercept	3.244	0.008	390.383***
	Linear	0.041	0.003	15.785***
	Quadratic	-0.002	0.000	-8.789***
5	Intercept	3.877	0.008	459.131***
	Linear	0.027	0.003	10.037***
	Quadratic	-0.002	0.000	-8.237***
Group membership				
1		24.6%	1.133	21.742***
2		25.6%	1.148	22.312***
3		22.1%	1.087	20.318***
4		18.4%	1.007	18.268***
5		9.3%	0.753	12.313***
BIC=-63345.2 (N=21,733) BIC=-63323.8 (N=1,496) AIC=-63281.3 L=-63265.3				

*Notes: * p < .05, ** p < .01, *** p < .001*
Source: System of Social statistical Datasets (SSD)

The third trajectory group first experiences a slight increase in the share of ethnic minorities, but over time, shows a modestly decreasing trend in the share of ethnic minorities. The third trajectory group comprises 22.1% of all neighborhoods. Almost 75% of the neighborhoods in the four largest Dutch cities are characterized by low shares of ethnic minorities, although some of these neighborhoods have experienced slight increases in the share of ethnic minorities over time. The fourth trajectory group accounts for 18.4% of the neighborhoods and has a linear coefficient ($b = 0.041$, $p < 0.001$) and a quadratic coefficient ($b = -0.002$, $p < 0.001$). The fifth trajectory group shows a similar linear ($b = 0.027$, $p < 0.001$) and quadratic trajectory ($b = -0.002$, $p < 0.001$), accounting for 9.3% of all neighborhoods. The share of ethnic minorities is the highest in this latter group of neighborhoods, illustrating that 9.3% of all neighborhoods in the four largest Dutch cities are characterized by an ethnic majority population. The predicted trajectories in Table 5.3 show that neighborhoods in trajectory group four and five first experienced a small increase in the share of ethnic minorities, but that they have seen a slight decrease in the share of ethnic minorities over time.

TABLE 5.3 Predicted change in the share of ethnic minorities by trajectory group

	GROUP 1	GROUP 2	GROUP 3	GROUP 4	GROUP 5
1999	0.354	1.561	2.440	3.244	3.877
2000	0.354	1.604	3.000	3.000	4.000
2001	0.354	1.647	2.497	3.279	3.898
2002	0.354	1.691	2.485	3.271	3.891
2003	0.354	1.734	2.467	3.260	3.880
2004	0.354	1.777	2.445	3.247	3.866
2005	0.354	1.820	2.418	3.230	3.850
2006	0.354	1.863	2.387	3.210	3.830
2007	0.354	1.907	2.350	3.187	3.807
2008	0.354	1.950	2.308	3.161	3.781
2009	0.354	1.993	2.262	3.132	3.752
2010	0.354	2.036	2.210	3.100	3.720
2011	0.354	2.079	2.154	3.065	3.685
2012	0.354	2.122	2.093	3.026	3.647
2013	0.354	2.166	2.026	2.985	3.606

Source: System of Social statistical Datasets (SSD)

TABLE 5.4 Socio-economic characteristics of the five trajectory groups in 2013

	GROUP 1	GROUP 2	GROUP 3	GROUP 4	GROUP 5
Average percentage Moroccans	0.3 (0.6)	1.8 (2.2)	4.9 (3.8)	10.8 (7.0)	18.6 (13.3)
Average percentage Turks	0.3 (0.6)	1.6 (1.7)	4.1 (2.8)	8.1 (5.4)	14.6 (9.5)
Average percentage Surinamese	0.8 (1.4)	3.6 (2.5)	7.3 (3.9)	11.1 (6.7)	15.3 (10.9)
Average percentage Antilleans	0.4 (0.7)	1.3 (1.3)	2.0 (2.0)	3.7 (3.6)	4.1 (3.9)
Average percentage Dutch	79.3 (14.7)	71.7 (9.7)	60.8 (9.4)	42.7 (9.9)	23.1 (9.9)
Average percentage households at risk of poverty	19.6 (12.4)	23.8 (11.4)[a]	28.8 (12.2)	39.0 (11.7)	44.1 (9.1)[b]
Average income in euros	71,243 (29,757)	56,892 (21,579)[a]	48,351 (20,144)	36,849 (10,787)	31,309 (6,384)[b]
Average housing value in euros	435,850 (214,397)[c]	267,153 (127,106)[d]	211,931 (85,493)[e]	165,598 (57,602)[f]	139,817 (35,234)[b]
N	**367**	**385**	**330**	**275**	**139**

Notes: Standard deviations in parentheses
[a] N = 384 [b] N = 137 [c] N = 354 [d] N = 379 [e] N = 329 [f] N = 274
Source: System of Social statistical Datasets (SSD)

Table 5.4 shows the average characteristics of the neighborhoods in each of the five trajectory groups in 2013. The first trajectory group is characterized by very few ethnic minorities and a high share of native Dutch (79.3%). Despite a high average household income of 71,243 euros a year, 19.6% of the households in these neighborhoods are at risk of poverty. This might be explained by the Dutch tradition of social mixing, where social housing is located in a variety of different neighborhoods (Van Kempen & Priemus, 2002). The average housing value in the first trajectory group lies at 435,850 euros. As such, these neighborhoods can be seen as 'White citadels' (Marcuse, 1997): neighborhoods that are populated by a large native majority and are characterized by above average incomes and house values. Each subsequent trajectory group shows an increase in the share of ethnic minorities and a decrease in the share of native Dutch. Similarly, the average household income and the average housing value decreases with each trajectory, while the share of households at risk of poverty increases. Neighborhoods in the fifth trajectory with the highest share of ethnic minorities are characterized by a 52.3% ethnic minority population in 2013. About 23.1% of the population in these neighborhoods is native Dutch. The average household income lies at 31,309 euros a year which is less than half of the average income in the first trajectory group. The average housing value of 139,817 is almost four times lower than the average housing value in the first trajectory group. The share of households at risk of poverty is 44.1% in these neighborhoods. This group of neighborhoods can be seen as ethnic concentration neighborhoods characterized by relative disadvantage. These findings confirm the assumption that the spatial patterning of ethnic minorities strongly related to income.

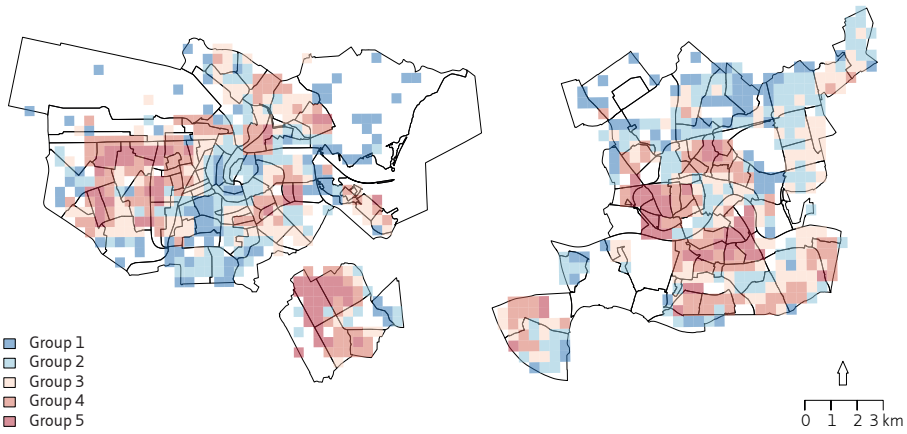

FIGURE 5.2 Geography of the trajectory groups in Amsterdam and Rotterdam
Source: System of Social statistical Datasets (SSD)

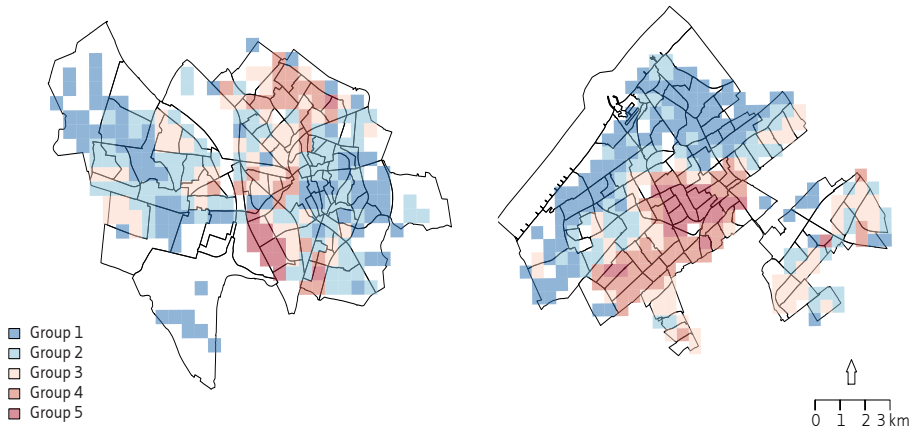

FIGURE 5.3 Geography of the trajectory groups in The Hague and Utrecht
Source: System of Social statistical Datasets (SSD)

Figure 5.2 and 5.3 show the geography of the five trajectories in each of the four cities. The maps show that neighborhoods that experience the same trajectory over time are generally clustered together. Trajectory group four and five are comprised of neighborhoods with the highest shares of ethnic minorities that tend to be located on the outskirts of all four cities. Many of these areas are postwar neighborhoods and are characterized by high shares of low-quality (social-rented) housing. This finding is in line with previous studies on segregation in the Netherlands and shows considerable overlap with income segregation (Hochstenbach & Van Gent, 2015; Zwiers et al., 2017). Neighborhoods in trajectory group one seem to cluster with with neighborhoods in trajectory group two. These 'White citadels' are located in the most expensive parts of each city, such as neighborhoods in the southern part of Amsterdam, and coastal neighborhoods in The Hague. These geographies show that neighborhoods with high shares of native Dutch and neighborhoods with high shares of ethnic minorities are characterized by spatial concentrations. All four cities appear to show extreme clustering of trajectories where neighborhoods with high shares of native Dutch are spatially segregated from neighborhoods with high shares of ethnic minorities. Especially The Hague shows extreme clustering of 'White citadels' along the more expensive coastal area and ethnically concentrated postwar neighborhoods to the south east.

To understand how patterns of ethnic neighborhood change can be explained, we analyze the role of residential mobility and natural population change. Figure 5.4 shows the mean net migration rates of ethnic minorities in each of the five trajectories. Figure 5.4 shows that there is no ethnic migration in the first trajectory group. This finding seems

to suggest that these 'White citadels' are exclusionary spaces that are inaccessible to ethnic minorities. The second and third trajectory group have experienced positive net migration over our 15-year observation period. These positive migration rates seem to be more or less stable over time. The fourth and fifth trajectory group experience declining migration rates of ethnic minorities. The negative net migration rate of ethnic minorities in these trajectory groups illustrates that there are more ethnic minorities moving out of these neighborhoods than in. This trend is most pronounced in the fifth trajectory group, meaning that the most ethnically concentrated neighborhoods show a decrease in the share of ethnic minorities as a result of ethnic out-mobility. The sharp decline in net migration rates in the fifth trajectory group between 1999 and 2005 is most likely the result of the Dutch policy of urban restructuring. Since the 1990s, many disadvantaged postwar neighborhoods with high concentrations of ethnic minorities were targeted for urban restructuring to improve the socioeconomic status of these neighborhoods. The main tool of urban restructuring was the large-scale demolition of low-quality social housing and the construction of more expensive owner-occupied or private-rented dwellings which forced many households to find affordable housing in other nearby neighborhoods (Zwiers et al., 2018b).

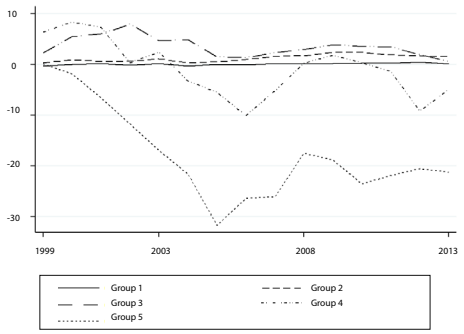

FIGURE 5.4 Ethnic net migration rates by trajectory group
Source: System of Social statistical Datasets (SSD)

Figure 5.5 illustrates the role of natural population change in each of the trajectories. The figure first of all shows that fertility rates among ethnic minorities have declined over time. This makes sense, as the age structure of the immigrant population matures over time, fertility rates will decline (see for instance Simpson et al., 2008). Figure 5.5 demonstrates that natural growth has remained stable in the first three trajectory groups, with no natural growth in the first trajectory group and general stable natural

growth in the second and third trajectory group. The other two trajectory groups have seen a decrease in natural growth over time, yet there is still positive natural change, meaning that the number of births still exceed the number of deaths among ethnic minorities in these neighborhoods.

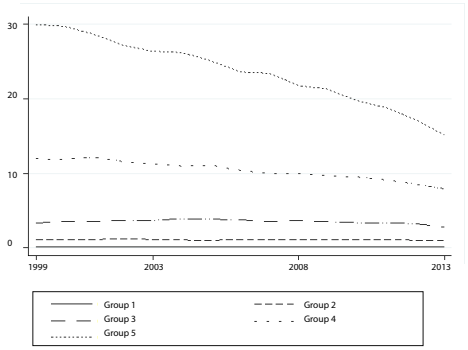

FIGURE 5.5 Ethnic natural change by trajectory group
Source: System of Social statistical Datasets (SSD)

Figure 5.4 suggests that selective mobility is an important driver behind changing ethnic residential patterns. Many individuals and households belonging to ethnic minority groups are moving out of the neighborhoods with the highest ethnic concentrations and are simultaneously moving into more mixed areas. However, at the same time, Figure 5.5 shows that although natural growth rates among migrants have declined over time, it is still an important explanation for the growth in the number of ethnic minorities in the four largest cities. Positive natural growth tends to reinforce existing patterns of ethnic segregation in the strongest concentration neighborhoods. The combination of stable positive natural growth and ethnic in-mobility in neighborhoods in trajectory group two and three is likely to lead to a growth in ethnic diversity over time.

Figure 5.6 presents the net migration rates of the native Dutch population. The migration rates of the native Dutch have remained relatively stable in the first three trajectory groups, whereas trajectory group four and five have seen an increasing inflow of the native Dutch population. At the beginning of our observation period, neighborhoods in trajectory group four and five experienced a substantial outflow of the native Dutch population.

However, over time, it seems that these neighborhoods have become more successful in attracting or maintaining the native Dutch population. It is very likely that the inflow of the native Dutch in these neighborhoods is the result of urban restructuring in these neighborhoods. Large-scale demolition and new construction has proven to be a successful tool for attracting more middle- and high-class native Dutch residents to previously disadvantaged neighborhoods (Zwiers et al., 2018b). Together with an increasing outflow of ethnic minorities, these residential mobility patterns might lead to declining levels of segregation over time.

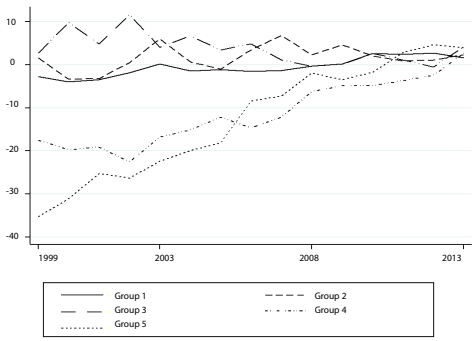

FIGURE 5.6 Native Dutch's net migration rates by trajectory group
Source: System of Social statistical Datasets (SSD)

§ 5.5 Discussion and conclusion

This paper has argued that to better understand ethnic segregation in cities it is necessary to analyze the changing ethnic population composition in neighborhoods as a result of residential mobility patterns and demographic changes. Although many studies have investigated changes in segregation levels, very few have actually investigated ethnic neighborhood change over a longer period of time and with a high temporal resolution of data. In light of increasing ethnic diversity in most cities, it is especially important to investigate how this increasing diversity is being expressed geographically. The present study has investigated trajectories of ethnic neighborhood change in the four largest cities in the Netherlands between 1999 and 2013 by using LCGMs. The use of annual data has the advantage over point-in-time measures to capture trends in ethnic neighborhood change. Instead of using a predefined typology, our modelling strategy

allowed us to create an empirical typology of ethnic neighborhood change, identifying neighborhoods that follow similar trajectories of change over time.

Our main conclusion is that neighborhoods show relative stability in the ethnic population composition over a 15-year period. This finding is in line with previous studies that argue that neighborhoods are rather 'slothful' and that significant changes, if they occur at all, take long to take effect (Meen et al., 2013; Tunstall, 2016; Zwiers et al., 2017). We have identified five different clusters of neighborhoods based on their trajectories. Although these neighborhood groups are generally characterized by stability, we find some indications of trends of change. We have shown that these neighborhood trajectories are experiencing large population dynamics, even though this has not resulted in substantial ethnic neighborhood change. These population dynamics might not have fundamentally changed the ethnic neighborhood trajectories in the short run but might have an effect on ethnic neighborhood change over a longer time horizon.

Our approach has yielded various interesting findings. First, we have identified a group of neighborhoods in the four largest cities in the Netherlands with hardly any ethnic minorities over the entire observation period. Almost 25% of all neighborhoods in each city are characterized by a high average income, a high average housing value and a high share of native Dutch. As such, these neighborhoods can be seen as 'White citadels': *"A citadel is a spatially concentrated area in which members of a particular population group, defined by its position of superiority, in power, in wealth, or status, in relation to its neighbours, congregate as a means of protecting or enhancing that position."* (Marcuse, 1997, p. 247). Figures 5.2 and 5.3 show that these 'White citadels' are located in the most expensive parts of each city and our analysis suggests that these neighborhoods are residentially inaccessible to ethnic minorities, illustrating the spatial manifestation of exclusionary elitism in increasingly ethnically diverse cities. This exclusive separation of the native population from ethnic minorities has been found in other studies as well (Johnston et al., 2002; 2015; Marcuse, 1997). The question remains, however, to what extent this exclusionary elitism in these increasingly ethnically diverse cities is the result of 'White avoidance or flight' or 'wealth flight' and to what extent these neighborhoods are accessible to other (ethnic) groups. Future research could provide more insight in the residential patterns of these native elites and analyze to what extent these 'White citadels' are the result of native self-segregation.

Second, the share of ethnic minorities in those neighbourhoods with already high shares is actually decreasing (the fourth and fifth trajectory groups). This trend is most advanced in the neighborhoods with the highest share of ethnic minorities. Ethnic minorities are the majority group in these neighborhoods which are characterized by a low average income, a low average housing value, and a low share of native Dutch.

We find that the deconcentrating trend can be explained by negative migration rates of ethnic minorities and positive net migration rates of the native Dutch. Although the outflow of ethnic minorities could be interpreted as an indication of processes of spatial assimilation, it can most likely be explained by the Dutch policy of urban restructuring where large-scale demolition and new construction has fundamentally changed the housing stock in these disadvantaged neighborhoods. This has resulted in an outflow of low-income households to a wide variety of other neighborhoods and an inflow of middle-class native Dutch. The Dutch policy of urban restructuring has been successful in decreasing levels of ethnic and income segregation by creating socioeconomically mixed neighborhoods (Zwiers et al., 2018b).

Third, most of the growth of ethnic minorities in these four Dutch cities can be explained by natural growth. We find that although ethnic minorities are increasingly moving away from concentration neighborhoods in trajectory groups four and five, positive natural growth seems to slow the trend of declining concentration down. The increases in the share of ethnic minorities in trajectory groups two and three also appear to be the result of positive natural growth. An important conclusion is that the increasing number of ethnic minorities in the four largest Dutch cities has not lead to increasing levels of segregation or concentration. The ethnic population composition has remained stable in most neighborhoods. The Dutch policy of urban restructuring has played an important role in maintaining stability in trajectory groups four and five by stimulating selective residential mobility. Without large-scale demolition and new construction, these neighborhoods would probably have seen increasing ethnic concentrations as a result of natural growth.

Last, our results confirm that there is a strong relation between the spatial patterning of ethnic minorities and socioeconomic status. Neighborhoods with high shares of ethnic minorities are generally characterized by lower incomes, lower housing values, and more households at risk of poverty, whereas neighborhoods with hardly any ethnic minorities are characterized by relative advantage. Dutch cities continue to be characterized by disadvantaged, ethnically concentrated neighborhoods on the one hand and relatively expensive, native Dutch neighborhoods on the other. Especially the map of The Hague shows a geographically divided city with relatively disadvantaged neighborhoods with high shares of ethnic minorities on the one side and advantaged neighborhoods with high shares of native Dutch on the other. The fact that these latter group of neighborhoods appear to be inaccessible to ethnic minorities raises questions about the exclusion of certain groups in particular parts of cities. Although we find a trend towards ethnic deconcentration and increased spatial mixing, this can most likely be ascribed to urban restructuring programs. It remains a question how recent budget cuts and declining government involvement will affect processes of ethnic segregation in the future.

TOC