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Zwiers, Merle

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Merle Zwiers

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Merle Zwiers
Delft University of Technology, Faculty of Architecture and the Built Environment, Department of OTB – Research for the Built Environment

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Trajectories of neighborhood change

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Friday 14 September at 10:00 o'clock

by

Merle Dominique ZWIERS
Master of Science in Sociology, University of Amsterdam, the Netherlands
born in Almere, the Netherlands

This dissertation has been approved by the promotors.

Composition of the doctoral committee:

Rector Magnificus	chairperson
Prof. dr. M. van Ham	Delft University of Technology, promotor
Dr. R.J. Kleinhans	Delft University of Technology, copromotor

Independent members:

Prof. dr. P.J. Boelhouwer	Delft University of Technology
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Prof. dr. S. Musterd	University of Amsterdam
Prof. dr. R. Van Gaalen	University of Amsterdam

Other member:

Dr. D. Manley	University of Bristol, United Kingdom

Dr. David Manley of the University of Bristol has contributed to the preparation of this dissertation.

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Summary

Introduction

Neighborhoods represent a scale at which inequalities are reflected in the unequal spatial distribution of ethnic and income groups across urban space. In many cities, the rich reside in high-quality neighborhoods in favorable locations while the poor are concentrated in disadvantaged areas (Hulchanski, 2010; Van Eijk, 2010). However, neighborhoods are not static entities and spatial patterns of socioeconomic and ethnic inequality shift over time as a result of processes of neighborhood change. Neighborhoods can develop in different ways: (1) they can gentrify which is characterized by rising house prices and the replacement of lower income groups by higher income groups (Hochstenbach & Van Gent, 2015; Newman & Wyly, 2006; Slater, 2006); (2) neighborhoods can decline which is indicated by physical deterioration and declining house prices and the succession of higher income groups by lower income groups (Grigsby et al., 1987; Prak & Priemus, 1986; Van Beckhoven et al., 2009); (3) neighborhoods can remain stable in their population composition and/or overall status for longer periods of time (Meen et al., 2013; Tunstall, 2016).

There are two empirical gaps in the literature on neighborhood change that this dissertation addresses. First, there has been a lack of longitudinal studies. Many studies on neighborhood change take on a relatively short-term perspective and reduce change to the difference between two points in time. While the literature has been dominated by case-studies on gentrification or decline, fuelling the assumption that gentrification and decline are widespread processes that quickly transform neighborhoods and cities, a growing body of research suggests that neighborhoods are rather 'slothful' and that neighborhood change takes time to take effect (Tunstall, 2016; Meen et al., 2013). Overall, we have little insight into the extent to which gentrification and decline are exceptional cases, in addition to, the prevalence and rate of change across all neighborhoods over time (cf. Tunstall, 2016).

Second, residential mobility is often seen as the most important driver of neighborhood change. However, residential mobility is shaped by structural factors such as the housing stock, local housing markets, and government policy (Meen et al., 2013; Nygaard & Meen, 2011). Moreover, researchers have argued that residential mobility should be understood in relation to demographic and in-situ change, which can also play an important role in processes of neighborhood change (Bailey, 2012; Finney & Simpson, 2009; Teernstra, 2014). The relative impact of the housing stock and different

population dynamics on neighborhood change has however received little attention in the literature to date.

This dissertation contributes to the literature on longitudinal neighborhood change, both theoretically and methodologically. Theoretically, it provides insight into diverging pathways of neighborhood change over time, illustrating how different mechanisms interact to shape the urban geography along socioeconomic and ethnic lines. The path-dependent role of the housing stock is analyzed, in addition to the extent to which changes to the housing stock as a result of urban restructuring affect residential mobility and neighborhood change. Moreover, this dissertation investigates patterns of ethnic segregation over time and explores the relative impact of residential mobility and demographic change. Methodologically, this dissertation explores innovative methods for the analysis of neighborhood trajectories, broadening the scope of statistical methods for the field of neighborhood change research.

This dissertation uses individual-level administrative data from the System of Social statistical Datasets (SSD) provided by Statistics Netherlands. The SSD contains longitudinal geocoded data on the full Dutch population, as well as information on the built environment. As such, the SSD allows for the analysis of the relationship between the housing stock and population change in processes of neighborhood change. Neighborhoods are operationalized using 500 by 500 meter grids, which are the most consistent low spatial scale over time. Three out of four chapters focused on the 1999 to 2013 time period, while chapter 3 covered the 1971 to 2013 period. This dissertation employed innovative methodologies to analyze trajectories of neighborhood change over time. Chapter 3 presents a combination of sequence analysis and a tree-structured discrepancy analysis that allows for the visualization of neighborhood pathways and its relation to their contexts. Chapter 5 uses a Latent Class Growth Model (LCGM) to categorize neighborhoods based on similarities in the timing and pace of change over time. Both methodologies have proven to be valuable tools for the identification of diverging neighborhood pathways over time.

Summary of chapters

This dissertation is comprised of five separate, but related papers. Chapter 2 presents a literature review of theories and studies on neighborhood decline. Chapters 3 to 6 are empirical research papers that have their own theoretical framework, empirical analyzes, results and discussion section. All papers have either been published in peer-reviewed journals or are currently under review. The content of chapters 2 to 6 is summarized below.

The Global Financial Crisis and neighborhood decline

Chapter 2 presents an overview of the literature and theories on the spatial consequences of the Global Financial Crisis (GFC). The impact of the GFC and the economic recession that followed is unevenly distributed between households and individuals, with low-income and vulnerable households being affected the most. As such, it can be expected that the consequences of the GFC are most pronounced in disadvantaged neighborhoods. While many studies have investigated the effects of the GFC on the economy and/or housing markets, only a few studies have focused on the unequal geographical impacts of the GFC (Batson & Monnat, 2015; Foster & Kleit, 2015). This chapter bridges two streams of literature by formulating ten ways in which the GFC might accelerate processes of neighborhood decline. The main goal of this chapter is to further the intellectual debate on neighborhood decline and to call for more longitudinal research on the ways in which the GFC has affected neighborhood trajectories and spatial patterns of increasing inequality.

The path-dependency of low-income neighborhoods

Chapter 3 presents an innovative longitudinal approach to analyzing neighborhood change and investigates the trajectories of low-income neighborhoods in the 31 largest cities in the Netherlands over the 1971 to 2013 period. Many studies on neighborhood change are limited by relatively short-term perspectives, and/or a focus on specific case-studies of gentrification or decline (e.g. Bailey, 2012; Jivraj, 2013; Hochstenbach & Van Gent, 2015). As such, it is unclear to what extent neighborhoods with similar characteristics experience the same process of change over time – or to what extent gentrification or decline are the exception to the rule. Using sequence analysis and a tree-structured discrepancy analysis, this chapter contributes to the literature by analyzing how housing stock characteristics shape neighborhood trajectories over longer periods of time. The results show that neighborhoods exhibit a high degree of path-dependency. Neighborhoods with high shares of social housing in 1971 display a pattern of increased poverty concentration and neighborhood decline over time. By way of contrast, increases in the share of owner-occupied housing contribute to more upward neighborhood trajectories.

The effects of physical restructuring on neighborhoods

Chapter 4 analyzes the effects of urban restructuring programs on neighborhood change in the 31 largest Dutch cities. Researchers have been critical about the effectiveness of urban restructuring in actually achieving upgrading neighborhoods (e.g. Lawless,

2011; Permentier et al., 2013; Tunstall, 2016; Wilson, 2013). However, many studies have been faced with methodological limitations with respect to measuring urban restructuring, spatial scale, and time periods. Chapter 4 overcomes these limitations by focusing on the effects demolition and new construction on a low spatial scale over a 15-year period. Using propensity score matching, this chapter finds a positive causal effect of demolition and new construction on neighborhood upgrading. The results indicate that large-scale demolition and new construction leads to socioeconomic upgrading of deprived neighborhoods as a result of attracting and maintaining middle- and high-income households. Urban restructuring appears to have negative spillover effects in terms of an increased share of low-income households in other neighborhoods.

Trajectories of ethnic neighborhood change

Chapter 5 focuses on trajectories of ethnic neighborhood change in the four largest Dutch cities, Amsterdam, Rotterdam, The Hague and Utrecht, between 1999 and 2013. As the share of ethnic minorities continues to grow in many cities, this raises concerns about increasing levels of ethnic segregation. The literature has been divided on the methods for analyzing ethnic segregation over time and many researchers have relied on single-number indices or typologies based on arbitrary thresholds (e.g. Duncan & Duncan, 1955; Johnston et al., 2010; Massey & Denton, 1993; Peach, 1996; Poulsen et al., 2001). Chapter 5 presents an innovative alternative for the identification of trends in the ethnic population composition over time. Using LCGMs, this chapter finds that neighborhoods show relative stability in the ethnic population composition over time, despite a substantial growth in the ethnic population. Although ethnic minorities are increasingly moving away from concentration neighborhoods, processes of natural growth play an important role in maintaining levels of ethnic segregation.

Intergenerational continuity of ethnic segregation

Chapter 6 investigates persistent patterns of ethnic segregation over the course of generations. In the literature, it is assumed that ethnic segregation will decrease over the course of generations as later generations will be more socially and economically integrated in society (e.g. Massey, 1985). This assumption is reflected in the official Dutch definition of ethnicity that classifies individuals whose parents are born in the Netherlands, but with one or more immigrant grandparents, as native Dutch. The use of this definition has important empirical consequences and influences conclusions about ethnic neighborhood change. Focusing on the residential patterns of third generation parental home-leavers in the 31 largest Dutch cities between 1999 and 2013, this chapter illustrates that third generation ethnic minorities continue to

be overrepresented in ethnic concentration neighborhoods. The intergenerational continuity of socioeconomic disadvantage among ethnic minorities plays an important role in persistent ethnic segregation over time.

Findings and conclusions

The findings of this dissertation contribute to the field of neighborhood change research in four ways. First, this dissertation has demonstrated that neighborhoods tend to be relatively stable in their socioeconomic and ethnic status over time and that neighborhood change takes several decades to take effect. Second, this dissertation underlines the determining role of the housing stock in processes of neighborhood change. Neighborhoods exhibit a high degree of path-dependency where the initial quality of the built environment is reinforced over time. Chapter 3 has illustrated that the share of social housing is an important determinant of future processes of neighborhood decline. Changes to the housing stock, however, have the ability to alter the trajectories of neighborhoods. Chapter 4 has shown that large-scale demolition and new construction as a result of urban restructuring programs has led to neighborhood upgrading by attracting and maintaining higher income groups. Third, this dissertation has illustrated how different population dynamics interact to maintain the status quo. Chapter 5 and 6 have identified persistent patterns of ethnic segregation over time as a result of socioeconomic disadvantage among ethnic minorities which leads to high residential mobility rates into ethnic concentration neighborhoods. Although residential mobility is often seen as the most important driver of neighborhood change, this dissertation adds to the growing literature on the role of demographic change. The effects of ethnic residential mobility out of concentration neighborhoods on ethnic segregation are mitigated by processes of natural growth. Fourth, this dissertation has explored innovative methods for the analysis of longitudinal patterns of neighborhood change. Sequence analysis in combination with a tree-structured discrepancy analysis allows for a detailed analysis of neighborhood trajectories and the relationship with their contexts. LCGMs enable the identification of diverging neighborhood patterns of change based on timing and pace.

Challenges and limitations

Despite the contributions to the literature, this dissertation is also faced with several limitations, three of which are highlighted below. First, this dissertation has analyzed patterns of neighborhood change, but has not directly focused on gentrification. While some view urban restructuring as a form of state-led gentrification (e.g. Uitermark & Bosker, 2014), this dissertation sees urban restructuring as fundamentally different

from more natural processes of gentrification. The term gentrification has become widely used (and abused) for a wide variety of different and, sometimes unrelated, processes leading to neighborhood upgrading. Future research would benefit from clearly defining gentrification and for analyzing gentrification over longer periods of time. Currently, we have very little insight in the prevalence, rate, and extent of gentrification across neighborhoods and cities and it is unclear to what extent its effects are temporary or long-lasting.

Second, this dissertation has limited its focus on the four largest ethnic groups in the Netherlands. However, the spatial distribution of these four ethnic groups is likely to be related to the residential behavior and distribution of other ethnic groups in the Netherlands. Future research would benefit from comparing patterns of segregation across different ethnic groups and the ways they interact to shape the urban geography along ethnic lines.

Third, the innovative methods employed in this dissertation enable the analysis of patterns of neighborhood change, however, they are not without limitations. Both methods allow for the identification of groups of neighborhoods that follow similar trajectories over time. However, these methods are faced with a degree of uncertainty around the true number of groups. In addition, a tree-structured discrepancy analysis uses the most significant values of the predictor variables as cut-off points, however, it is unclear to what extent these values can be interpreted as threshold values in processes of neighborhood change. Overall, these limitations reflect the nature of the modelling process and underlines the need to string theoretical reasoning beneath the models.

Policy implications

This dissertation has underlined the relative stability of neighborhoods over time. Policy makers should keep in mind that neighborhood change takes time to take effect, often exceeding standard policy time periods. Large-scale changes to the housing stock in the context of urban restructuring programs have the ability to generate neighborhood change by stimulating selective residential mobility. However, the positive effects of urban restructuring are limited to the restructured neighborhood. Other neighborhoods appear to suffer from negative spillover effects, illustrated by an increase in the share of low-income households as a result of displacement.

The GFC has accelerated the shift towards the marketization of social housing. Some cities aim to stimulate gentrification through the sales of social housing which reduces the size and quality of the social housing stock. The spatial consequences of such policies are however unclear and may take time to take effect. Policy makers should be aware

that reducing the size and quality of the social housing stock in large cities complicates the accessibility of cities for low-income groups and can have a major impact on the urban geography of cities and regions.

This dissertation has found persistent patterns of ethnic segregation which can be explained by intergenerational ethnic disadvantage. The question remains to what extent spatial patterns of ethnic disadvantage should be targeted by urban (re)development. As studies have shown that ethnic socioeconomic mobility tends to lead to more residential opportunities and spatial dispersal, it could be more beneficial to invest in education and labor market participation.

Last, this dissertation has illustrated that official definitions of ethnicity can influence empirical conclusions. Ethnic origin is based on the country of birth of the parents, however, this indicator ignores other aspects of ethnic origin. Later generations of ethnic minorities might still be characterized by other aspects of ethnic origin that play an important role in group inequalities. As society is becoming increasingly diverse, policy makers should be sensitive to ethnic differences and group inequalities that are not directly reflected in official statistics.

TOC

Samenvatting

Introductie

Sociale ongelijkheid tussen verschillende etnische en inkomensgroepen manifesteert zich via duidelijke ruimtelijke patronen. Veel steden worden gekenmerkt door een ruimtelijke tweedeling tussen hoge inkomensgroepen die in kwalitatief goede buurten op gunstige locaties wonen en lage inkomensgroepen die zich concentreren in achterstandsbuurten (Hulchanski, 2010; Van Eijk, 2010). Vaak hebben dit soort vormen van inkomenssegregatie ook een sterke etnische dimensie: veel achterstandswijken worden gekenmerkt door een oververtegenwoordiging van etnische minderheden. Deze ruimtelijke patronen van ongelijkheid kunnen echter veranderen door de tijd heen doordat buurten geen statische eenheden zijn. Buurten kunnen zich op verschillende manier ontwikkelen: (1) buurten kunnen gentrificeren waarbij huisprijzen stijgen en lagere inkomensgroepen plaatsmaken voor hogere inkomensgroepen (Hochstenbach & Van Gent, 2015; Newman & Wyly, 2006; Slater, 2006); (2) buurten kunnen in verval raken door fysieke achteruitgang, dalende huisprijzen en een toename in het aandeel lage inkomensgroepen (Grigsby et al., 1987; Prak & Priemus, 1986; Van Beckhoven et al., 2009); (3) buurten kunnen stabiel blijven als er nauwelijks sprake is van fysieke of sociale verandering (Meen et al., 2013; Tunstall, 2016).

Dit proefschrift richt zich op verschillende processen van buurtverandering door de tijd en de oorzaken daarvan. Hoewel er veel onderzoek is gedaan naar buurtverandering, is er een gebrek aan lange-termijn studies naar dit fenomeen. De meeste studies naar buurtverandering richten zich op een relatief kort tijdsbestek en/of beperken verandering tot het verloop tussen twee tijdspunten. Het merendeel van de literatuur betreft specifieke case-studies van buurtverval of gentrificatie, wat het idee heeft gevoed dat dit veelvoorkomende processen zijn die buurten en steden in een snel tempo drastisch veranderen. Echter, buurtverandering is een traag proces waarvan de gevolgen pas zichtbaar zijn na een langere periode (Tunstall, 2016; Meen et al., 2013). Er is weinig inzicht in de mate waarin hoeverre buurtverval of gentrificatie uitzonderlijke gevallen zijn en de omvang en snelheid van verandering in alle buurten in een stad of regio (cf. Tunstall, 2016).

Het verhuisgedrag van huishoudens en individuen wordt vaak gezien als de belangrijkste oorzaak van buurtverandering. Maar verhuisgedrag wordt beïnvloed door structurele factoren zoals de woningvoorraad, de woningmarkt en stedelijk beleid (Meen et al., 2013; Nygaard & Meen, 2011). Daarnaast hebben onderzoekers beargumenteerd dat

demografische ontwikkelingen en in-situ verandering gevolgen kunnen hebben op buurtniveau (Bailey, 2012; Finney & Simpson, 2009; Teernstra et al., 2014). Weinig studies hebben de rol van de woningvoorraad in combinatie met bevolkingsdynamiek in processen van buurtverandering onderzocht.

Dit proefschrift draagt bij aan de literatuur over buurtverandering, zowel theoretisch als methodologisch. Dit proefschrift draagt bij aan theoretische kennis van uiteenlopende processen en oorzaken van buurtverandering en de gevolgen voor sociaalruimtelijke ongelijkheid. Dit proefschrift onderzoekt de pad-afhankelijkheid van de woningvoorraad en de manier waarop veranderingen in de woningvoorraad (bijvoorbeeld als gevolg van stedelijke vernieuwing) buurtverandering en verhuisbewegingen stimuleren. Daarnaast richt dit proefschrift zich op ontwikkelingen in etnische segregatie en de rol van verhuisbewegingen en demografische veranderingen. Tevens draagt dit proefschrift bij aan de methodologische verkenning van innovatieve statistische methoden voor longitudinaal onderzoek naar buurtverandering.

Het onderzoek in dit proefschrift maakt gebruik van registerdata uit het Stelsel van Sociaal-statistische Bestanden (SSB) van het Centraal Bureau voor de Statistiek. Het SSB bevat longitudinale geo-gecodeerde data van alle geregistreerde inwoners van Nederland. Daarnaast bevat het SSB data over de gebouwde omgeving. Hierdoor is deze data geschikt voor het analyseren van buurtverandering en de rol van de woningvoorraad en bevolkingsdynamiek. Buurten zijn in dit proefschrift gedefinieerd als 500 bij 500 meter grids. Het voordeel van grids is dat ze analyses op laagruimtelijk schaalniveau door de tijd heen mogelijk maken. Drie van de vier hoofdstukken in dit proefschrift richten zich op de periode 1999 tot 2013. Hoofdstuk 3 omvat een tijdsbestek van 42 jaar en richt zich op de periode 1971 tot 2013. Dit proefschrift gebruikt innovatieve statistische methoden om verschillende patronen van buurtverandering te identificeren. Hoofdstuk 3 combineert sequence analysis met een tree-structured discrepancy analysis wat de visualisatie van contextuele buurtpatronen door de tijd mogelijk maakt. Hoofdstuk 5 past een Latent Class Growth Model (LCGM) toe om buurten te groeperen op basis van overeenkomsten in veranderingspatronen. Beide methoden zijn waardevolle technieken voor de analyse van uiteenlopende longitudinale patronen van buurtverandering.

Samenvatting van de hoofdstukken

Dit proefschrift bestaat uit vijf afzonderlijke maar gerelateerde hoofdstukken. Hoofdstuk 2 bestaat uit een literatuurstudie over theorieën over en onderzoek naar buurtverval. Hoofdstuk 3 tot en met 6 zijn volledige onderzoeksartikelen die gepubliceerd zijn in wetenschappelijke tijdschriften of die momenteel nog onder review zijn. Deze hoofdstukken hebben een eigen theoretische uiteenzetting, empirische

analyses, resultaten en discussie sectie. De inhoud van hoofdstuk 2 tot en met 6 is hieronder samengevat.

De Grote Financiële Crisis en buurtverval

Hoofdstuk 2 geeft een overzicht van de theorie over de ruimtelijke gevolgen van de Grote Financiële Crisis (GFC). De impact van de GFC en de recessie die volgde is ongelijk verdeeld tussen huishoudens en individuen waarbij lage inkomensgroepen en andere kwetsbare groepen het meest te lijden hebben gehad. Hoewel er veel studies zijn die de gevolgen van de GFC voor de economie en/of de woningmarkt hebben onderzocht, zijn er maar weinig studies die gekeken hebben naar ongelijke geografische uitkomsten (Batson & Monnat, 2015; Foster & Kleit, 2015). Dit hoofdstuk verbindt de literatuur over de GFC met de literatuur over buurtverval door tien hypothesen te formuleren over de mogelijke gevolgen van de GFC voor buurten. Het doel van dit hoofdstuk is om het debat over buurtverval voort te zetten en meer longitudinaal onderzoek naar de ruimtelijke uitkomsten van de GFC te stimuleren.

De padafhankelijkheid van lage inkomensbuurten

Hoofdstuk 3 presenteert een innovatieve longitudinale methode voor het analyseren van buurtverandering. Dit hoofdstuk richt zich op de ontwikkeling van lage inkomensbuurten in de 31 grootste Nederlandse steden over de periode 1971 tot 2013. Veel studies over buurtverandering beperkingen zich tot een relatief kort tijdsbestek en/of richten zich op specifieke case studies over buurtverval of gentrificatie (e.g. Bailey, 2012; Jivraj, 2013; Hochstenbach & Van Gent, 2015). Hierdoor blijft de vraag onbeantwoord of buurten met soortgelijke kenmerken zich op dezelfde manier ontwikkelen en of buurtverval en gentrificatie de uitzondering op de regel zijn. Dit hoofdstuk combineert sequence analysis met een tree-structured discrepancy analysis en draagt bij aan inzicht over de manier waarop de woningvoorraad de ontwikkeling van buurten door de tijd heen beïnvloedt. De resultaten laten zien dat buurten een sterke mate van padafhankelijkheid ervaren. Buurten met een hoog aandeel sociale huurwoningen in 1971 laten een toenemende ontwikkeling van armoedeconcentratie en buurtverval door de tijd zien. Buurten die na 1971 een toename in het aandeel koopwoningen laten zien, maken daarentegen een positieve ontwikkeling door.

De gevolgen van stedelijke vernieuwing voor buurten

Hoofdstuk 4 richt zich op de gevolgen van stedelijke vernieuwing voor buurtverandering in de 31 grootste Nederlandse steden. Onderzoekers zijn kritisch over de mate waarin stedelijke vernieuwing heeft bijgedragen aan buurtverbetering (e.g. Lawless, 2011; Permentier et al., 2013; Tunstall, 2016; Wilson, 2013). Veel studies naar de uitkomsten van stedelijke vernieuwing worden echter gekenmerkt door een aantal belangrijke methodologische beperkingen met betrekking tot het meten van stedelijke vernieuwing, het ruimtelijk schaalniveau, en de tijdsperiode. Hoofdstuk 4 omzeilt deze beperkingen door zich te richten op de gevolgen van grootschalige sloop en nieuwbouw op een laagruimtelijk schaalniveau over een periode van 15 jaar. Dit hoofdstuk gebruikt propensity score matching en vindt een positief causaal effect van sloop en nieuwbouw op buurtverbetering. De resultaten laten zien dat grootschalige sloop en nieuwbouw leidt tot de sociaaleconomische opwaardering van buurten door het aantrekken en behouden van hogere inkomensgroepen. Stedelijke vernieuwing lijkt daarentegen negatieve spillover effecten te hebben op andere buurten in de zin van een toename van lage inkomensgroepen als gevolg van verplaatsing.

Patronen van etnische buurtverandering

Hoofdstuk 5 onderzoekt patronen van etnische buurtverandering in de vier grootste steden, Amsterdam, Rotterdam, Utrecht en Den Haag, tussen 1999 and 2013. Het groeiende aandeel etnische minderheden in veel steden leidt tot zorgen over toenemende etnische segregatie. Er is een tweedeling in de literatuur wat betreft de methoden voor het analyseren van ontwikkelingen in etnische segregatie. Traditionele studies hebben gebruikt gemaakt van indices (Duncan & Duncan, 1955; Massey & Denton, 1993; Peach, 1996), terwijl recentere studies zich richten op typologieën die gebaseerd zijn op relatief willekeurige grenswaarden (Johnston et al., 2010; Poulsen et al., 2001). Hoofdstuk 5 presenteert een innovatief alternatief voor het identificeren van veranderingen in de etnische compositie van buurten. Met behulp van LCGMs laat dit hoofdstuk zien dat buurten redelijk stabiel zijn in de etnische bevolkingssamenstelling door de tijd, ondanks de stijging in het aandeel etnische minderheden in deze vier steden. Hoewel etnische minderheden steeds vaker wegverhuizen uit concentratiewijken, blijkt dat het hoge geboortecijfer onder etnische minderheden een belangrijke rol speelt in het stabiel houden van etnische segregatieniveaus.

Intergenerationele continuïteit van etnische segregatie

Hoofdstuk 6 richt zich op aanhoudende patronen van etnische segregatie door generaties heen. In de literatuur wordt er vaak aangenomen dat etnische segregatie zal afnemen door de generaties heen vanwege de sociaaleconomische integratie van jongere generaties. Deze aanname wordt zichtbaar in de Nederlandse definitie van etnische minderheden. Derde generatie minderheden wiens ouders in Nederland zijn geboren, maar met één of meer grootouders in het buiteland geboren, worden geclassificeerd als autochtonen. Het gebruik van deze definitie heeft belangrijke empirische consequenties en beïnvloedt tevens conclusies over etnische buurtverandering. Dit hoofdstuk richt zich op het verhuisgedrag van derde generatie jongeren die uit huis gaan en zelfstandig gaan wonen in de 31 grootste steden tussen 1999 en 2013. De resultaten laten zien dat derde generatie minderheden oververtegenwoordigd zijn in etnische concentratiebuurten. De intergenerationele overdracht van sociaaleconomische achterstand onder etnische minderheden speelt een belangrijke rol in aanhoudende patronen etnische segregatie door de tijd.

Bevindingen en conclusies

De bevindingen uit dit proefschrift dragen op vier manieren bij aan de literatuur over buurtverandering. Ten eerste heeft dit proefschrift aangetoond dat buurten relatief stabiel zijn in hun etnische en sociaaleconomische status door de tijd en dat verandering pas na verloop van tijd zichtbaar is.

Ten tweede laat dit proefschrift de belangrijke rol van de woningvoorraad zien in processen van buurtverandering. Buurten worden gekenmerkt door een sterke mate van padafhankelijkheid waarbij de oorspronkelijke kwaliteit van de gebouwde omgeving sterk bepalend is voor de ontwikkeling van buurten door de tijd. Zo heeft hoofdstuk 3 aangetoond dat het aandeel sociale huurwoningen een belangrijke determinant is voor latere processen van buurtverval. Veranderingen in de woningvoorraad hebben echter de mogelijkheid om de ontwikkeling van buurten een andere richting op te duwen. Hoofdstuk 4 heeft laten zien dat grootschalige sloop en nieuwbouw als gevolg van stedelijke vernieuwing heeft geleid tot buurtverbetering door het aantrekken en behouden van hogere inkomensgroepen.

Ten derde heeft dit proefschrift bijgedragen aan inzicht in de manier waarop verschillende bevolkingsdynamieken samenwerken om de status quo te behouden. Hoofdstuk 5 en 6 hebben aanhoudende patronen van etnische segregatie geïdentificeerd. De langdurige sociaaleconomische achterstand van etnische minderheden speelt een belangrijke rol in hun verhuisgedrag waardoor etnische minderheden in hoge mate verhuizen

naar etnische concentratiebuurten. Hoewel het verhuisgedrag van huishoudens en individuen vaak wordt gezien als de belangrijkste oorzaak van buurtverandering, draagt dit proefschrift bij aan de groeiende literatuur over de rol van demografische ontwikkelingen. Dit proefschrift laat zien dat stedelijke vernieuwing verhuizingen uit etnische concentratiebuurten heeft gestimuleerd, maar de gevolgen hiervan voor etnische segregatie teniet worden gedaan door het hoge geboortecijfer onder de zittende etnische bevolking.

Tenslotte heeft dit proefschrift twee innovatieve statistische methoden gepresenteerd voor de analyse van longitudinale patronen van buurtverandering. Sequence analysis in combinatie met een tree-structured discrepancy analysis maakt een gedetailleerde contextuele analyse van buurtverandering mogelijk. LCGMs kunnen gebruikt worden voor de duiding van diverse trends in buurtontwikkelingen gebaseerd op overeenkomsten in veranderingspatronen.

Uitdagingen en beperkingen

Naast de bijdragen aan de literatuur kent dit proefschrift ook een aantal beperkingen. De drie belangrijkste beperkingen worden hieronder toegelicht. Om te beginnen, hoewel dit proefschrift zich richt op patronen van buurtverandering in de brede zin van het woord, heeft het niet specifiek gekeken naar gentrificatie. Sommigen zien stedelijke vernieuwing als een vorm van overheidsgestuurde gentrificatie (e.g. Uitermark & Bosker, 2014), echter, dit proefschrift ziet stedelijke vernieuwing als fundamenteel verschillend van gentrificatie. Gentrificatie is een meer markt-gedreven proces waarbij buurten een sterke verbetering doormaken en in toenemende mate hogere inkomensgroepen aantrekken. De term gentrificatie wordt tegenwoordig alom gebruikt (en misbruikt) voor een verscheidenheid aan, in sommige gevallen ongerelateerde, processen die leiden tot buurtverbetering. Toekomstig onderzoek zou baat hebben bij het duidelijker definiëren van gentrificatie en bij het analyseren van de lange-termijn effecten van gentrificatie. Momenteel is er te weinig inzicht in de mate waarin gentrificatie voorkomt en hoe snel het leidt tot verandering in buurten en steden.

Daarnaast heeft dit proefschrift zich gericht op de vier grootste etnische groepen in Nederland. Maar de ruimtelijke verdeling van de vier grote groepen is waarschijnlijk gerelateerd aan het verhuisgedrag en de ruimtelijke verdeling van andere etnische groepen. Er is meer onderzoek nodig dat patronen van segregatie van verschillende etnische groepen vergelijkt en kijkt naar de manier waarop ze elkaar beïnvloeden.

Tot slot bieden de statistische methoden die gepresenteerd zijn in dit proefschrift veel mogelijkheden voor onderzoek naar buurtverandering, maar ze kennen ook een aantal

beperkingen. Beide methoden kunnen gebruikt worden voor het duiden van groepen buurten op basis van dezelfde ontwikkeling door de tijd. Echter, beide methoden hebben te maken met een zekere mate van onzekerheid omtrent het aantal te identificeren groepen. Het is moeilijk om zeker te weten of het aantal gevonden groepen overeenkomt met het ware aantal groepen in de werkelijkheid. Daarnaast wordt er bij een tree-structured discrepancy analysis gebruik gemaakt van de meest significante waarden van de voorspellende variabelen voor het creëren van groepen, maar het is niet duidelijk in hoeverre deze waarden daadwerkelijk geïnterpreteerd kunnen worden als drempelwaarden in processen van buurtverandering. Al met al zijn deze beperkingen inherent aan statistisch onderzoek en benadrukken ze het belang van een sterke verbinding met de theorie.

Beleidsimplicaties

Dit proefschrift benadrukt de relatieve stabiliteit van buurten door de tijd. Het is belangrijk dat beleidsmakers zich bewust zijn dat buurtverandering tijd kost om te verwezenlijken; de termijn voor buurtverandering overstijgt vaak standaard beleidsperioden. Grootschalige veranderingen aan de woningvoorraad in de context van stedelijke vernieuwing kunnen leiden tot buurtverandering door het stimuleren van selectief verhuisgedrag. Beleidsmakers moeten echter in het achterhoofd houden dat de positieve uitkomsten van stedelijke vernieuwing beperkt blijven tot de aandachtsbuurten. Andere buurten lijken juist te lijden onder stedelijke vernieuwing vanwege de toename in het aandeel lage inkomensgroepen als gevolg van verplaatsing.

De GFC heeft bijgedragen aan de toenemende marktwerking in de sociale huursector. Veel steden proberen gentrificatie te stimuleren door de betere sociale huurwoningen te verkopen, waardoor de sociale woningvoorraad krimpt en daalt in kwaliteit. De ruimtelijke gevolgen van dit beleid zijn echter niet duidelijk en zullen waarschijnlijk pas zichtbaar worden over een langere periode. Het is belangrijk dat beleidsmakers rekening houden met het feit dat het krimpen van de sociale woningvoorraad belangrijke gevolgen zal hebben voor de toegankelijkheid van bepaalde buurten en steden voor lagere inkomensgroepen. Dit kan grote gevolgen hebben voor de grotere stedelijke regio met betrekking tot het ontstaan van nieuwe ruimtelijke concentraties van armoede en segregatie.

Dit proefschrift heeft aanhoudende patronen van etnische segregatie gevonden als gevolg van de intergenerationele sociaaleconomische achterstand van etnische minderheden. Het blijft de vraag of dit soort ruimtelijke concentraties van etnische verschillen in sociaaleconomische status aangepakt moeten worden met stedelijk beleid. Studies hebben aangetoond dat sociaaleconomische mobiliteit onder etnische minderheden

leidt tot meer mogelijkheden op de woningmarkt, waardoor etnische minderheden meer diversiteit in hun verhuisgedrag laten zien. Het lijkt dan ook doeltreffender om te investeren in onderwijs en arbeidsmarktparticipatie om sociaaleconomische mobiliteit onder etnische minderheden te stimuleren.

Tot slot heeft dit proefschrift aangetoond dat officiële definities van etniciteit empirische conclusies kunnen beïnvloeden. In Nederland wordt etnische afkomst gebaseerd op het geboorteland van de ouders, maar deze definitie negeert andere aspecten van etniciteit. Latere generaties worden niet meer officieel gedefinieerd als etnische minderheden, maar kunnen nog wel gekenmerkt worden door andere aspecten van etnische afkomst die een rol kunnen spelen in groepsverschillen. Nu de samenleving steeds meer divers wordt is het belangrijk dat beleidsmakers zich bewust zijn van etnische verschillen tussen groepen die misschien niet direct zichtbaar zijn in officiële statistieken.

1 Introduction

§ 1.1 Introduction

The Global Financial Crisis (GFC) has led to increased socio-spatial inequalities between different groups across Europe (OECD, 2013a). Austerity programs and large-scale budget cuts have contributed to the growth in the number of disadvantaged households and has exacerbated poverty, while the dismantling of welfare state regimes has led to a shift towards privatization and marketization (Peck, 2012). These developments affected the spatial distribution of different ethnic and income groups across urban space and have led to increased socioeconomic and ethnic segregation in many European cities (Tammaru et al., 2016).

Neighborhoods represent a scale at which inequalities are reflected, illustrated by large differences in services and infrastructure, house prices and quality, and population composition. Many cities are characterized by distinctive spatial patterns where the rich tend to be located in historic inner-city areas while the poor reside in more disadvantaged outer-city or suburban neighborhoods (Hulchanski, 2010; Van Eijk, 2010). However, neighborhoods are not static entities and processes of neighborhood change have a major impact on the socio-spatial geography of cities and regions. Neighborhoods can develop in different ways: (1) they can remain demographically stable for longer periods of time; (2) neighborhoods can gentrify which is characterized by rising house prices and the replacement (or displacement) of low-income households by more affluent households (Hochstenbach & Van Gent, 2015; Newman & Wyly, 2006; Slater, 2006); (3) in contrast, neighborhoods can decline, indicated by the physical deterioration of the built environment and declining house prices, and the succession of high-income households by low-income households (Grigsby et al., 1987; Prak & Priemus, 1986; Van Beckhoven et al., 2009).

Processes of neighborhood change have multiple dimensions, including both ethnic and socioeconomic dimensions. Gentrification is often described as a process by which the White middle-class replaces the black working-class in previously disadvantaged neighborhoods (cf. Lees, 2000). In a similar vein, processes of decline tend to be depicted as a process by which the White middle-class is succeeded by low-income ethnic minorities (e.g. Duncan & Duncan, 1957; Schelling, 1971; Taeuber & Taeuber, 1965).

Although ethnic and socioeconomic neighborhood change are highly interrelated, they may be driven by different processes. For example, demographic change plays a large role in ethnic neighborhood change (Finney & Simpson, 2009), while socioeconomic neighborhood change is largely driven by selective residential mobility (Hochstenbach & Van Gent, 2015). Together, these different processes interact to shape the urban geography along socioeconomic and ethnic lines.

The main aim of this dissertation is to improve our understanding of pathways and drivers of ethnic and socioeconomic neighborhood change over time. This dissertation specifically focuses on the following research questions: *(1) What trajectories of neighborhood change can be identified over time? (2) To what extent can neighborhood change be explained by population change and housing stock characteristics?*

This dissertation contributes to the literature in two ways. First, there is an empirical gap in the literature on how typical the neighborhoods that change are, and the prevalence and extent of change across all neighborhoods (Tunstall, 2016; Zwiers et al., 2017). The literature has been dominated by the assumption that gentrification and decline are wide-spread developments that quickly transform cities. However, a small body of research argues that neighborhoods are rather 'slothful' and that significant neighborhood change is rare and may take several decades (Hulchanski, 2010; Meen et al., 2013; Tunstall, 2016). Prior studies on neighborhood change have been limited by a short-term perspective, often reducing neighborhood change to the difference between two points in time. The lack of longitudinal analyzes of neighborhood change is an important lacuna that affects urban planning and neighborhood policies. This dissertation aims to add to the literature on longitudinal studies on neighborhood change, both theoretically and methodologically. By analyzing neighborhood trajectories over longer periods of time, this dissertation provides insight into different trends over time and the prevalence and rate of change. The innovative methodologies used in this dissertation contribute to broadening the scope of statistical methods for the analysis of longitudinal neighborhood change. This dissertation employs new visualization techniques to illustrate the various pathways of change. In addition, it uses advanced statistical models that allow for causal analysis and the identification of non-linear patterns of neighborhood change.

Second, this dissertation focuses on several determinants of neighborhood change. In the literature, residential mobility has long been seen as the most important driver of neighborhood change. However, residential mobility is influenced by structural factors such as the quality of the housing stock, local housing markets, and government policy (Meen et al., 2013; Nygaard & Meen, 2011). This dissertation will show how the housing stock and urban restructuring programs shape patterns of residential mobility and neighborhood change. Moreover, this dissertation argues that residential

mobility is not the sole driver of neighborhood change by also analyzing other types of population change, such as demographic change and in-situ change. An emerging body of research has argued that neighborhoods can change without any significant in- and out-migration (Bailey, 2012; Finney & Simpson, 2009; Teernstra, 2014). Processes of natural growth and ageing, as well as changes in the socioeconomic status of the sitting population, can change the population composition and status of neighborhoods. This dissertation contributes to a better understanding of the role of housing stock characteristics and population dynamics in shaping the spatial distribution of different ethnic and socioeconomic groups.

§ 1.2 Neighborhood dynamics and stability

While there are many views on neigbhorhood change, there are two competing extremes: whilst some argue that neighborhoods are 'slothful' (Meen et al., 2013; Tunstall, 2016); others emphasize the dynamic character of neighborhoods (Bailey & Livingston, 2007; Bailey et al., 2013; Van Ham et al., 2013). The mismatch between these two views arguably leads to dilemmas in policymaking and evaluation (Tunstall, 2016). This dissertation argues that a comprehensive understanding of neighborhood change needs to take both views into account. On the one hand, neighborhoods are indeed characterized by relative stability. The advantages and disadvantages of the geographical location of neighborhoods are reinforced over time, demonstrating a strong degree of path-dependence (Meen et al., 2013). Neighborhoods are characterized by a relatively static housing stock and large changes to the built environment are rare (Meen et al., 2013). On the other hand, neighborhoods can be extremely dynamic in their population composition as a result of residential mobility and demographic change. Mobility in and out of neighborhoods, together with births and deaths, imply that the population composition of neighborhoods is constantly changing (Simpson & Finney, 2009; Van Ham et al., 2013).

This dissertation argues that population dynamics generally do not lead to neighborhood status change. When the housing stock maintains a certain quality over time, neighborhoods tend to retain a relatively stable socioeconomic and ethnic status (Meen et al., 2013). The static character of the built environment then implies that similar types of residents move through these neighborhoods. In-situ change as a result of household dynamics, demographic change, or socioeconomic mobility can have an effect on neighborhoods (e.g. Bailey, 2012), but by itself it is unlikely to fundamentally change the overall status of neighborhoods. Rather, processes of neighborhood status

change tend to be driven by (changes to) the built environment. Gentrification has been related to the desirable location, high-quality, and architectural aesthetics of historic inner-city neighborhoods that become increasingly popular over time (e.g. Bridge, 2001; Zukin, 2010). The physical quality and amenities of these neighborhoods lead to rising house prices, stimulating the selective in-mobility of higher income groups and out-mobility of lower income households. Decline can instead be explained by the low-quality of the built environment, where a lack of investment and technical problems lead to deteriorating housing conditions and declining housing values, leading to the selective outflow of more affluent households (Prak & Priemus, 1986; Van Beckhoven et al., 2009). The cheap housing attracts many low-income households, resulting in spatial concentrations of poverty.

However, processes of gentrification and decline that fundamentally transform neighborhoods in terms of their population composition and overall status are rare (Cortright & Mahmoudi, 2014; Tunstall, 2016). Moreover, the effects of decline and gentrification on the urban geography may take several decades to appear (Hulchanski, 2010). This disseration adopts a longitudinal approach to neighborhood change, analyzing longer term processes and residential dynamics over several decades to understand how the urban geography has been shaped by neighborhood change and stability. The important role of the built environment in reproducing socio-spatial inequalities as a result of path-dependence is highlighted. Spatial structures alone do not determine neighborhood trajectories, however, they have a large impact on the distribution of households and individuals across urban space. Large shocks to the urban system are necessary to change the trajectory of a neighborhood (Nygaard & Meen, 2013).

From the point of view of policy makers, processes of change and stability are important for policy development and implementation. The neighborhood represents a scale at which government interventions aimed to counteract socio-spatial inequality may be developed. Many countries have implemented urban restructuring programs directed at changing the spatial distribution of disadvantaged residents and ethnic minorities, such as the *HOPE VI* program in the US, *La Rénovation Urbaine* in France, the *New Deal for Communities* in the UK, and *Stedelijke Vernieuwing* in the Netherlands. Urban restructuring programs that consist of large-scale demolition and new construction have the potential to induce neighborhood change (Meen et al., 2013). Improvements to the housing stock may attract different types of residents which could potentially lead to neighborhood upgrading. Analyzing the outcomes of urban restructuring has been a challenge in the current literature. The lack of insight into the long-term effects of urban restructuring on the urban geography constitutes a gap in the literature that this dissertation aims to address. Urban restructuring could also fundamentally impact the larger urban area through spillover effects or processes of displacement (Bråmå,

2013; Musterd & Ostendorf, 2005a). The effects of urban restructuring may take time to materialize, exceeding restructuring policy time periods (Tunstall, 2016). Analyzing the effects of urban restructuring over longer periods of time is necessary to understand to what extent change is substantial or to which investments are dissipated over time (Nygaard & Meen, 2013).

§ 1.3 The Dutch context

The Dutch government has played a large role in shaping the spatial distribution of different income and ethnic groups. Historically, the Netherlands was characterized as a country with a strong social welfare state (Esping-Andersen, 1990). One goal of the Dutch welfare state was to provide good housing facilities to its citizens, which has resulted in a large social housing sector that consisted of relatively high-quality housing inhabited by different income groups (Van Kempen & Priemus, 2002). Since the 1990s, there has been a steady growth in the owner-occupied sector providing more housing opportunities for middle- and high-income households, leading to an overrepresentation of low-income households in the social housing sector (Van Kempen & Priemus, 2002). While there was relatively little segregation before, these developments led to processes of neighborhood decline and increased spatial concentrations of poverty as social housing was often located in particular (post-war) neighborhoods (Prak & Priemus, 1986; Van Kempen & Priemus, 2002). These concentrations of poverty were characterized by a specific ethnic dimension, illustrated by a disproportionally high share of ethnic minorities in these neighborhoods (Bolt et al., 2008), which reflects the strong relation between ethnic and socioeconomic segregation in the Netherlands.

The relation between socioeconomic and ethnic segregation is probably most pronounced for the four largest non-western migrant groups: Moroccans, Turks, Surinamese, and Antilleans. Moroccans and Turks mainly immigrated to the Netherlands as a result of labor migration in the 1960s and 1970s, while the immigration of Surinamese and Antilleans largely occurred in the context of postcolonial relations from 1975 onwards. In 1999, these four groups combined consisted of almost 950,000 people, comprising 6% of the total population (Statistics Netherlands, 2017). The share of ethnic minorities increased substantially over the study period of this dissertation as a result of family formation and family reunification (Beets et al., 2008). In 2013, the share of the four largest groups increased to 7.5%, comprising almost 1,3 million individuals, of which half consists of the second generation (Statistics Netherlands, 2017).

In 2013, there were almost 370,000 residents from a Moroccan background and around 400,000 residents from a Turkish background in the Netherlands. Most Moroccan and Turkish migrants were 'guest workers' that were originally recruited for temporary low-skilled work, but that decided to permanently settle in the Netherlands and were subsequently joined by their families (Beets et al., 2008; Zorlu & Hartog, 2002). The majority of Moroccan and Turkish children were born in the Netherlands, resulting in an increasingly large second generation (Statistics Netherlands, 2016a). The relatively low level of educational attainment among the first generation, together with large cultural differences and difficulties with Dutch language acquisition, has contributed to the relatively disadvantaged position of Moroccans and Turks in Dutch society (Odé & Veenman, 2003). Although the socioeconomic position of the second generation is improving slowly, they continue to have lower levels of education, higher unemployment rates, and more benefit-dependency compared to the native population (Statistics Netherlands, 2016b).

Migration from the former colonies, Surinam and the Netherlands Antilles, has a long history. Migration from Surinam to the Netherlands increased in the 1970s when Surinam became independent (Van Amersfoort & Van Niekerk, 2006). A decline in the Antillean economy has led to increased migration from the Antilles to the Netherlands in the 1990s (Oostindie, 2011). In 2013, almost 150,000 Antillean and some 350,000 Surinamese residents were living in the Netherlands, almost half of which consists of the second generation (Statistics Netherlands, 2017). In contrast with Moroccan and Turkish migrants, the Surinamese and Antilleans were familiar with the Dutch society and language as a result of the colonial history (Oostindie, 2011). Despite this, their socioeconomic position tends to be less favorable compared to that of the native population, although it is slightly better than that of Moroccan and Turkish migrants (Odé & Veenman, 2003). Second generation Surinamese and Antilleans show more labor market participation and higher educational attainment compared to the first generation and compared to Moroccan and Turks, but continue to lag behind the native population (Statistics Netherlands, 2016b).

The relatively disadvantaged position of those of Moroccan, Turkish, Surinamese and Antillean descent is reflected in their distribution across the urban environment. The four ethnic groups have been overrepresented in disadvantaged neighborhoods in Dutch cities (Bolt et al., 2008). In the 1990s, policy debates were focused on the negative effects of concentrations of ethnic minorities and low-income groups in neighborhoods dominated by social housing. It was argued that these spatial concentrations were related to several socioeconomic problems, such as high unemployment and crime rates, which was thought to negatively affect socioeconomic mobility and the integration of ethnic minorities (VROM, 1997). From 1997 to 2014, several urban restructuring programs were implemented with the aim to improve disadvantaged neighborhoods through the

demolition of low-quality social housing and the construction of new owner-occupied or private-rented dwellings. By changing the housing stock, policy makers aimed to create a socioeconomic mix of residents in these disadvantaged neighborhoods which would break up concentrations of poverty and would counteract negative neighborhood effects (Ostendorf et al., 2001; Uitermark, 2003). This dissertation will show that the Dutch urban restructuring programs have affected the spatial distribution of different income and ethnic groups through demolition and new construction. Chapter 4 will illustrate that urban restructuring has affected processes of neighborhood change through selective mobility. It will show that urban restructuring changes the spatial distribution of disadvantaged residents which affects the entire urban region.

The spatial distribution of ethnic minorities has been a continuous topic of debate (e.g. Dagevos, 2009; VROM, 1997; 2007). While urban restructuring programs have been relatively successful in counteracting socioeconomic segregation, ethnic segregation appears to be a persistent feature of Dutch cities (see chapters 5 and 6). The growing size of the ethnic minority population raises concerns about increasing levels of ethnic segregation and its hampering effects on social integration, mobility, and interethnic contact, thereby posing a threat to inclusive diverse societies (Kaplan & Douzet 2011; Monkkonen & Zhang 2013; Van Ham & Tammaru 2016). The literature suggest that ethnic segregation will decrease over time as a result of socio-spatial assimilation (Alba & Logan, 1993; Massey, 1985). Ethnic segregation is arguably a logical phenomenon in the period directly after immigration as ethnic minorities initially cluster together for mutual support (Massey, 1985). The spatial assimilation hypothesis assumes that when ethnic minorities become increasingly (socioeconomically and culturally) assimilated with the host society, they will display the same residential mobility behavior as the native population, moving away from concentration neighborhoods to more mixed areas (Gordon, 1964; Massey, 1985; Bolt & Van Kempen, 2010a). Studies have indeed shown that compared to the first generation, second generation ethnic minorities are less likely to move to concentration neighborhoods (Bolt & Van Kempen 2010a; Kleinepier & van Ham 2017; Zorlu & Mulder 2010). Nevertheless, ethnic segregation appears to be a persistent feature of many large cities (e.g. Bolt & Van Kempen, 2010a; Jivraj & Khan, 2015; Lymperopoulu & Finney, 2017).

Next to a sizeable second generation, there is a small, but growing, third generation of the four largest non-western ethnic groups in the Netherlands. Though relatively young, the third generation consists of some 95,000 individuals under the age of 50, or comprising 0.6% of the population in 2016 (Statistics Netherlands, 2016c). Third generation immigrants whose parents are Dutch-born, but with one or more immigrant grandparents, are considered to be of Dutch birth or ancestry. Behind this definition lies the assumption that these third generation immigrants are no longer substantially different from the native Dutch in social, cultural, and economic terms (Kooiman et al.,

2012). The use of this definition of ethnicity has empirical consequences for research on neighborhood change. Child-birth among Dutch-born second generation ethnic minorities will lead to a decrease in the share of ethnic minorities in a neighborhood. In a similar vein, the in-migration of third generation immigrants into ethnic concentration neighborhoods will appear to have a deconcentrating effect in official statistics. This dissertation will illustrate how the use of such official definitions complicates empirical research on ethnic neighborhood change. More importantly, chapter 6 will show how the growth of the third generation is likely to lead to an increase in ethnic segregation in particular disadvantaged neighborhoods.

§ 1.4 Data and methods

The empirical research in this dissertation uses individual-level administrative data from the System of Social statistical Datasets (SSD) provided by Statistics Netherlands. The SSD contains longitudinal information on the full Dutch population, including various socioeconomic and demographic characteristics, in addition to information on dwellings and buildings, such as tenure and housing value. All data are geocoded which makes it possible to follow individuals and households over time and space, in addition to the description of small area characteristics. As such, the SSD allows for the analysis of processes of neighborhood change by tracking changes in the population composition. The data on (changes to) the housing stock enable the analysis of the relationship between housing stock characteristics and population change, which is a key element of this dissertation. Three out of four chapters analyze neighborhood change over a period of 15 years between 1999 to 2013. One chapter combines the SSD with the last Dutch census of 1971 to provide a more long-term perspective on neighborhood change. The temporal analysis includes the period of the Global Financial Crisis and its aftermath which contributes to an understanding of how the GFC has exacerbated socio-spatial inequalities in recent times.

Individual-level socioeconomic and ethnic information has been aggregated to create neighborhood characteristics. In this dissertation, neighborhoods are operationalized using 500 by 500 meter grids. These grids consist of approximately 800 residents on average in the 31 largest cities in 2013. It is important to mention that while the size of 500 by 500 meter grids is likely to correspond to residents' perception of their direct residential environment, it might not necessarily reflect what residents perceive as their neighborhood. In addition, urban restructuring programs were focused on administrative neighborhoods or on postcode areas instead of grids. However, although the SSD provides

different spatial scales, such as administrative neighborhoods and postcode areas, grids are the most suitable spatial scale for this research. Postcode areas are relatively large administrative areas (consisting of 5,000 residents on average in 2013) which complicates research on neighborhood change. The effects of neighborhood change have to be extremely large to influence the trajectories of postcode areas. Alternatively, the geographical boundaries of administrative neighborhoods have changed drastically over time which can lead to spurious conclusions on neighborhood change. Although urban restructuring programs concentrated on administrative neighborhood instead of grids, in practice, only specific parts of neighborhoods were targeted for restructuring (Dol & Kleinhans, 2012). The use of 500 by 500 meter grids makes it therefore possible to better analyze the effects of such localized restructuring. Overall, 500 by 500 meter grids provide the most consistent low spatial scale at which processes of neighborhood change can best be captured.

Three out of four chapters in this dissertation are focused on the 31 largest Dutch cities for two reasons. First, the majority of the urban restructuring programs concentrated on the 31 largest cities where neighborhood disadvantage was most extensive. Second, neighborhood dynamics in large cities are fundamentally different from dynamics in smaller, rural, or suburban areas. Analyzing neighborhood dynamics in other areas would be an interesting avenue for future research, but was beyond the scope of this dissertation. One chapter in this dissertation concentrates specifically on ethnic neighborhood change in the four largest Dutch cities: Amsterdam, Rotterdam, Utrecht, and the Hague. The decision to focus on these four cities was related to the fact that ethnic minorities tend to be overrepresented in these cities (Bolt et al., 2008). In addition, including multiple cities in the analyses was computationally too extensive for the servers.

The SSD has important advantages over other data sources because of its detailed, high-quality, individual-level data, however, there are several limitations as well. The SSD only contains administrative register-based information which means that there is no data on, for example, individual preferences, perceptions, or motivations. This makes it harder to understand how and why individuals and households move or stay put, which can be important to our understanding of how individual situations affect patterns of segregation. Moreover, while the SSD provides longitudinal data, most data are only available from 1999 onwards. This implies that the longitudinal analysis in this dissertation covers 15 years which is relatively short for neighborhood change research. One chapter in this dissertation overcomes this limitation by using the last Dutch census of 1971, which allows for a temporal analysis of 42 years.

One of the goals of this dissertation was to explore innovative methodologies for the longitudinal analysis of neighborhood change. The methods for analyzing trajectories

are limited and generally do not allow for the identification of patterns over time. This dissertation applies sequence analysis as a method for analyzing neighborhood trajectories. Sequence analysis allows for the visualization of individual neighborhood pathways, illustrating how neighborhoods move through different states over time (cf. Gabadinho et al., 2011). Neighborhoods that experience similar trajectories can be clustered. To overcome the issue of the identification of mutually exclusive groups in cluster analysis, this dissertation uses a tree-structured discrepancy analysis to illustrate how housing stock characteristics relate to different neighborhood trajectories, contributing to an understanding of complex, contextualized patterns over time (cf. Studer et al., 2011). A different approach to analyzing neighborhood trajectories are Latent Class Growth Models (LGCMs). LCGMs enable the identification of quantitatively different trajectories in longitudinal data when they are not identifiable ex ante (Nagin, 2005). To provide insight into contemporary patterns and varying degrees of population mix, this dissertation employs a LCGM to create an empirical typology of ethnic neighborhood change over time, allowing for the identification of common trajectories based on the timing and pace of ethnic neighborhood change. Crucially, instead of using arbitrary cut-off points, LCGMs facilitate the identification of empirical trends over time. This dissertation is the first to apply these methods in the context of neighborhood change research. Both sequence analysis and LCGMs have proven to be valuable and innovative methodologies for neighborhood change research, facilitating the identification of patterns of change over time.

§ 1.5 Overview of the dissertation

This dissertation is comprised of one theoretical and four empirical chapters. All empirical chapters are complete research papers with their own introduction, theoretical framework, data and methods section, empirical analyzes, results and discussion section. All papers have been published in peer-reviewed journals or are currently under review.

Chapter 2 presents a theoretical overview of the spatial consequences of the GFC. The GFC has led to increased unemployment and poverty rates which has been unevenly distributed between households and individuals. These developments tend to have specific spatial outcomes, where neighborhoods represent a scale at which inequalities are reflected. Chapter 2 aims to further the debate on the unequal geographical impacts of the GFC and proposes ten about the ways in which it might accelerate neighborhood decline.

Chapter 3 focuses on the trajectories of low-income neighborhoods in the 31 largest Dutch cities over the 1971 to 2013 period. Using sequence analysis and a tree-structured discrepancy analysis, this chapter analyzes the relationship between housing stock characteristics and neighborhood trajectories. Dutch cities have shown increased spatial concentrations of low-income households over a 42-year period. Processes of neighborhood decline can be explained by the low-quality of post-war social housing, illustrating a high degree of path-dependency related to the initial quality of housing.

Chapter 4 analyzes the effects of urban restructuring on neighborhood change. Focusing on large-scale demolition and new construction between 1999 and 2013, this chapter uses propensity score matching to compare restructured neighborhoods to a set of control neighborhoods with similar socioeconomic characteristics. The results indicate that large-scale demolition and new construction leads to the socioeconomic upgrading of deprived neighborhoods as a result of attracting and maintaining middle- and high-income households. The results indicate that urban restructuring has negative spillover effects by stimulating the displacement of low-income households to nearby neighborhoods and other disadvantaged neighborhoods.

Chapter 5 focuses on ethnic neighborhood change in the four largest Dutch cities between 1999 and 2013. Using LCGMs, this chapter identifies five trajectories of ethnic neighborhood change over time. The main conclusion is that the ethnic population composition of neighborhoods remains relatively stable over time. Although there is evidence for a slow trend towards deconcentration of ethnic minorities and increased population mixing, these pathways towards deconcentration are mitigated by processes of ethnic natural growth that reinforce existing patterns of ethnic segregation.

Chapter 6 addresses the socio-spatial assimilation of third generation ethnic minorities. The literature assumes that ethnic segregation will decrease over the course of generations as a result of social and economic assimilation. This chapter focuses on the residential mobility behavior of third generation Moroccan, Turkish, Surinamese, and Antillean parental home-leavers in the 31 largest Dutch cities between 1999 and 2013 and its effects on ethnic segregation. Third generation home-leavers from continue to be more likely to move into ethnic concentration neighborhoods than their native peers, illustrating a strong intergenerational continuity of socio-spatial patterns among those from a migrant background.

Chapter 7 consists of an overall conclusion of this dissertation, summarizing the main findings of the chapters outlined above and reflecting on the theoretical and methodological contributions and limitations. This dissertation concludes with an overview of the policy implications.

TOC

2 The Global Financial Crisis and neighborhood decline

Merle Zwiers, Gideon Bolt, Maarten van Ham, Ronald van Kempen
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§ 2.1 Introduction

The Global Financial Crisis (GFC), which started in 2008, has had a major impact on many Western European and North American countries. In the years preceding the crisis, many countries in the Global North experienced rising house prices, accompanied by an expansion of mortgage financing (Wachter, 2015). As the financial market has become increasingly global, the collapse of the subprime mortgage market and house price bubble in the United States (US) has had repercussions on a global scale (Martin, 2011). While there were significant differences between impacted countries in the timing and macroeconomic processes underlying the GFC, the characteristics of the subsequent economic recession have been similar: stagnating economic growth, a sovereign debt crisis, and rising unemployment (Aalbers, 2015). Many governments have responded to the declining economy and growing unemployment levels with the implementation of major budget cuts for social provisions (Peck, 2012). This has contributed to both relative and absolute growth in the number of economically disadvantaged households and has exacerbated poverty on both sides of the Atlantic. While the average income of the top 10% of the populations of OECD countries was essentially unaffected by the crisis, the average income of households in the lowest income decile experienced an annual decline of 2% between 2007 and 2010 (OECD, 2013a). In many countries, the GFC has also had a major impact on the housing market, evidenced by a large drop in home prices and declining sales of both existing and new-build housing (Van Der Heijden et al., 2011).

Today, many countries are slowly recovering from the first shocks of the GFC and the economic recession that followed. However, in many Southern European countries, unemployment rates continue to be very high and, although unemployment is declining in places like the United States and Germany, long-term unemployment appears to

be a persistent problem in many countries (OECD, 2014; Shierholz, 2014). Similarly, despite graudual stock market recoveries and some modest increases in house prices, repercussions from the GFC and economic recession persist in all countries. In many countries, the GFC has had predictable effects on the supply side of the housing market - the willingness of banks to lend money to prospective owners has generally declined. In some countries, investors in real estate became more selective, avoiding projects with too much risk; in the United States, in contrast, investors of another ilk have bought large numbers of foreclosed, real estate owned (REO) properties with the main goal of making a profit (e.g. Mallach, 2010b). Regeneration and restructuring initiatives have been put on hold throughout Western Europe (Boelhouwer & Priemus, 2014; Raco & Tasan-Kok, 2009; Schwartz, 2011). While some governments, such as the United Kingdom and the Netherlands, implemented stimulus programs to generate more (affordable) housing in the years after the crisis, recent budget cuts have put an end to these programs (Scanlon & Elsinga, 2014; Schwartz, 2011).

The demand side of the housing market has also changed. Banks have tightened lending terms, making it more difficult for many households to obtain a mortgage (Goodman et al., 2015). As a result, there is more demand for private rentals and social or public housing. The GFC has affected employment on both sides of the Atlantic, in terms of either high unemployment levels or a shift toward more casualized labor contracts such as zero hour or temporary employment contracts (Aalbers, 2015; Puno & Thomas, 2010). This has led to financial strain and housing affordability problems for many households (JCHS, 2015). In the United States, households that are behind on their mortgage payments, and that are unable to obtain a mortgage modification with their lender, are faced with displacement due to foreclosure. This results in a large group of residents with badly damaged credit ratings who are in search of post-foreclosure housing in nearby areas (Martin, 2012). In other countries where the option of foreclosure is often not available, households that are unable to pay their rent or mortgage often have to move to cheaper dwellings and less attractive neighborhoods, while others have to stay put, because moving is too expensive or alternatives are not available, or because negative equity makes it impossible for them to move.

All of these developments have contributed to rising inequality in the Global North, particularly in terms of income and housing (e.g. Immervoll et al., 2011; Bellman & Gerner, 2011). The GFC therefore raises questions about the future development of neighborhoods, especially because inequality tends to have specific spatial outcomes including increased segregation, increased spatial concentrations of low-income groups, and negative neighborhood effects (e.g., European Commission, 2010; Glaeser et al., 2009; Van Eijk, 2010; Zwiers & Koster, 2015). While there has been little research on the effects of the GFC at the neighborhood level, the evidence described above suggests that the effects are distributed unevenly across urban areas (Foster & Kleit, 2015;

Batson & Monnat, 2015). As households in the bottom income decile have experienced the sharpest drop in income, the effects of the GFC are likely to be felt most acutely in the most disadvantaged neighborhoods (see also Rugh & Massey, 2010; Thomas, 2013).

In view of these concerns, this article sets out to identify factors that affect neighborhood decline in the aftermath of the GFC. Many economists have pointed to structural changes in national housing markets and to the changing role of states as important consequences of the GFC (e.g. Wachter, 2015), yet, few researchers analyze how these changes play out at the neighborhood level. Similarly, housing researchers have identified multiple drivers behind neighborhood decline, but many of them focus on within-neighborhood processes at the expense of developments at higher scale levels (Van Beckhoven et al., 2009). In this paper, we aim to bridge this gap by presenting 10 hypotheses on how changes at different geographical scales affect neighborhood decline. Our goal is not to create the next ideal-type model of neighborhood decline processes; rather, we seek to further the intellectual debate on neighborhood decline call for more research on the spatial consequences of the GFC, specifically on neighborhoods as an important territorial dimension of increasing inequality.

Our hypotheses mainly pertain to the Global North. Although these countries have very different political, economic, and social structures, research on neighborhood change in different contexts in the Global North has often led to broadly similar findings. This suggests that many of the underlying processes of neighborhood change are comparable across countries. In the same vein, the increasingly global nature of financial and housing markets (Aalbers, 2015) yields similarities in the effects of the GFC and the economic recession between countries. However, the effects of the GFC are mediated by national policies, local (housing market) circumstances, and intra-neighborhood processes, meaning that the GFC has different outcomes in different places.

The next section of this article presents a short discussion of definitions of neighborhoods and neighborhood decline. We then highlight important elements from existing studies to formulate 10 hypotheses about the effects of the GFC and the economic recession on neighborhood decline. These hypotheses are divided over three sections, each with a different geographical focus. The conclusion brings our arguments together and calls for more contextualized longitudinal research.

§ 2.2 Defining neighborhoods and neighborhood decline

Neighborhoods are defined in various ways. Some definitions are related to distance: the neighborhood covers the area within which one can reach important destinations (schools, shops, and friends) within walking distance (e.g. Morris & Hess, 1976). Other definitions are based on social networks and refer explicitly to the existence of social bonds in the area (e.g. Warren, 1981). However, these definitions imply that 'the neighborhood' is different for each individual, which makes research on neighborhood outcomes extremely complicated. Galster (2001) defines neighborhoods as "*... bundles of spatially based attributes associated with clusters of residences, sometimes in conjunction with other land uses*" (p. 2112). The 'spatially based attributes' refer to, for example, the characteristics of buildings, and infrastructural, demographic, class, status, social interactive, and sentimental characteristics. Defining neighborhoods based on spatial similarities (such as housing type or population composition) is difficult, especially in mixed-housing areas.

All definitions of neighborhoods have their advantages and disadvantages and there is no ideal neighborhood definition. The choice of definition depends on the type of research and should be substantiated by the researcher, bearing in mind that different definitions of neighborhoods may lead to different outcomes. For our purposes, it is sufficient to use a rather general and pragmatic definition of neighborhood: *a neighborhood is a relatively small spatial subdivision of a city or town for which a number of physical, demographic, and socioeconomic characteristics can be measured. The size of a neighborhood may vary by city*.

Neighborhoods play an important role in shaping the lives of individuals and households, in relation to their social contacts, identity, health, and happiness (see also Martin, 2003). Moreover, neighborhoods have become increasingly important as local political and economic entities, with many governments focusing on neighborhoods to solve a wide array of social and economic problems (Martin, 2003). This highlights the importance of neighborhoods in a post-crisis society: with declining national government involvement in many countries, there may be an even stronger need to deal with many problems locally, on, for example, the level of cities or neighborhoods.

Neighborhoods can develop in different directions: a neighborhood can be demographically stable for years or even decades. Neighborhoods can experience gentrification, indicated by, for example, rising house prices, an outflow of low-income households and an inflow of more affluent households. The extensive literature on this topic documents such processes in great detail (e.g. Doucet, 2014; Lees, 2008).

Neighborhoods can also show a process of decline, indicated by falling house prices, an inflow of low-income households and an outflow of more affluent households.

In this article, we assume that the long-lasting effects of the GFC and the economic recession will fuel neighborhood decline. We use a broad definition of neighborhood decline: *any negative development in the physical, demographic, or socioeconomic conditions of a neighborhood as experienced by its residents or other stakeholders*.

§ 2.3 Ten hypotheses on the GFC and neighborhoods

The remainder of this article consists of ten hypotheses about the ways in which the GFC might influence neighborhood decline. They are intended as a challenge to researchers to test whether these hypotheses can be confirmed or rejected in different national and urban contexts. The hypotheses are divided into three sections. The first part focuses on how the GFC plays out in different national housing and welfare systems. The next part zooms in on the local context as a mediating variable in processes of neighborhood decline, while the final part concentrates on residents as drivers of neighborhood change.

§ 2.3.1 The role of national housing and welfare systems

Differences in welfare state regimes are an important explanatory factor in the wide range of national differences in housing systems (Priemus & Whitehead, 2014). In countries where the government has historically been strongly involved in the development of affordable (social) housing, such as Denmark, Sweden, and the Netherlands, the quality and the size of the social housing stock was originally very high (Van Kempen & Priemus, 2002; Tsenkova & Turner, 2004). This high initial quality has mitigated processes of neighborhood decline and has led to relatively low levels of income segregation in these countries. However, over the past few decades, severe cuts in housing subsidies took place in these countries, and they have moved toward a more market-based housing system, where the responsibility for social housing shifted from public authorities to housing associations or NGO landlords. Housing associations are now increasingly dependent on their own revenue to construct new social housing (Van Kempen & Priemus, 2002; Schwartz, 2011). To generate revenue, many housing associations have been selling off the better parts of their social housing stock over the past decade, significantly reducing

the share and average quality of the social housing stock (Kleinhans & Van Ham, 2013; Schwartz, 2011).

In many countries, the GFC has led to the implementation of budget cuts and austerity programs. In combination with cuts in (social) housing subsidies before the GFC, these austerity programs have had an important impact on the opportunities for households on the housing market. Firstly, especially in times of economic recession, austerity programs and budget cuts directly affect the financial resources of households (cf. Lindbeck, 2006; Swank, 1998). Secondly, austerity programs and budget cuts have restricted the resources available for the maintenance and construction of affordable social housing, although these processes have been more dramatic in some countries than in others (Van der Heijden et al., 2011; Priemus & Whitehead, 2014). In the United States, for example, Low-Income Housing Tax Credit (LIHTC) programs were implemented in the 1980s and these programs were extended during the mortgage crisis and the years after to stimulate the development of low-income housing (Schwartz, 2011). However, because of the unstable market for tax credits, the LIHTC program tends to be more successful in the more robust housing markets in major metropolitan areas where banks are still dependent on the Community Reinvestment Act (Schwartz, 2011; Belsky & Nipson, 2010). Next to showing geographical differences in the effectiveness of tax credit programs, it is unlikely that they will generate as much equity for housing as it did before the GFC (Schwartz, 2011).

We can thus see that the GFC has affected the production of affordable housing in many countries in different ways. In countries where housing associations are dependent on private investors, we can expect to see the production of social housing to increase in those areas where there is a more robust housing market and where there is potential for financial gain. In other countries, we can generally expect a declining production of affordable housing. Together with more financial restrictions for households as a direct effect of the crisis, these processes can reduce residential mobility and force low-income groups to concentrate in neighborhoods where affordable housing options are still available. This can easily lead to increasing concentrations of low-income groups in the most deprived areas.

Hypothesis 1

Austerity programs and budget cuts lead to a smaller social safety net for vulnerable groups on the one hand, and to more limited options on the social housing market on the other, leading to increasing concentrations of low-income groups in particular neighborhoods.

The extent of the impact of the GFC on the housing market depends on the volatility and structure of local and regional housing markets in different countries (Van der Heijden et

al., 2011). In countries with highly regulated housing finance systems, such as Germany, Switzerland, and Austria, the housing market was barely affected by the crisis (Whitehead et al., 2014). The most important explanations for housing market stability in these countries are the well-developed rental markets and the low homeownership rates, together with conservative lending policies (Schneider and Wagner, 2015; Whitehead et al., 2014). In countries with more open finance markets, of which Ireland and Iceland are the main examples, house prices fell considerably due to the rapid expansion of mortgage debt in the years before the crisis (Whitehead et al., 2014).

In countries with high mortgage indebtedness, states and financial institutions deliberately stimulated homeownership over the past few decades. First, many low- to middle-income groups and first-time buyers were allowed to obtain a mortgage by engaging in high loan-to-value lending (Schelke, 2012). Second, direct subsidies or tax allowances were implemented to support low- to middle-income groups' entry into homeownership (though in some countries, subsidies such as mortgage interested deductions tend to benefit high-income groups the most) (Hanson et al., 2014; Schelkle, 2012). Low- to middle-income groups have generally been hit the hardest by the GFC and the subsequent economic recession in terms of underwater mortgages, unemployment, and declining incomes (Dreier et al., 2014).

In the United States, subprime and predatory lending practices have disproportionally targeted disadvantaged groups in disadvantaged neighborhoods (Aalbers, 2009; Martin, 2011; Mayer & Pence, 2008). Subprime and predatory lending generally refer to high loan-to-value lending, compensating for higher credit risks with unfavorable terms such as higher fees and interest rates that are not beneficial to the borrower (Crossney, 2010; Aalbers, 2013). These practices increase the debt of the borrower beyond the collateral property and reduce the value of the underlying asset and accumulated equity (Crossney, 2010; Schloemer et al., 2006). Subprime and predatory lending tended to be spatially clustered in particular disadvantaged and segregated parts of US cities, resulting in high numbers of foreclosures in these areas (e.g., Anacker & Carr, 2011; Batson & Monnat, 2015; Crossney, 2010; Hyra & Rugh, 2016; Immergluck, 2008; Mallach, 2010a; Rugh & Massey, 2010). Concentrations of foreclosures and vacancies in particular areas may lead to declining housing values of nearby properties (Immergluck, 2009; Immergluck & Smith, 2006) and fuel neighborhood decline through vandalism and increasing crime rates (Aalbers, 2013; Jones & Pridemore, 2016; Martin, 2011; Newman, 2009; Ojeda, 2009).

In general, declining house prices have disproportionally affected low- to middle-income groups, often leaving them with a very unstable financial situation and negative equity (e.g., Crossney, 2010; Dreier et al., 2014; Thomas, 2013). In the United States, this has resulted in high concentrations of foreclosures in disadvantaged neighborhoods,

displacing large numbers of people who are in need of (affordable) housing and have lost the ability to obtain a mortgage due to badly damaged credit (Goodman et al., 2015; Martin, 2012). These post-foreclosure households tend to relocate in other hard-hit foreclosure areas, contributing to declining average household income and neighborhood instability (Martin, 2012).

Hypothesis 2

The neighborhood effects of the GFC on neighborhoods are stronger in countries that have actively stimulated homeownership at high loan-to-value rates. Vulnerable groups such as racial or ethnic minorities, low- to middle-income households, and first-time buyers are especially affected by the GFC. When these groups are overrepresented in particular neighborhoods, these neighborhoods are often affected by rapid processes of decline.

In countries where there has been a deliberate policy to expand homeownership over the past few decades, it has become more difficult for low- to middle-income groups and first-time buyers to obtain a mortgage than in the years preceding the crisis (Boelhouwer & Priemus, 2014; Clark, 2013; Goodman et al., 2015). The mortgage systems that have emerged from the crisis generally favor higher income groups, leading to increasing disparities between financially stable and financially unstable households (Forrest & Hirayama, 2015). This ultimately means that particular groups and areas are excluded from the mortgage housing market (Clark, 2013; Forrest & Hirayama, 2015; Martin, 2011; Watson, 2009). When it is more difficult for low- to middle-income groups to obtain a mortgage, they are forced to turn to the rental sector. Because renters spend a significantly higher share of their income on housing costs than homeowners (e.g. Haffner & Boumeester, 2014) and because they are not able to accumulate housing equity, this will ultimately contribute to increasing inequality between renters and owners.

Hypothesis 3

After the GFC, low- to middle-income groups and first-time buyers are increasingly excluded from the mortgage market, which creates a large group in need of affordable rental housing. At the same time, these changes will lead to a declining homeownership rate in particular areas, creating a spatial divide based on different tenures, and ultimately leading to increasing inequality.

Housing opportunities typically differ between generations. The GFC and subsequent recession is likely to further increase intra-generational differences in terms of housing opportunities (e.g., Forrest & Hirayama, 2015). There is already a clear difference between older generations and younger generations - the former have been more able to transform their housing investments into assets over time. High student debts,

long-term unemployment, a shift towards a more casualized workforce, and stricter mortgage eligibility criteria make it more difficult for the millennial generation to pursue homeownership (JCHS, 2015). The older members of this cohort are just entering the housing market and studies have shown that only a small percentage has been able to become homeowners; this is even more difficult for minority groups (Clark, 2013; JCHS, 2015). In many countries, there has been a decline in homeownership rates among younger households as they postpone marriage and childbirth and tend to prolong their stay in the parental home (Aalbers, 2015; JCHS, 2015; Lennartz et al., 2016).

Although many young people might have always been dependent on family financial support to some extent (in the sense of receiving down payments), in recent times, the dependence on family resources to achieve homeownership is becoming more pronounced (Forrest & Hirayama, 2015). However, as many parents have also been subjected to the effects of the GFC and the recession (in terms of unemployment, declining incomes, foreclosures, and negative equity), parents are not equally able to transfer wealth to their children. This is especially true for the younger, lower educated, and minority groups that have accumulated only modest equity (Clark, 2013). In the long run, children from more privileged families will be able to maintain their relatively privileged status by investing in homeownership and accumulate wealth through mortgage amortization and housing appreciation (Forrest & Hirayama, 2015; Rohe et al., 2002). Children from more economically deprived backgrounds, however, will be more dependent on the rental market, thereby increasing their housing costs and reducing their ability to use homeownership as a way to accumulate wealth. These developments will ultimately lead to strong inter- and intra-generational disparities on the housing market (see also Clark, 2013; Forrest & Hirayama, 2015).

Hypothesis 4

The GFC has fueled intra-generational differences in terms of housing opportunities. This will increase the influence of social class and the inter-generational transmission of resources as stratifying factors.

Countries like Japan, England, the United States, and Australia witness an increase in the proportion of households (often young people) who enter the private rental sector (Forrest & Hirayama, 2015). There is much concern amongst scholars that the rise of the private rental sector has negative consequences for both the renters and the neighborhoods in which these houses are concentrated. In the United States, for example, the number of foreclosed properties owned by banks and other mortgage lenders has spiked the post-crisis period. These REO properties are often acquired by private investors with the main goal of making their investment profitable (Mallach, 2010b). Scholars and activists fear that investors in private housing have little interest

in maintaining these dwellings and that practices of 'milking' and speculation will spur the process of neighborhood decline (Aalbers, 2013; Ellen et al., 2014; Fields & Uffer, 2016; Forrest & Hirayama, 2015).

Although the US federal government has invested billions into the Neighborhood Stabilization Program targeting REO and other vacant properties, the majority of these properties are purchased by private investors rather than owner-occupiers (Ellen et al., 2014). Researchers have argued that private investors play an important role in reducing concentrations of REO properties in particular neighborhoods and that they have been successful in reducing vacancy periods (Ellen et al., 2014; Immergluck, 2010; Pfeiffer & Molina, 2013). Despite the widespread assumption that the sales of REO properties to private investors accelerates neighborhood decline in the most hard-hit neighborhoods due to a lack of maintenance (e.g. Mallach, 2010a), recent studies show that not all private investors adopt business models that negatively affect neighborhoods, (Ellen et al. 2014; Immergluck & Law, 2014; Mallach, 2010b).

Though corporate investment does not necessarily harm neighborhoods, the conversion of REO properties into rental units might still fuel processes of neighborhood decline. First of all, renting out properties can contribute to neighborhood instability because of high turnover rates (Kleinhans & Van Ham, 2013; Mallach, 2010a). Second, research has shown that properties sold to private investors and converted into rental units negatively affect the value of surrounding properties (Ihlanfeldt & Mayock, 2016).

Hypothesis 5

The crisis has led to an increase of corporate investment in the private rental sector. Converting properties into rental units might lead to neighborhood instability and might negatively impact surrounding property values. These effects will be the strongest in the most hard-hit neighborhoods and are likely to have negative spillover effects on surrounding areas.

§ 2.3.2 The mediating role of the local context

The effects of the GFC and recession, and the austerity programs and budget cuts that followed, are unevenly distributed within countries (cf. Peck, 2012). Cities have been hit hardest, because housing markets are essentially localized and public services and social housing generally tend to be concentrated in city areas (Blank, 1988; Borjas, 1999; Peck, 2012). Yet, the effects of the crisis differ between cities. Although most scholars

have focused mainly on neighborhood-level characteristics to explain neighborhood decline, Jun (2013) argues that metropolitan and municipal factors significantly affect neighborhood change. Jun (2013) finds that the neighborhood economic status trends in a positive direction in smaller and more homogeneous cities (in terms of race/ethnicity), while the reverse applies to larger heterogeneous cities. Her explanation is that smaller cities are less bureaucratic, that there is more room for citizen participation, and that the spending on public goods is lower in ethnically and racially diverse cities, possibly because there are more dissenting views than in homogeneous cities (Jun, 2013).

At the metropolitan level, economic strength is obviously an important factor associated with neighborhood change. Lauria and Baxter (1999) showed how the economic shock in New Orleans in the 1980s (caused by falling oil prices) led to the racial transition of neighborhoods, through the mechanisms of foreclosures. It intensified White flight from neighborhoods with relatively small but increasing Black populations. While Lauria and Baxter (1999) focused on the effect of a regional economic downturn, Hyra and Rugh (2016, this issue) look at the effects of the Great Recession that followed the GFC. They compare three gentrifying African American neighborhoods in Chicago, New York, and Washington, DC. The Chicago neighborhood suffered more than the other two from foreclosure and house price decline, whereas the home values in the other two neighborhoods recovered to pre-recession levels. This may be related to the fact that the recession hit Chicago relatively hard, which led to a higher unemployment and vacancy rate than in the other two cities.

Hypothesis 6

The crisis has the strongest negative effect on neighborhoods in metropolitan areas with a weak economy and their recovery (if any) will also take longer than in neighborhoods that are situated in a strong regional economy.

In addition to exogenous factors that can set off processes of neighborhood decline, some of which we have identified above, characteristics of the neighborhood itself may fuel or mitigate these processes. The initial economic status of a neighborhood is a very strong predictor of its course of development in the long run. Meen and colleagues (2013) have shown how some areas have always had a natural advantage over others because of their location and/or access to particular resources, such as a proximity to ports or transportation centers, and that they maintain their high-quality status and position in the neighborhood hierarchy over longer periods of time.

The importance of the relative 'starting position' of a neighborhood also relates to the physical quality of the dwellings. Some authors take an almost deterministic stance

regarding the relevance of this 'hard' variable (e.g. Newman, 1972; Coleman, 1985; and to a lesser extent Power, 1997). In the European context, there is much research on neighborhoods with a high share of post-war, high-rise residential buildings which are prone to processes of neighborhood decline due to the low quality of, and technical problems with, these buildings (e.g., Dekker & Van Kempen, 2004; Kearns et al., 2012; Kleinhans, 2004; Prak & Priemus, 1986; Van Beckhoven et al., 2009). But also in the US context, high foreclosure rates and predatory lending practices cannot only be attributed to the socioeconomic profile of residents (Strom & Reader, 2013). Neighborhoods characterized by a marginal housing stock and poor residents are often explicitly targeted by investors looking to make a profit (Aalbers, 2006; Strom & Reader, 2013).

However, the position of neighborhoods in the neighborhood hierarchy is not only a question of location or physical quality, but also a consequence of social processes. Similar types of housing (in physical terms) can acquire a vastly different social status dependent on the identity of a neighborhood. This identity can be very long-lasting (see also Tunstall, 2016, this issue). Comparing three neighborhoods in Stirling, Scotland, Robertson and colleagues (2010) show that the social positioning in terms of class (poor, 'respectable' working-class, and middle-class) did not significantly change since the time they were built (1920s and 1930s). This reveals that neighborhood reputations are sticky, which is partly due to the one-sided way in which neighborhoods are covered in the local media (Kearns et al., 2013; see also Tunstall, 2016). Similarly, Wacquant (2008) has shown how political and academic debates on the American ghetto reinforce divisions in society based on race and class, thereby contributing to collective processes of stigmatization and exclusion. The stigmatizing perception of neighborhoods with concentrations of poor and/or racial/ethnic minorities as disordered environments leads to a reinforcement of segregation as middle-class residents and especially Whites are moving (or staying) away from these kinds of neighborhoods (Sampson, 2009).

Hypothesis 7

Areas that are characterized by a low-quality housing stock and a negative reputation are particularly prone to processes of neighborhood decline.

Over the past decades, many countries have implemented neighborhood regeneration programs. The general goal of these programs was to reduce relative inequality between the most disadvantaged neighborhoods and the city or the national average (Jivraj, 2012). The ways in which these urban restructuring programs are pursued in practice differs between countries (Skifter Andersen, 1999). However, in general, policies were implemented to stimulate a socioeconomic residential mix in deprived neighborhoods. Examples are the HOPE VI program in the United States, the Urban Restructuring

Program in the Netherlands and the New Deal for Communities in the United Kingdom (e.g. Bolt & Van Kempen, 2011; Goetz, 2010; Phillips & Harrison, 2010).

Many policymakers believe that the mixing of different socioeconomic groups in disadvantaged areas will lead to neighborhood upgrading (Andersson & Musterd, 2005; Van Gent et al., 2009). In many cases, urban restructuring meant the demolition of low-quality rental dwellings, replacing them with more upmarket owner-occupied and luxury rental dwellings (Kleinhans, 2004). In this way, spatial concentrations of low-cost rental dwellings were reduced and the residents of the demolished dwellings were forced to relocate to other (often nearby, often also disadvantaged) neighborhoods where affordable housing was still available (Bolt et al., 2008; Crump, 2002; Posthumus et al., 2013; Van Kempen & Priemus, 2002). Most of these residents did not have the means to move back to the more expensive, newly created housing in the regeneration area (Kleinhans & Varady, 2011). It has thus been argued that restructuring programs may lead to the downgrading of other (surrounding) neighborhoods, because the previous spatially concentrated deprivation becomes dispersed over a larger geographical area (Andersson et al., 2010; Bråmå, 2013; Posthumus et al., 2013).

While these mixing policies can be successful in improving the economic statistics of a neighborhood, most of these policies have, however, been heavily criticized for failing to really improve the lives of the original residents (Doff & Kleinhans, 2011; Goetz, 2010; Van Ham & Manley, 2012). Nevertheless, policymakers often frame such programs as successful, and these programs have contributed to some extent of segregation decrease (Feins & Shroder, 2005; Frey, 2010; Musterd & Ostendorf, 2005b). A well-known argument is that countries such as the Netherlands and Sweden do not have ghetto-like neighborhoods *because* of a strong government involvement and mixing policies. This raises the question whether the retreat of governments from deprived neighborhoods as a result of the crisis will fuel processes of socioeconomic segregation and neighborhood decline. On the basis of Tunstall's (2016) conclusion that neighborhood renewal policies have not made a significant change in the neighborhood hierarchy, one might speculate that government retreat does not make much of a difference. On the other hand, it can be argued that whether a neighborhood is at the bottom rung of the ladder is not the only important factor; stratification between neighborhoods also contributes to their various fates.

Hypothesis 8

The crisis will have the largest effect on processes of neighborhood decline in neighborhoods where there has been a strong government involvement in urban regeneration and other neighborhood policies.

§ 2.3.3 Behavioral responses: Exit and voice

The dynamics of a neighborhood are highly affected by the decisions of its residents. Following Hirschman's (1970) 'Exit, voice and loyalty' framework, Permentier and colleagues (2007) argue that residents who are dissatisfied with their neighborhood can either choose to move out (exit) or adopt problem-solving strategies (voice). Loyalty (the attachment to neighborhood and its residents) increases the likelihood of the voice option and reduces the probability of residential mobility (Permentier et al., 2007)

Residential mobility is the central explanatory variable in the neighborhood decline model of Grigsby and others (1987). Neighborhoods can change rapidly as a result of selective mobility where the demographic and socioeconomic characteristics of those households leaving are different from the characteristics of the newly arriving households. Declining housing and neighborhood quality can spur residential mobility: middle- and high-income groups move away from declining neighborhoods as a result of the decreasing attraction of dwellings and neighborhoods and the creation of new dwellings elsewhere - a process also known as relative depreciation (Grigsby et al., 1987; Hoyt, 1939). The likelihood of a household moving depends on whether household preferences can be realized by the resources available to the household within the opportunities (available dwellings) and restrictions (ability to obtain a mortgage) of the desired housing market (Clark & Dieleman, 1996; Mulder & Hooimeijer, 1999). Generally speaking, more affluent households have a larger choice set of dwellings and neighborhoods.

The GFC and subsequent recession is likely to have major impacts on residential mobility. On the one hand, we have argued that people tend to be more limited in their options due to financial restrictions and stricter mortgage eligibility criteria. Households might *want* to move, but *are not able* to move because they cannot obtain a mortgage or do not find a suitable rental dwelling. In the European context, many low-income households are dependent on the availability of social or public housing and waiting lists are long, making it difficult for these households to move from one to another rented dwelling. Similarly, many homeowners in Western Europe might be forced to stay in a particular dwelling and neighborhood, because they cannot sell their current home without taking a large financial loss.

In the US context, foreclosures force people to move and thus lead to a wave of residential moves at first. However, the unstable financial situation of many foreclosed households, together with tight credit standards, make it nearly impossible for these households to obtain a mortgage in the future (Goodman et al., 2015; Martin, 2012). Residential mobility can therefore also be expected to decrease in the United States, although a recent study by Pfeiffer and Molina (2013) shows how the foreclosure crisis offers an

opportunity for Latino households in terms of socioeconomic mobility; however, they also argue that Latino households are more likely to purchase properties in Latino-concentrated areas, thereby exacerbating existing patterns of spatial segregation (Pfeiffer & Molina, 2013). Similarly, research has shown how many foreclosed households tend to end up in other hard-hit foreclosure areas (Martin, 2012), after which they are more or less stuck in these neighborhoods because they are unable to obtain a mortgage and move to a different area.

The unstable financial situation of many households, combined with stricter mortgage eligibility, complicates residential mobility on both sides of the Atlantic. Even though residential mobility has decreased on both continents, the outcomes may be very different. In the United States, we can expect that limited residential mobility has further contributed to existing socioeconomic and racial segregation, while in Europe, it can be expected that the process of segregation has slowed down.

Hypothesis 9

Decreases in residential mobility rates can have different outcomes in different contexts. In many Western European countries, we expect a lower likelihood of an increase in residential segregation, while in the United States, foreclosures have led to a small short-term upsurge in residential mobility patterns, exacerbating existing segregation.

If residents are not satisfied with their neighborhood, they can (instead of moving out) also opt to organize themselves to address neighborhood problems. Whether that is a feasible strategy depends on the level of social cohesion in the neighborhood. It is often assumed that disadvantaged neighborhoods suffer from the lack of strong social ties and the advantages these ties bring along (Forrest and Kearns, 2001). Without a strong social fabric, neighborhoods are more prone to disorder in terms of vandalism, nuisance, and crime (Kleinhans & Bolt, 2014). Social disorganization theory, which originated from the Chicago School of Sociology, stated that disorganization in neighborhoods is caused by incapability of the local community in terms of a lack of (access) to resources, residential instability, or a weak social network (Shaw & McKay, 1942). Physical and social problems arise because residents are not able to enforce certain norms and to maintain social control. As a result, governments tend to retreat from public space and residents lose their trust in each other and 'hunker down' (Putnam, 2007; Ross et al., 2001). Some researchers have argued that small levels of disorder (such as graffiti or broken windows) give rise to more serious crime offenses. The broken windows theory states that potential criminals interpret these levels of disorder as a sign of a lack of social control or involvement of the residents, and as such, feel free to engage in criminal behavior (Wilson & Kelling, 1982).

Recent research by Jones & Pridemore (2016) on the effect of vacancies on crime rates after the GFC concludes that population loss and vacant homes complicate neighborhood social organization. In line with social disorganization theory and the broken windows theory, they argue that the lack of collective efficacy as a result of low levels of population density makes those areas more attractive to criminals (Jones & Pridemore, 2016). In times of crisis, social cohesion in (disadvantaged) neighborhoods can develop in different directions. With many governments retreating, an increasing level of responsibility for the neighborhood has shifted to its residents. In these neighborhoods, where many residents are unable to move, people may feel close to each other because of a common fate, actually increasing social cohesion. This can lead to a strengthening of solidarity networks and a deepening attachment to place, even in very stigmatized areas like the French banlieues (Kirkness, 2014). However, it is also possible that neighborhoods experiencing an inflow of lower-income groups are prone to increasing social disorganization. A change of population composition might lead to residential stress as people tend to prefer a neighborhood population that matches their own characteristics (Feijten & Van Ham, 2009; McPherson et al., 2001).

Hypothesis 10

In times of crisis, social cohesion may be reinforced in areas where there has been a reasonable level of social interaction in the past, while it is likely to crumble in areas that experience increasing tensions because of a diversification of the population, or in areas that are experiencing significant declines in population density.

§ 2.4 Conclusions

In this article, we have argued that contemporary neighborhood decline is a multidimensional process fuelled by several macroeconomic processes related to the GFC and the recession that followed. However, we have also argued that there are several local and internal factors that might function as a mediating factor in processes of neighborhood decline. The interaction of micro-, meso- and macro-level factors heavily depends on the context in space and time.

There is a lack of empirical studies that focuses on the effects of the GFC on neighborhoods and their residents. In an attempt to push the debate forward, we have formulated 10 hypotheses on how the GFC might interplay with processes of neighborhood decline. We submit these hypotheses as a guide for future empirical research. Research is necessary

because differences in the local effects of the GFC are likely to lead to a widening of the gap between wealthy and disadvantaged neighborhoods, between high-income mortgage borrowers and low-income borrowers, between privileged and less privileged households, and between renters and homeowners (Forrest & Hirayama, 2015). In combination with severe budget cuts and the implementation of austerity programs, this raises concerns about increasing spatial segregation based on social class (see also Tammaru et al., 2016).

We have identified several factors from the literature that influence neighborhood change. However, little is actually known about the ways in which these factors interact in different contexts. We therefore call for more longitudinal research of neighborhoods *and* households that focuses on the drivers of neighborhood decline and disinvestment, and more generally, neighborhood change. Without longitudinal data on the residential and social mobility of households, it is difficult to disentangle the relative weight of residential sorting and incumbent processes in explaining neighborhood change. Incumbent upgrading and downgrading refers to the changing socioeconomic profile of the resident population within an area (e.g. Teernstra, 2014). It is an empirical question regarding how important external forces and internal developments are to neighborhoods; this can differ by country, city, or even by neighborhood.

This question is crucial, especially because in countries where the crisis has reduced residential mobility, incumbent processes may become relatively more important in explaining neighborhood decline through processes of rising unemployment and declining incomes (Andersson & Hedman, 2016, this issue). Individual-level data over long periods of time are needed to address this question. Such data are not available in all countries; however, as better data becomes available, researchers should aim to take a richer array of longitudinal individual and spatial variables into account (Van Ham & Manley, 2012). This is not only an academic question, but also relevant in the evaluation of neighborhood restructuring programs. Is there, for instance, an improvement in the livability and social status of neighborhoods due to the empowerment of the sitting population or due to the replacement of vulnerable groups by middle-class households?

Most studies that focus on neighborhood change tend to concentrate on case studies of specific cities, or specific gentrifying or declining neighborhoods. This focus can be largely attributed to the complexity of the subject, a lack of detailed (comparable) longitudinal data, and a bulk of statistical problems with which researchers are confronted; it nevertheless constitutes a large gap in research on neighborhood dynamics. Neighborhoods do not operate in a vacuum and while a particular neighborhood may experience absolute change, the picture may be completely different when we look at the relative change in a city or a country. Moreover, in a globalizing world, with growing

internationally connected economies and housing markets, it will become increasingly important to understand neighborhood change from a more global perspective.

The GFC has had different economic, physical, social, and health-related outcomes, most of which we are only now beginning to grasp. Researchers have argued that the GFC has had different local outcomes between *and* within countries (Aalbers, 2009), but we have little insight in the long-term effects of the GFC on neighborhoods and its residents. It is important to understand how the crisis has affected spatial patterns of increasing inequality, and neighborhood trajectories. A deeper understanding of the drivers behind neighborhood decline can contribute to the development of effective policymaking in the aftermath of the GFC and the economic recession.

3 The path-dependency of low-income neighborhood trajectories: An approach for analyzing neighborhood change

Merle Zwiers, Reinout Kleinhans, Maarten van Ham
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§ 3.1 Introduction

Socio-spatial polarization is increasing in large cities throughout Europe (Tammaru et al., 2016). Socio-spatial polarization refers to the process where the gap between the rich and the poor is increasing, which is translated into spatial segregation along ethnic or socioeconomic lines. In the European context, this has resulted in distinctive spatial patterns in large cities where the rich are increasingly located in historic city centres, while the poor reside in the more disadvantaged outer-city neighborhoods (cf. Hulchanski, 2010; Van Eijk, 2010). Despite substantial government investments to counteract such socio-spatial polarization over the past few decades, this process seems to be persistent, though it varies over time and between places (Bailey, 2012).

In most of the studies on socio-spatial polarization the continuous dynamic character of neighborhoods is neglected, reducing neighborhood change to comparing two points in time. However, neighborhoods are constantly changing in their population composition as the result of residential mobility and demographic events, thereby changing the aggregate status of neighborhoods. Many studies investigating neighborhood change focus on exceptional cases of gentrifying or declining neighborhoods (Bailey, 2012; Bailey et al., 2013; Bailey & Livingston, 2007; Clark et al., 2006; Finney, 2013; Hochstenbach & Van Gent, 2015; Jivraj, 2013; Van Ham et al., 2013). Although these studies have provided important insight in the drivers behind neighborhood change, they are typically limited to time-specific case-studies in particular cities. As a result, we do not know if neighborhoods with similar characteristics experience similar

processes of change over time – or if processes of gentrification or downgrading are the exception to the rule. In addition, we have limited understanding of how processes of gentrification and downgrading affect other neighborhoods. As neighborhoods do not operate in a societal and policy vacuum, changes in one neighborhood are likely to affect other neighborhoods as well. It has, for example, been argued that processes of urban restructuring or gentrification are likely to lead to new concentrations of deprivation in other neighborhoods through the displacement of low-income groups (Bolt et al., 2009). As such, the upgrading of one neighborhood might go hand-in-hand with the deterioration of another neighborhood (Bråmå, 2013; Musterd & Ostendorf, 2005a).

In addition, many studies in this field rely on percentile shifts and point-in-time measures to analyze change, neglecting the possibility that development over time might be more non-linear than linear or need much more time to take effect (see also Van Ham & Manley, 2012). Because the physical structure of neighborhoods hardly changes, neighborhoods can maintain their overall status over longer periods of time (Meen et al., 2013; Tunstall, 2016). However, selective mobility and demographic events lead to a constantly changing population composition (Van Ham et al., 2013). In this paper we argue that to fully understand processes of neighborhood change, the next step in neighborhood research is to focus on detailed neighborhood *trajectories* and to identify typologies of neighborhood change over longer periods of time. Analyzing interrelated neighborhood trajectories and understanding why some neighborhoods are more prone to change than others is therefore highly relevant to the debate on spatial manifestations of inequality and neighborhood development.

In this paper, we present an approach for analyzing neighborhood change by focusing on long-term neighborhood change combined with a detailed analysis of neighborhood trajectories. Focusing on the trajectories of low-income neighborhoods in the Netherlands over the period 1971-2013, we analyze the role of physical characteristics in neighborhoods change. In the Dutch context, neighborhood and housing quality is often related to the debate on neighborhood change, however, few empirical studies try to analyze to what extent physical characteristics are related to today's spatial patterns. Different starting positions in terms of housing quality can have long-lasting effects on neighborhood status through processes of path-dependency (Meen et al., 2013). In addition, because the Dutch government has invested heavily in urban restructuring by changing the share of owner-occupied and social-rented dwellings in particular neighborhoods, we analyze the effect of demolition and construction on the different neighborhood trajectories. Changes to the housing stock generate mobility processes and may thus affect neighborhoods in both direct and indirect ways.

To analyze neighborhood trajectories we use a combination of methods. Sequence analysis allows for the analysis of complete pathways through time and is therefore a

promising method for longitudinal neighborhood research. Sequence analysis is gaining popularity in the social sciences and is increasingly used by researchers interested in patterns of socio-spatial inequalities (e.g. Coulter & Van Ham, 2013; Hedman et al., 2015; Van Ham et al., 2014). However, sequence analysis is ultimately a descriptive method and its potential for *explaining* trajectories is limited. Researchers have therefore developed a methodological framework that combines sequence analysis and a tree-structured discrepancy analysis, allowing for the analysis of the relationship between covariates and sequences (Studer et al., 2011). As such, this framework can provide insight in how different covariates affect neighborhood trajectories in different ways. To our knowledge, this paper offers the first empirical application of this combination in the field of urban research, constituting a new approach towards researching neighborhood dynamics and a move towards the visualization and analysis of complex trajectories. In this paper, we only highlight the most important aspects of the combination between sequence analysis and a tree-structured discrepancy analysis. Based on our presentation, researchers should be able to get a basic understanding of both methods (for a full understanding of sequence analysis researchers are referred to Gabadinho et al., 2011; for a tree-structured discrepancy analysis to Studer et al., 2011).

The remainder of this paper is organized as follows. We start with expounding our approach for analyzing neighborhood change. We then move to describe the combination of sequence analysis and the tree-structured discrepancy analysis in more detail. In the data and method section, we elaborate on the structure of the dataset and the methodological choices made. We then discuss the substantive results and reflect on the applicability of the methods for neighborhood research.

§ 3.2 Longitudinal neighborhood change

Time is an important dimension in neighborhood research. There are generally two viewpoints on this: one emphasizes the general stability of neighborhood status over longer periods of time as a result of path-dependency (Dorling et al., 2007; Meen et al., 2013). Another viewpoint argues that neighborhoods are highly dynamic and are constantly experiencing population change (Van Ham et al., 2013). These two views on neighborhood change are however rather complimentary than competing. On the one hand, neighborhoods are indeed very dynamic and are constantly changing in their population composition as a result of residential mobility and demographic events. On the other hand, because the housing stock of neighborhoods is rather static, the overall socioeconomic status of neighborhoods does not change much over time. In

other words: because the physical spatial structure of neighborhoods remains broadly unchanged, similar types of residents move in and out of these neighborhoods, thereby maintaining the status quo.

This is not to say that there are no changes in neighborhood status at all: neighborhoods can experience processes of decline or gentrification over time because the population in-situ experiences changes in employment status (Bailey, 2012), or because of selective out- and inflow of different income groups (Van Ham et al., 2013). However, extreme processes of decline or gentrification whereby neighborhoods experience a complete transformation of their population composition and overall status are rare (Cortright & Mahmoudi, 2014; Tunstall, 2016). Moreover, when neighborhoods experience processes of decline or gentrification, the effects of these processes on the urban mosaic are often only visible after longer periods of time (e.g. Hulchanski, 2010).

When such extreme changes do occur, they can often be explained by the physical quality of the neighborhood. Processes of gentrification have been related to the desirable location, high quality, and architectural aesthetics of pre-war or other historic neighborhoods (e.g. Bridge, 2001; Zukin, 1982; 2010). As higher income groups gradually move into these neighborhoods, housing values and prices go up, thereby pushing lower income households out. In a similar vein, many unattractive post-war neighborhoods have experienced processes of extreme neighborhood decline over the past few decades. Researchers have argued that this decline can be explained by the low quality of and technical problems with dwellings and neighborhoods built after the Second World War (Prak & Priemus, 1986; Van Beckhoven et al., 2009).

In the Netherlands, these extreme processes of neighborhood decline in postwar neighborhoods (built between 1945 and 1970) led to the development of large-scale urban restructuring programs. These urban restructuring programs were aimed at creating a social mix in these neighborhoods by demolishing social housing and constructing more upmarket owner-occupied or rental dwellings (Kleinhans, 2004). Researchers have argued that urban restructuring programs have led to minor improvements in the socioeconomic position of these neighborhoods (Kleinhans et al., 2014; Permentier et al., 2013). This can be explained by the fact that while a large number of social rented dwellings has been demolished, the overall share of social housing remained high in most restructuring neighborhoods (Dol & Kleinhans, 2012). Urban restructuring is only effective in reducing sociospatial segregation when a substantial part of the social housing stock in a neighborhood is replaced by owner-occupied dwellings (Bolt et al., 2009). Quite often (part of) the original residents in restructuring neighborhoods moved back to the newly constructed dwellings. This meant that while these neighborhoods have experienced a physical upgrade; the socioeconomic status of the population remained largely unchanged (see e.g. Kleinhans et al., 2014).

There are thus two important, yet related, gaps in the literature on neighborhood change. First, many studies focus on exceptional cases of change involving gentrification, downgrading, or urban restructuring in particular cities or neighborhoods, failing to answer the question if neighborhoods with similar characteristics experience similar changes over time. Second, few studies have analyzed the role of path-dependency of physical characteristics of neighborhoods in processes of change for a large sample of neighborhoods in different cities. As a result, we have little insight into which neighborhoods are more prone to change than others. Analyzing the effect of physical characteristics and/or physical changes on neighborhood trajectories is important for our understanding of why some neighborhoods experience change while others remain stable for longer periods of time and help to answer the question which neighborhood characteristics are predictors of future processes of change.

However, research on neighborhood change is complicated because neighborhoods have different starting positions, may experience different paces and processes of change over time, and the effects of changes in context might be non-linear or might only be visible after longer periods of time (Van Ham & Manley, 2012). To fully capture patterns of neighborhood change, it is therefore necessary to adopt a twofold approach: (1) Change should be analyzed over longer periods of time (20-40 years) to capture the effects of longer term processes; and (2) The focus should be on continuous change of neighborhood trajectories instead of simply comparing two points in time. As such, a dual approach would contribute to the identification of neighborhood change typologies providing insight in (the drivers of) different spatial dynamics.

§ 3.3 Analyzing neighborhood trajectories

The methods for analyzing trajectories are limited: the most common statistical methods treat time as another level (in multilevel models), as dummy variables (in regression models), or as growth curves (time-series models). While all of these models have their advantages and disadvantages for studying change over time, they do not easily allow for the identification of *patterns* of change. Sequence analysis, a method that originates from the biological sciences to map DNA patterns, however, allows for the study of patterns of change and is gaining increasing popularity within the social sciences because of its ability to show complete pathways. Social researchers are using sequence analysis to explore class careers (Halpin & Chan, 1998), labor market patterns (Abbott & Hrycak, 1990; Brzinsky-Fay, 2007; McVicar & Anyadike-Danes, 2002; Pollock

et al., 2002), family histories (Elzinga & Liefbroer, 2007) and life-course trajectories (Billari & Piccarreta, 2005; Martin et al., 2008; Wiggins et al., 2007).

The main goal of sequence analysis is to explore trajectories of subjects (individuals, neighborhoods, et cetera) over time and to identify groups of subjects that experience similar trajectories (Gabadinho et al., 2011). Sequences are comprised of different *states* that show the order and duration that the individual subject occupied in each state. Focusing on neighborhood trajectories, a neighborhood can, for example, be in the 6th socioeconomic neighborhood category in 1971, then move up to the 5th category in 1999, and the 4th category in 2000, to end up in the 3th category in 2013. The neighborhood categories in this example represent the different *states* that a neighborhood can move through. The *sequence* of this particular neighborhood would then look like this: 6th category-5th category-4th category-3rd category. This is an example of the most straightforward state sequence format (STS), however, other sequence representations are also possible (for a detailed understanding of state sequence representations, see Gabadinho et al., 2011). All sequences together can then be visualized as a series of individual neighborhood trajectories, which represents how each neighborhood moves through the different states over time. There are different ways to visualize sequences depending on the objective of the researcher (Gabadinho et al., 2011).

Many researchers are however interested in going a step further and explain variation in sequences. For that reason, sequence analysis is often combined with cluster analysis where similar sequences are clustered together. However, cluster analysis has several disadvantages. First of all, the clusters can be very arbitrary because different algorithms generate different clusters. In addition, cluster membership tends to be unstable and the optimal number of clusters is very difficult to assess (Studer, 2013). Cluster analysis reduces sets of sequences to a number of standard trajectories which are a rather crude approximation that consider deviations from the standard as noise (Studer et al. 2011).

In a few recent papers Studer and colleagues (2010; 2011; 2012; 2013) indicate a tree-structured discrepancy analysis as a valuable alternative to cluster analysis. The advantage of this method over cluster analysis is that a tree-structured discrepancy analysis does not create a number of groups that is supposedly representative for the entire population, instead it shows the effect of different variables on the set of sequences in a stepwise approach. Discrepancy analysis is similar to the analysis of variance (ANOVA)-types of analyses and measures the variability between sequences (Studer et al., 2011). The researcher can select a number of explanatory variables which are hypothesized to be related to the different sequences. Based on these predictor variables, the tree-structured discrepancy analysis will group similar sequences together. This is done by using the pairwise dissimilarities between sequences to compute the discrepancy within groups (Studer et al., 2010; 2011). In practice, this means that two sequences

are compared to determine to what extent they are different from one another. This level of mismatch is then quantified by the dissimilarity measure (Studer & Ritschard, 2016). In this paper, we use Optimal Matching distances to quantify dissimilarity. Optimal Matching computes the distance between pairs of sequences using a chosen cost scheme. This cost scheme constitutes of (1) insertion and deletion costs (indel) which capture whether the same state occurs in two sequences, and (2) substitution costs that focus on the timing of states and whether the same state occurs at the same time point in two sequences (Aisenbrey & Fasang, 2010). Here we have set the indel costs to one and we base the substitution costs on the inverse transition frequencies between different states, which is in line with previous studies (e.g. Aassave et al., 2007; Barban, 2013; Kleinepier et al., 2015; Widmer & Ritschard, 2009). This means that we are more focused on distinct trajectories (i.e. a change from the 1st category to the 6th category is considered to be more costly than a change from the 1st category to the 2nd category) than on timing (i.e. we place less importance on differences in neighborhood states at different points in time). We have replicated our results using a different dissimilarity matrix to ensure robustness. We have used Optimal Matching with indel costs of one and substitution costs of two, which is equivalent to the Longest Common Subsequence distance (Studer & Ritschard, 2016). All of our results remain the same.

There are different ways to measure dissimilarity and the choice of dissimilarity algorithm has been subject to debate for many years (see Abbot & Tsay, 2000; Aisenbrey & Fasang, 2010; Gabadinho et al., 2011). Different dissimilarity measures focus on different aspects of the trajectories; researchers interested in change are advised to use one of the Optimal Matching algorithms; researchers focused on timing should employ one of the Hamming algorithms; while researchers interested in duration are recommended to use algorithms such as the Longest Common Subsequence or Chi^2 or Euclidian distances (for an excellent overview, see Studer & Ritchard, 2016). Optimal Matching remains the most popular dissimilarity matrix used in the social sciences because of its flexibility and can generally be used to understand the 'common narrative' between trajectories (Elzinga & Studer, 2015).

The tree-structured discrepancy analysis visualizes the relationship between predictor variables and the sequences trajectories. The tree starts with all sequences in an initial group. The tree-structured discrepancy analysis then selects the most important (significant) predictor and its most important values to split the group into two distinctly different groups using the dissimilarity measure and a pseudo R^2 and a pseudo F test. Significance is assessed through permutation tests (5,000 permutations are sufficient to assess the results at the 1% significance level, see Studer et al., 2011). Looking at, for example, the share of social housing, the model identifies the threshold value at which the sequences differ most, resulting in two significantly different groups of sequences that show different trajectories below and above the threshold value. In practice, this

could mean that the model illustrates the trajectories for a group of neighborhoods with low shares of social housing and a group of neighborhoods with high shares of social housing. For each of the newly created groups, the discrepancy analysis splits the groups into two again, using the second most important predictor and its values (for that group) for which the highest pseudo R^2 is found. Using our example, for the group of neighborhoods with high shares of social housing, the model then shows the effect of a different variable, again creating two groups that show distinctly different trajectories. The process is repeated until a stopping criterion is reached or when a non-significant F for the selected split is encountered (Studer et al., 2010). The overall quality of the model can be assessed through the pseudo F test and the pseudo R^2 that provide information on the statistical significance of the tree and the part of the total discrepancy explained, respectively (Studer et al., 2010).

A tree-structured discrepancy analysis can be seen as the next step in sequence analysis and contributes to the creation of meaningful groups of sequences (Studer et al., 2011). In this paper, we adopt an exploratory approach and use the tree-structured discrepancy analysis to understand how variation in neighborhood sequences can be explained by the physical characteristics of neighborhoods.

§ 3.4 Data and methods

§ 3.4.1 Data and measures

Research on neighborhood change ideally requires individual-level georeferenced data at short-time intervals over a longer period of time. Unfortunately, in many countries, such longitudinal data are unavailable or inconsistent through time. Researchers are therefore confronted with a trade-off between data quality and data availability. This paper used longitudinal register data from the System of Social statistical Datasets (SSD) from Statistics Netherlands. For 1999 to 2013, we have data for the full Dutch population. Historic neighborhood-level data from before the 1990s is extremely scare in the Netherlands due to the move from a census based system to a register based system. The last Dutch census was conducted in 1971, and the alternative country-wide individual-level registration system was ionstalled by 1995. Data on neighborhood income levels is however only available from 1999 onwards, hence our focus on 1999

to 2013. Combining the recent register data with the last census from 1971 allowed us to analyze long-term neighborhood change, however, this meant that there was a 28-year time-gap in our dataset. Nevertheless, the inclusion of 1971 data provides a unique viewpoint on long-term neighborhood change in the Dutch context.

Our definition of a neighborhood is based on 500 by 500 meter grids. The use of 500 by 500 meter grids enabled the comparability of geographical units over time (as other administrative definitions of neighborhoods have changed drastically over the last 40 years) and allowed for a detailed analysis on a relatively low level of aggregation. We focused on the 31 largest cities of the Netherlands, resulting in a total of 8,917 500 by 500 meter grids (including newly constructed neighborhoods in the period 1971-2013). The choice for including the 31 largest cities in the Netherlands is related to the scale of urban restructuring programs over the past few decades and can therefore be understood as a political construct. To ensure the stability of spatial boundaries over time, we use the city boundaries of 2013. Because of the high density of these cities, the average grid consists of 900 residents. For privacy reasons, grids with less than 10 residents have been excluded from the analyses.

We analyzed changes in the share of low-income households in neighborhoods over time. Low-income households are defined as the bottom 20%, which in 1971 included households with an income below 8,000 guilders and in 2013 households with an income below 17,167 euros. Neighborhoods have been categorized according to their share of low-income households into deciles. Because there were few neighborhoods with more than 50% low-income households, the last four deciles have been grouped together.

To examine the role of the physical characteristics of neighborhoods on their trajectories over time, we have included several control variables. We first included a dummy variable for the four largest cities in the Netherlands (Amsterdam, Rotterdam, Utrecht, and the Hague) because we expect more dynamics in big cities. To analyze the path-dependency of neighborhood quality, we included the share of social housing and the share of post-war housing in 1971. We included the change in the share of owner-occupied dwellings between 1971 and 2013 as an indicator for high-quality construction. To assess the effect of changes to the physical structure, we analyzed the effect of demolition, defined as the cumulative number of demolished postwar rental dwellings over the period 1999 to 2013. We have no information on demolition in 1971, however, as many postwar dwellings were still relatively new in 1971 and as large-scale urban restructuring of postwar areas started in the 1990s, it is highly unlikely that the demolition of postwar rental dwellings in 1971 was more than incidental. A summary of all the variables used in the analyses is presented in Table 3.1.

§ 3.4.2 Methods

To provide a detailed illustration of long-term neighborhood change, we first zoomed in on Amsterdam and Rotterdam. We visualized how the spatial distribution of low-income neighborhoods has changed in Amsterdam and Rotterdam between 1971 and 2013. Amsterdam and Rotterdam are the two largest cities in the Netherlands, but have experienced different neighborhood trajectories over time. The economy of Amsterdam is characterized by a strong service sector, while Rotterdam's economy remains tied to the harbor (Burgers & Musterd, 2002; Hochstenbach & Van Gent, 2015). The average income level of the population is therefore higher in Amsterdam (Hochstenbach & Van Gent, 2015). Amsterdam has experienced strong gentrification in the past few decades, which is often ascribed to the historic architecture of inner-city neighborhoods. Although some neighborhoods in Rotterdam have also experienced processes of gentrification, the dominant process in Rotterdam has been neighborhood downgrading since the 1970s (Hochstenbach & Van Gent, 2015).

To come to a better understanding of patterns of neighborhood change, we next focused on neighborhood trajectories of the 31 largest cities using a combination of sequence analysis and a tree-structured discrepancy analysis. We have first conducted a multifactor discrepancy analysis to assess the raw effects of the variables on the sequences trajectories (see Table 3.3). The multifactor approach offers insight in which covariates are significantly associated with the neighborhood trajectories and provides information on the significance of the variables (using permutation tests) and the strength of the model using a pseudo F and a pseudo R^2 (see also Studer et al., 2011).

We then combined sequence analysis and a tree-structured discrepancy analysis to analyze variation in neighborhood trajectories. Sequence analysis is used for the visualization of neighborhood trajectories showing the neighborhood status at each point in time using a color scheme. Each neighborhood category is assigned a different color where the red to blue scheme represents the low to high neighborhood status scale. There are different ways to visualize sequences (for an overview, see Gabadinho et al., 2011). In this paper, we used a sequence distribution plot showing the overall neighborhood distribution instead of individual sequences. Importantly, this means that we are focused on the general pattern of neighborhood trajectories rather than individual neighborhoods. The tree-structured discrepancy analysis then visualized how our control variables affect the trajectories in a tree-structured sequence plot (Studer et al., 2011).

TABLE 3.1 Summary of the dataset

	MIN	MAX	MEAN	SD
Neighborhood category:				
1971	1	6	2.21	1.78
1999	1	6	2.07	1.15
2000	1	6	2.09	1.13
2001	1	6	2.12	1.16
2002	1	6	2.13	1.16
2003	1	6	2.15	1.16
2004	1	6	2.20	1.19
2005	1	6	2.21	1.19
2006	1	6	2.28	1.22
2007	1	6	2.36	1.29
2008	1	6	2.39	1.28
2009	1	6	2.38	1.27
2010	1	6	2.36	1.26
2011	1	6	2.37	1.27
2012	1	6	2.38	1.27
2013	1	6	2.49	1.32
Four largest cities	0	1	0.20	0.40
Percentage social housing 1971	0	100	12.77	27.47
Percentage postwar dwellings 1971	0	100	28.24	39.55
Change percentage owner-occupied dwellings 1971-2013	-97.70	100	6.24	26.66
Total number of demolished dwellings 1999-2013	0	1,536	16.15	67.15

Source: System of Social statistical Datasets (SSD)

We have used the default stopping criteria of a p-value of 1% for the F test (R = 5,000), fixing the minimal group size at N = 446 (5% of the total N = 8,917), and allowing for the creation of five levels (see also Studer et al., 2011). The analyses were conducted in R version 3.2.1 ('World-Famous Astronaut') using the TraMineR package (Gabadinho et al., 2011).

§ 3.5 Results

We first zoom in on Amsterdam and Rotterdam in Figure 3.1 and 3.2. Table 3.2 tabulates the neighborhood categories in 1971 and 2013 for each city. Both illustrate a process of increasing poverty concentration in these cities. Table 3.2 shows that the share of low-income neighborhoods in the last two categories has remained stable over 40 years: the share of neighborhoods with more than 40% low-income households has not increased. However, the spatial distribution of these neighborhoods is characterized by increased spatial concentration as shown in Figure 3.1 and 3.2. While both cities were characterized by a large share of high-income neighborhoods (category 1) in 1971, they show more variation in the neighborhood income distribution by 2013.

The maps show the distribution of low-income households in 1971 and 2013. Figure 3.1 illustrates how inner-city neighborhoods in Amsterdam have maintained their high status over time, while the postwar neighborhoods at the outskirts of the city have experienced downgrading. Low-income neighborhoods in Amsterdam are now increasingly concentrated outside the city centre (cf. Van Gent, 2013). Figure 3.2 shows significant downgrading of large parts of Rotterdam over the last 40 years. Contrary to Amsterdam, Rotterdam's inner city neighborhoods have experienced downgrading, while the high-status neighborhoods in the northern part of the city have maintained their status (cf. Hochstenbach & Van Gent, 2015).

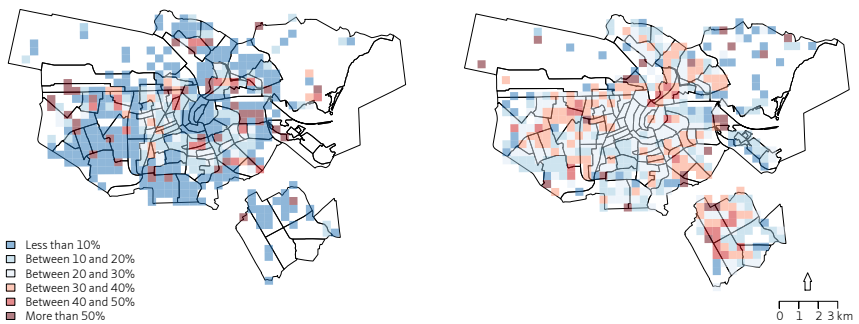

FIGURE 3.1 Percentage low-income households in Amsterdam, 1971 and 2013
Source: System of Social statistical Datasets (SSD)

TOC

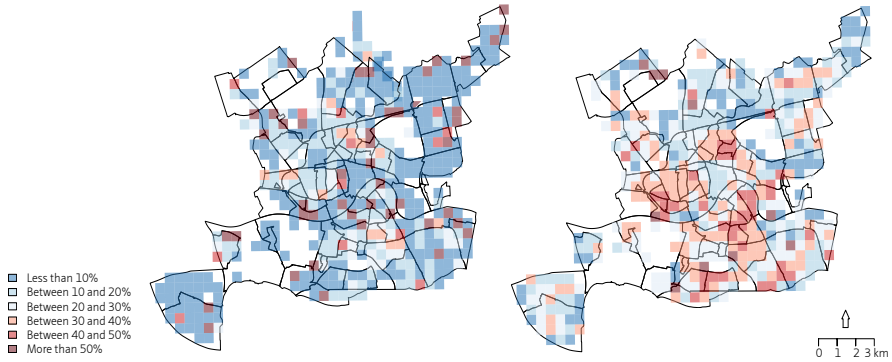

FIGURE 3.2 Percentage low-income households in Rotterdam, 1971 and 2013
Source: System of Social statistical Datasets (SSD)

TABLE 3.2 Distribution of low-income households in neighborhood deciles in Amsterdam and Rotterdam, 1971 and 2013

	PERCENTAGE NEIGHBORHOODS AMSTERDAM		PERCENTAGE NEIGHBORHOODS ROTTERDAM	
	1971	2013	1971	2013
Percentage low-income households:				
<10	57.1	11.3	57.0	19.0
10-20	18.2	23.5	21.0	25.5
20-30	7.8	34.2	7.4	23.2
30-40	3.3	21.7	3.1	21.1
40-50	4.0	4.6	2.4	8.8
>50	9.7	4.6	9.2	2.3
N	**424**	**497**	**458**	**478**

Source: System of Social statistical Datasets (SSD)

We are interested in the neighborhood trajectories underlying the patterns described above and how these trajectories are related to a set of predictors. We are particularly interested how the physical characteristics of neighborhoods are associated with neighborhood trajectories over time. As mentioned earlier, we have first conducted a multi-factor discrepancy analysis to assess the raw effect of our variables on the neighborhood sequences. The results are shown in Table 3.3.

The global statistics show that the model is significant (F = 43.58, R = 5,000) with an R^2 of 14.4%, meaning that our set of variables provides overall significant information about the diversity of neighborhood trajectories. All variables are significant at the 1% level (assessed through 5,000 permutations), with the exception of our dummy variable for the four largest cities. The share of social housing in 1971 and the number of demolished dwellings appear to be the most important predictors of neighborhood trajectories between 1971 and 2013.

TABLE 3.3 Multifactor discrepancy analysis

	PSEUDO-F	PSEUDO-R^2
Four largest cities	1.428	0.001
Percentage social housing 1971	117.701**	0.078
Percentage postwar dwellings 1971	43.201**	0.029
Change percentage owner-occupied dwellings 1971-2013	20.874**	0.014
Total number of demolished dwellings 1999-2013	45.316**	0.030
Overall model	**43.584****	**0.144**

Note: significance is assessed through permutations (R = 5,000).
Source: System of Social statistical Datasets (SSD)

Figure 3.3 shows the tree-structured discrepancy analysis for the neighborhood trajectories in the 31 largest Dutch cities. The initial node shows the distribution of neighborhood states by year (box 1). Overall, the 31 largest cities are characterized by a more or less even distribution of neighborhoods. Over time, the share of high-income neighborhoods is decreasing while the share of low-income neighborhoods is increasing. In the tree, the most significant variables and their most significant values are used in respective order. For each group, we see how the selected variable (and the threshold values of the variable) affects the neighborhood trajectories, showing the group size, the within-discrepancy, and the R^2 for that split. Our overall model has an R^2 of 19.5%, which is higher than the R^2 from the multifactor discrepancy analysis, meaning that the tree has better explanatory power, which can be explained by the fact that the tree automatically accounts for interaction effects (Studer et al., 2011). Our neighborhood characteristics explain 19.5% of the variability in neighborhood trajectories. We have forced the model to use the dummy variable for the four largest cities – Amsterdam, Rotterdam, the Hague, and Utrecht – for its first split because we were interested to see how the trajectories of neighborhoods in these large cities differ from the trajectories in the other cities. We find that neighborhoods in the four largest cities (box 3) are characterized by more neighborhood dynamics than the other cities (box 2).

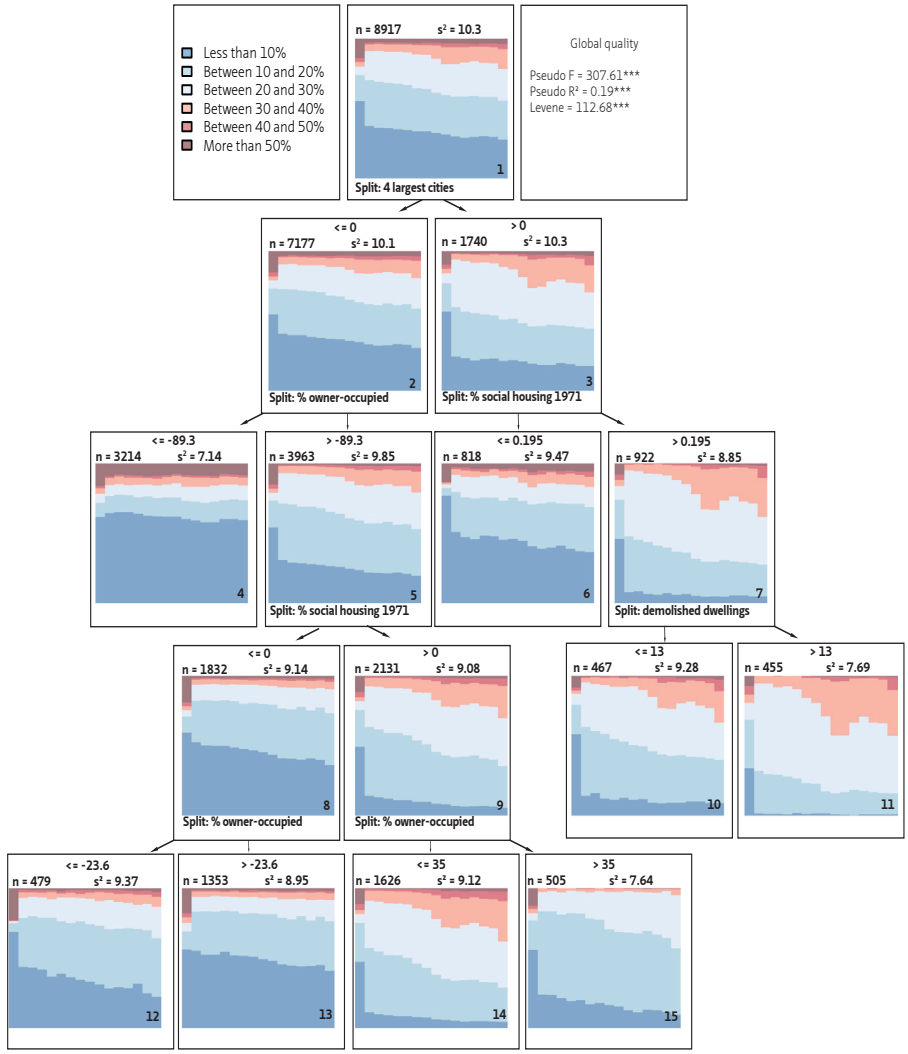

FIGURE 3.3 Tree-structured discrepancy analysis of neighborhood trajectories, 1971-2013
Source: System of Social statistical Datasets (SSD)

Since 1971, the four largest cities have experienced a substantial decrease in their share of high-income neighborhoods and an increase in low-income neighborhoods. The model shows that the share of social housing in 1971 is the most important indicator in explaining variance in neighborhood trajectories in the four largest cities (box 6 and 7). The neighborhoods with hardly any social housing in 1971 are characterized by high-income trajectories, while the neighborhoods with higher shares of social housing show more downward trajectories.

For this latter group, the number of demolished dwellings between 1999 and 2013 seems to matter (box 10 and 11). Demolition took place in neighborhoods that were experiencing downgrading (box 11). These processes of decline were the reason for the Dutch government to target these neighborhoods for urban renewal through the demolition of low-quality social-rented dwellings (Kleinhans, 2004).

The left side of the tree shows that changes in the share of owner-occupied dwellings between 1971 and 2013 is the most important predictor for neighborhood trajectories in the other 27 cities (box 4 and 5). Box 4 consists almost solely of newly constructed neighborhoods with high shares of owner-occupied dwellings since 1999. These neighborhoods are characterized by more neighborhood stability. Existing neighborhoods that have seen increases in their share of owner-occupied dwellings are characterized by more downward trajectories (box 5). Here the share of owner-occupied dwellings interacts with the share of social housing in 1971. For those neighborhoods that have seen an increase in the share of owner-occupied dwellings (box 5), the share of social housing seems to matter. Higher shares of social housing in 1971 are associated with more downward trajectories (box 9). For this latter group, higher increases in the share of owner-occupied dwellings are associated with more high-income trajectories (box 15). This interaction between the share of social housing in 1971 and changes in the share of owner-occupied dwellings captures the Dutch policy of social mixing by changing the tenure composition in neighborhoods.

§ 3.6 Discussion and conclusion

Especially in the four largest Dutch cities, our results show an increase in the share of low-income neighborhoods since 1971. Amsterdam and Rotterdam, in particular, have experienced increasing poverty concentrations in specific neighborhoods. Most of these neighborhoods were built after the Second World War and were characterized by concentrations of social housing. The Netherlands, historically, had a large social housing sector with relatively high-quality housing. Contrary to many other countries, social-rented dwellings were inhabited by mix of socioeconomic groups, not just low-income households (Van Kempen & Priemus, 2002). In 1971, many postwar neighborhoods were still relatively new and were considered to be high-status neighborhoods (Van Beckhoven et al., 2009). By 2013, these postwar neighborhoods have experienced significant downgrading and are characterized by concentrations of poverty as is shown in Figure 3.1 and 3.2. The downgrading of these neighborhoods can be explained by their physical characteristics, in particular, the low-quality housing and its multiple technical

and physical problems. This, combined with relative downgrading due to new housing construction elsewhere, fuelled processes of neighborhood decline (Kleinhans, 2004; Prak & Priemus, 1986). At the same time, this process led to the residualization of the social housing stock in the Netherlands, where the social housing sector increasingly became the domain of low-income households (Van Kempen & Priemus, 2002).

In the 1990s, the Dutch government launched large-scale urban restructuring programs to target the most disadvantaged neighborhoods. In practice, this meant that many low-quality postwar social-rented dwellings were demolished to make room for more expensive privately rented or owner-occupied dwellings (Kleinhans, 2004). Figure 3.3 captures this process very well: we see that demolition took place in downgrading neighborhoods with relatively high shares of postwar rental dwellings in the four largest cities. At the same time, we see that the changes in the share of owner-occupied dwellings interacts with the share of social housing in 1971 in the other 27 cities. If we interpret a rising share of owner-occupied dwellings in these neighborhoods as an indicator of the Dutch policy of mixing tenure, it then seems to be most effective in neighborhoods that have experienced substantial increases in the share of owner-occupied dwellings, thereby contributing to more high-income trajectories (see also Bolt et al., 2009). The question however remains if such changes to the housing stock will lead to significant neighborhood upgrading and to what extent these effects will be temporary or long-lasting (Tunstall, 2016; Van Ham & Manley, 2012; Zwiers et al., 2016)

Our analyses seem to indicate a high degree of path-dependency as the initial quality of dwellings and neighborhoods was found to be associated with neighborhood trajectories over time. While the four largest cities generally show a change towards a more equal neighborhood distribution, there is some indication of increasing poverty concentration. Especially neighborhoods with high shares of social housing in 1971 have experienced strong processes of neighborhood decline. Zooming in on Amsterdam and Rotterdam in Table 3.2 and Figures 3.1 and 3.2, we see that both cities were characterized by high shares of high-income neighborhoods in 1971, but show more variation in neighborhood income groups by 2013, albeit with more poverty concentration in many postwar neighborhoods.

The main contribution of this paper is the introduction of a new method for exploring neighborhood trajectories. Our empirical exercise confirms the need for an approach that incorporates both long-term neighborhood changes and a more detailed analysis of neighborhood trajectories, because neighborhoods are extremely dynamic but the effects of downgrading and upgrading on neighborhoods are only visible after longer periods of time. A focus on neighborhood trajectories lends itself for the identification of different patterns of change over time. The combination of sequence analysis and a tree-structured discrepancy analysis contributes to an understanding of how changes in a

particular group of neighborhoods are related to the trajectories of other neighborhoods. As such, these methods provide an integrated approach towards neighborhood change, by focusing on trajectories and by identifying factors that contribute to changing trajectories over time. The analyses show how specific levels of change function as thresholds for a different direction of neighborhood trajectories. It is however unclear to what extent these thresholds can be used as more than cut-off points. Future research should aim to explore the meaning of these thresholds for the identification of risk factors for neighborhood change and its implications for spatial policy.

A tree-structured discrepancy analysis can be seen as the next step in sequence analysis, providing a new way of researching neighborhood dynamics. The combination between sequence analysis and a tree-structured discrepancy analysis has proven to be a powerful tool to visualize and understand complex, contextualized patterns of change over time. These methods could contribute to an understanding of 'when' or 'under what circumstances' neighborhood trajectories diverge in a particular direction, instead of 'if'. Such research is necessary, because the time-period, frequency, and composition of mechanisms that influence neighborhood trajectories may be non-linear, can be temporary or long-lasting, may vary over time, and might be conditional on other factors (Galster, 2012; Van Ham & Manley, 2012).

4 The effects of physical restructuring on the socioeconomic status of neighborhoods: Selective migration and upgrading

Merle Zwiers, Maarten van Ham, Reinout Kleinhans
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§ 4.1 Introduction

Many European and North American governments have a long tradition of urban restructuring programs to regenerate deprived neighborhoods. The combination of low-quality housing and a variety of socioeconomic problems, such as high crime rates and high unemployment rates, was thought to negatively affect the larger urban area and its residents. On the city level, concentrations of poverty were considered to be detrimental to the economic prosperity of urban regions by reducing the attractiveness of the area to businesses and higher income groups. On the individual level, neighborhood deprivation was thought to have a negative impact on the individual life chances of residents through a lack of network resources and negative role models. Urban restructuring policies therefore aimed to break up concentrations of poverty and to counteract negative neighborhood effects by changing the spatial distribution of disadvantaged residents (VROM, 1997).

In many European countries, the main tool of urban restructuring was housing diversification. Through the demolition or sales of low-quality social housing and the construction of more expensive owner-occupied or private-rented dwellings, policymakers aimed to create a socioeconomic mix of residents in deprived neighborhoods. The in-migration of middle- and high-class households in these neighborhoods was thought to lead to a process of socioeconomic upgrading (Kleinhans, 2004). It was implicitly assumed that these middle- and higher income groups would act as role models and network resources for the original residents, thereby improving their

individual life chances (Andersson & Musterd, 2005). The socioeconomic upgrading of previously deprived neighborhoods was also thought to have positive spillover effects on nearby neighborhoods, by improving the housing market position, reputation, and attractiveness of the larger geographical area (cf. Deng, 2011; Ellen & Voicu, 2006).

Many scholars have since been critical about urban restructuring. Some have criticized urban restructuring policies for being a form of state-led gentrification (Uitermark & Bosker, 2014). Similar to other processes of gentrification, state-led gentrification arguably leads to displacement as the demolition and sales of social housing forces disadvantaged residents to relocate elsewhere (Boterman & Van Gent, 2014; Uitermark & Bosker, 2014). In addition, the construction of more expensive dwellings stimulates exclusionary displacement, making it financially difficult for low-income residents to move into the neighborhood (Boterman & Van Gent, 2014; Marcuse, 1986). Others have been critical about the effectiveness of urban restructuring in actually achieving neighborhood change (e.g. Lawless, 2011; Permentier et al., 2013; Tunstall, 2016; Wilson, 2013). It has been argued that although urban restructuring has led to a physical upgrading of neighborhoods and a diversified population composition as a result of selective migration, it has failed to improve the lives of disadvantaged residents and it did not lead to significant changes in the socioeconomic status of neighborhoods (cf. Bailey & Livingston, 2008; Jivraj, 2008; Permentier et al., 2013; Tunstall, 2016; Wilson, 2013).

The present study focuses on the extent to which urban restructuring has stimulated socioeconomic neighborhood change as a result of changes in the population composition in the 31 largest Dutch cities. While many studies have extensively analyzed the effects of urban restructuring on *individual* outcomes (e.g. Bolt & Van Kempen, 2010b; Manley et al., 2012; Miltenburg, 2017), it has been much more difficult to identify the effects of urban restructuring on *area-based* outcomes (Lawless, 2011). First, urban restructuring programs were both people-based and place-based programs that entailed a number of different interventions over time that also differed between neighborhoods and cities in size and scope. This implies that it has been difficult to 'measure' urban restructuring and to identify control neighborhoods with similar socioeconomic characteristics that did not experience any urban restructuring (Lawless, 2011). The present study overcomes this limitation by focusing on the share of demolished and newly constructed dwellings as the main indicator of urban restructuring. We use propensity score matching to compare neighborhoods that experienced physical restructuring to neighborhoods with similar socioeconomic characteristics that did not, allowing us to analyze the causal effect of policy on socioeconomic neighborhood change.

Second, many studies investigating the effects of physical restructuring have focused on relatively large administrative areas, which means that the effects have to be large to

change the trajectory of the entire neighborhood. We therefore analyze neighborhood change on a relatively low spatial scale, i.e. 500 by 500 meter grids, which allows us to better capture the effects of very localized demolition and new construction.

Third, research has shown that significant changes take time to have effect (Meen et al., 2013; Tunstall, 2016; Zwiers et al., 2017; Zwiers et al., 2018a). Prior studies on urban restructuring in the Netherlands have been limited by a relatively short-time perspective, ranging from one to six years (e.g. Permentier et al., 2013; Wittebrood & Van Dijk, 2007), while it is possible that the effects of physical restructuring will only be visible over a much longer period of time. We therefore focus on neighborhood change over a 15-year period, providing insight in the effects of physical change over and beyond the course of the restructuring programs and the extent to which restructured neighborhoods have been successful in maintaining and attracting middle- and high-income groups over time.

This study focuses on neighborhood socioeconomic change in the 31 largest Dutch cities between 1999 and 2013. We compare changes in the median neighborhood income between restructured neighborhoods, control neighborhoods, adjacent neighborhoods, and all other neighborhoods. We find that restructured neighborhoods have experienced the highest increase in the median neighborhood income. We analyze to what extent these changes can be explained by a changed population composition or neighborhood change in-situ. Changes to the housing stock as a result of urban restructuring seems to attract and maintain middle- and high-income households in previously deprived neighborhoods. However, these effects are very local and do not extent to adjacent neighborhoods. These findings contribute to our understanding of long-term neighborhood change and illustrate that large-scale shocks such as physical restructuring can change the trajectory of a neighborhood.

§ 4.2 Physical restructuring and selective migration

Neighborhoods are very dynamic in their population composition as a result of residential mobility and demographic events, however, neighborhood status tends to be relatively stable over time (Tunstall, 2016; Zwiers et al., 2017; Zwiers et al., 2018a). This can be explained by the fact the housing stock tends to remain unchanged after initial construction (e.g. Meen et al., 2013; Nygaard & Meen, 2013; Zwiers et al., 2017). Next to less frequent cases of gentrification or decline, this implies that processes of residential mobility often do not lead to neighborhood change, as households with

similar socioeconomic characteristics move in and out of these neighborhoods, thereby maintaining the status quo over longer periods of time (Meen et al., 2013; Zwiers et al., 2017). Physical restructuring has however the potential to induce neighborhood change by fundamentally changing the housing stock and stimulating selective migration (Meen et al., 2013).

Over the past few decades, many Western European governments have used physical restructuring as a tool to combat processes of decline in deprived neighborhoods. Although urban restructuring often consisted of both people-based and place-based programs, most restructuring policies were strongly focused on the housing stock and aimed to create a social mix in deprived neighborhoods through housing diversification (Kleinhans, 2004). Housing diversification was achieved through the demolition, upgrading, or sales of low-quality social-rented or council housing and the construction of new upmarket owner-occupied or private-rented housing in order to attract a more affluent, middle-class population. The inflow of higher income groups as a result of these tenure changes was expected to lead to the socioeconomic upgrading of these deprived neighborhoods (Kleinhans, 2004; VROM, 1997).

However, studies evaluating area-based urban policies have been critical about the effectiveness of restructuring in generating processes of neighborhood upgrading through selective migration (e.g. Lawless, 2011; Permentier et al., 2013; Tunstall, 2016; Wilson, 2013). While some studies have found small positive effects in terms of selective migration as a result of restructuring (Bailey & Livingston, 2008; Jivraj, 2008; Permentier et al., 2013; Wittebrood & Van Dijk, 2007), others have found that selective migration can lead to increasing concentrations of poverty in restructured neighborhoods (cf. Andersson & Bråmå, 2004; Jivraj, 2008) or elsewhere (Andersson, 2006; Andersson et al., 2010; Posthumus et al., 2013).

In the current literature, it is thus unclear to what extent physical restructuring affects selective migration and how this contributes to socioeconomic neighborhood change. Researchers have argued that the effectiveness of physical restructuring in generating neighborhood change depends on the size and scope of these policies (Jivraj, 2008; Nygaard & Meen, 2013; Tunstall, 2016). Major demolition and new construction is necessary to change the trajectory of a neighborhood (Nygaard & Meen, 2013; Tunstall, 2016). In many cases, only parts of neighborhoods were targeted for restructuring, which means that the rest of the neighborhood remained unchanged (cf. Dol & Kleinhans, 2012). This could lead to a (temporary) in-flow of higher income groups in the newly constructed part of the neighborhood, however, this might not be enough to stimulate the upgrading of the entire neighborhood. At the same time, many residents from demolished dwellings have moved within the restructured neighborhood, thereby impeding neighborhood change (Kleinhans & Varady, 2011; Kleinhans & Van Ham,

2013; Posthumus et al., 2013). When a large proportion of the low-income residents moves within the restructured neighborhood, a greater share of middle- and high-income groups moving into the restructured neighborhood is needed to generate neighborhood change. Moreover, the effects of physical restructuring might only be visible over a longer period of time as neighborhood change takes long to take effect (Tunstall, 2016; Zwiers et al., 2017). The effectiveness of restructuring depends on the ability of restructured neighborhoods to maintain and attract middle- and high-income groups over time. As renovated or newly constructed dwellings age over time, continuous investments are necessary to maintain a certain housing quality (Weber et al., 2006). If unsuccessful, positive effects might be visible at first, however over time, new processes of decline might become apparent leading to the out-migration of middle- and high-income households (Musterd & Ostendorf, 2005a).

The question remains to what extent physical restructuring has effects outside those areas which were directly targeted for demolition and new construction. There are two possible opposing trends. On the one hand, several researchers have been concerned with processes of displacement. As the share of affordable housing is reduced in restructured neighborhoods, low-income households are forced to find affordable housing elsewhere (Atkinson, 2002; Posthumus et al., 2013). This process of displacement might lead to increasing concentrations of poverty in other (nearby) deprived neighborhoods (Bolt & Van Kempen, 2010b; Posthumus et al., 2013). A review of the literature on the effects of urban restructuring programs in the United States and the Netherlands has however found no evidence for such negative spillover effects (Kleinhans & Varady, 2011). On the other hand, US studies have found evidence of positive spillover effects of physical restructuring. Changes to the housing stock in deprived neighborhoods might improve the reputation and attractiveness of the entire area, leading to positive spillover effects on house prices in nearby neighborhoods (Deng, 2011; Ellen & Voicu, 2006).

The present study explores three hypotheses. First, we hypothesize that neighborhoods that have experienced large-scale demolition and new construction, resulting in a substantially different housing stock, have seen more positive change in the median neighborhood income over time than control neighborhoods with similar socioeconomic characteristics that have experienced little physical restructuring. Second, we expect that this process of neighborhood upgrading in restructured neighborhoods can be explained by a decrease in the share of low-income households and an increase in the share of middle- and high-income households. Third, it could be hypothesized that adjacent areas experienced positive spillover effects as a result of the upgrading of restructured neighborhoods. Improvements to the housing stock are likely to improve an area's reputation and lead to rising house prices. We thus might also expect a higher share of higher income households in neighborhoods surrounding restructured neighborhoods.

§ 4.3 Data and methods

This study used longitudinal register data from the System of Social statistical Datasets (SSD) from Statistics Netherlands. We have data on the full Dutch population from 1999 to 2013. Neighborhoods are operationalized using 500 by 500 meter grids. Although 500 by 500 meter grids do not correspond to the administrative boundaries of neighborhoods, they do provide the geographical most consistent spatial scale as the administrative boundaries of neighborhoods have changed drastically over time. We focused on neighborhoods in the 31 largest Dutch cities, leading to a total of 5,364 neighborhoods, and an average population of approximately 800 in 2013. To analyze neighborhood change over time, we focused on the yearly median household income adjusted for inflation in a neighborhood. The median is less affected by outliers and thus provides a robust measure of changes in neighborhood income over time. To ensure the comparability of household incomes across different household types, an equivalence factor was used. We have divided household income by the square root of household size. Conceptually, this means that a four-person household has twice the needs of a single-person household (OECD, 2013b).

We concentrated on neighborhoods that have experienced substantial restructuring, as the literature suggests that major restructuring is necessary to generate neighborhood change (Meen et al., 2013; ; Nygaard & Meen, 2013). We specifically focused on the total number of demolished and newly constructed dwellings as this has been the main tool of urban restructuring in the Netherlands (Kleinhans, 2004). Statistics Netherlands provides information on different types of demolition (partial, complete), with, or without, new construction and/or renovation. We have selected neighborhoods with more than one standard deviation above the average total number of mutated dwellings between 1999 to 2013. This means that we have selected neighborhoods with a total number of restructured dwellings ranging from 124 to 1,536. This has resulted in a total of 393 neighborhoods. As the restructuring of these neighborhoods was expected to have a positive effect on the larger urban area in terms of reputation, house prices, and overall attractiveness, we test for spillover effects in nearby neighborhoods. Potential spillover effects would be the strongest in the geographically most proximate neighborhoods, therefore, we have used queen criteria to identify adjacent neighborhoods, selecting all neighborhoods that share a boundary with the restructured neighborhoods. We have identified a total of 921 adjacent neighborhoods. Propensity score matching was used to identify control neighborhoods. Propensity score matching creates matched sets of treated and untreated subjects with similar propensity scores (Rosenbaum & Rubin, 1983). The propensity score is the probability of treatment conditional on a number of observed baseline characteristics (Austin, 2011). This study aimed to compare neighborhoods with similar socioeconomic status and used the median equivalized

household income in 1999, the share of unemployed individuals in 1999, the number of households in 1999, and the share of rented dwellings in 1999 as baseline covariates. Unemployment was defined as receiving unemployment or social assistance for a full year or longer. As we are unable to distinguish between social rented housing and private rented housing in the data, the share of rented dwellings included both, although the majority of rented housing in the Netherlands is social housing (Statistics Netherlands, 2014). The results from the propensity score model indicate that there is a significant positive causal effect of restructuring on the 2013 median neighborhood income of restructured neighborhoods (ATET = 709.93 (258.44), $p < 0.01$).

Control neighborhoods were constrained to have experienced below average physical mutations between 1999 to 2013, with the main goal of isolating the effects of physical restructuring on neighborhood change. We have used nearest neighbor matching with replacement, which means that restructured neighborhoods were matched with control neighborhoods with the closest propensity score (Rosenbaum & Rubin, 1985). Matching with replacement implies that each control neighborhood can be used as a match more than once, which is particularly useful for the present study as there are only a limited number of neighborhoods that could function as a suitable control group (Wittebrood & Van Dijk, 2007). We have identified 142 control neighborhoods with a total number of restructured dwellings ranging from 0 to 31. For comparability, these neighborhoods were selected from the 31 largest cities within the Netherlands. Control neighborhoods were not allowed to neighbor restructured neighborhoods. Maps that illustrate the distribution of the different neighborhood groups in Amsterdam and Rotterdam are presented in Figure 4.1.

To reduce selection bias it is important that the covariates are balanced between the treated and untreated subjects. We found no significant mean differences between the control neighborhoods and the restructured neighborhoods in the median household income in 1999 ($t (173) = 0.73$, $p > 0.05$), the share of unemployed individuals in 1999 ($t (156) = 0.33$, $p > 0.05$) and the share of rented dwellings in 1999 ($t (216) = -0.77$, $p > 0.05$). There was a significant mean difference in the number of households in 1999 ($t (402) = -9.17$, $p < 0.001$). Inspecting the distribution of the explanatory variables with quintiles of the propensity scores proved that the baseline covariates were balanced between the restructured and control neighborhoods (cf. Austin, 2009). The only exception here was the number of households in 1999, where we found a discrepancy in the number of households between the restructured and control neighborhoods, especially in the fourth and fifth propensity score quintile. However, excluding this variable from the propensity score model leads to severe imbalances in the other covariates (results not shown). We therefore keep the number of households in 1999 as a baseline covariate in the propensity model.

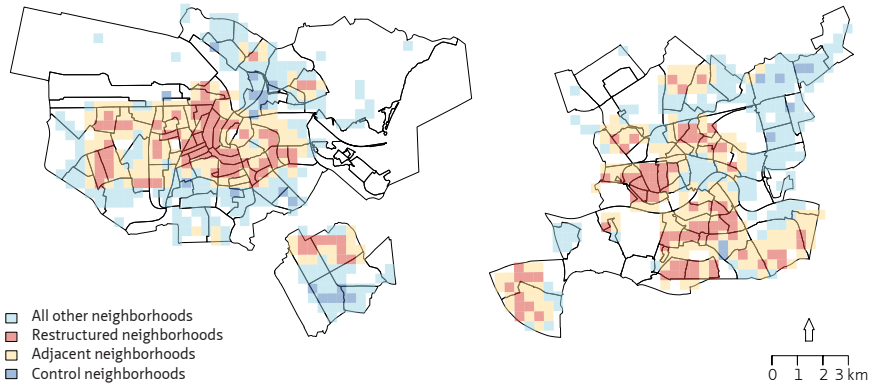

FIGURE 4.1 Distribution of neighborhood groups in Amsterdam and Rotterdam
Source: System of Social statistical Datasets (SSD)

The number of households in 1999 was associated with both our neighborhood groups and our outcome variable. As mentioned above, the number of households in 1999 was imbalanced between groups. The number of households measures the density in a neighborhood, but can also be understood as a measure of the potential for change: higher density is generally associated with less change over time. As such, this confounding variable distorted the relationship between our neighborhood groups and the change in the median neighborhood income. The inclusion of the number of households as a control variable substantially changed the regression coefficients as the differences between neighborhood groups became larger and statistically significant (results not shown). Stratification is a way of dealing with confounding by producing groups within which the confounder does not vary. We have therefore created five strata based on quintiles of the number of households in 1999, with the first stratum consisting of low-density neighborhoods and the fifth stratum of high-density neighborhoods. The distribution of neighborhoods across the five strata is presented in Table 4.1.

TABLE 4.1 Distribution of neighborhoods across the five strata based on quintiles of the number of households in 1999

	ALL OTHER NEIGHBORHOODS	RESTRUCTURED NEIGHBORHOODS	ADJACENT NEIGHBORHOODS	CONTROL NEIGHBORHOODS
Stratum 1	25.9	0.3	6.2	8.5
Stratum 2	23.7	0.8	13.4	9.2
Stratum 3	22.1	8.1	17.6	11.3
Stratum 4	18.5	18.3	26.3	24.7
Stratum 5	9.8	72.5	36.6	46.5

Source: System of Social statistical Datasets (SSD)

We conducted a stratified analysis of five OLS regression models with robust standard errors to explain changes in the median neighborhood income over time. There was some multicollinearity between the neighborhood groups in models 1 and 2 because of the small group size of the restructured neighborhoods and the control neighborhoods. For these models, these two groups have therefore been combined into one group. The residuals showed some deviations from normality. There was however no clear indication of heteroscedasticity and the results from the regression with OLS standard errors did not differ substantially from the results from the regression with robust standard errors. However, the OLS standard errors of the most important predictors were larger than the robust standard errors in the fourth and fifth strata, which suggests that the OLS standard errors were biased upward. As such, we decided to report the results from the OLS regression with robust standard errors.

To better understand the process of neighborhood change, we analysed changes in the population composition between 1999 and 2013. Based on the national household income distribution, we have created three income categories: low-income groups (the lowest 40%), middle-income groups (the middle 30%), and high-income groups (the top 30%) (see also Hochstenbach & Van Gent, 2015). We focused on changes in the share of the three income groups in the different neighborhoods. We also analyzed in-situ change by comparing changes in the median household income of non-movers between 1999 and 2013.

§ 4.4 Results

Table 4.2 presents the descriptive statistics of the restructured neighborhoods, the adjacent neighborhoods, the control neighborhoods, and the rest of the Netherlands. The median equivalized neighborhood household income in the restructured neighborhoods was 14,528 euros in 1999. The median equivalized neighborhood household income was similar in the control neighborhoods, 14,800 euros, and higher in the adjacent neighborhoods, 17,353 euros. The median equivalized neighborhood household income was much higher in the rest of the Netherlands, 20,506. The average share of unemployed individuals was 16.1% in the restructured neighborhoods, compared to 10.7% in adjacent neighborhoods and 16.6% in the control neighborhoods. These shares are far above the average share of unemployed individuals in the rest of the rest of the country; 5.9%. These descriptive figures indicate that neighborhoods that have experience large-scale demolition and new construction were among the most disadvantaged neighborhoods of the country. The average share of rented dwellings in 1999 was 80.6% in the restructured

neighborhoods, which was similar to the average share of rented dwellings in the control neighborhoods, 79.2%. The average share of rented dwellings in the rest of the country was almost half of that in the restructured neighborhoods: 40.5%. The average share of rented dwellings in the adjacent neighborhoods was 64.7%. The restructured neighborhoods were highly populated areas: the average number of households in 1999 was 1,313, compared to 775 in the control neighborhoods, 716 in the adjacent neighborhoods, and 326 in the rest of the country. In 2013, the median equivalized neighborhood household income adjusted for inflation increased to 15,180 euros in the restructured neighborhoods. This means that, after adjusting for differences in household size and inflation, the median neighborhood income has increased with 652 euros, reflecting a 4.5% increase. This increase is almost twice the increase in the control neighborhoods: the 2013 median neighborhood household income increased to 15,140, reflecting an average increase of 340 euros, or 2.3%. The median neighborhood household income in the adjacent neighborhoods increased with 216 euros to 17,568, showing a 1.2% increase. All other neighborhoods in the Netherlands experienced an average increase of 1,289 euros leading to a median neighborhood household income of 21,796, reflecting a 6.3% increase. The average share of unemployed individuals dropped in all areas. The average unemployment rate declined to 9.8% in the restructured neighborhoods, compared to 10.7% in the control neighborhoods, 7.8% in the adjacent neighborhoods, and 4.4% in the rest of the country. The average number of households remained relatively stable in all grids: in 2013, the average number of households was 1,294 in the restructured neighborhoods, 801 in the control neighborhoods, 780 in the adjacent neighborhoods, and 356 in the rest of the Netherlands.

TABLE 4.2 Descriptive statistics of the different neighborhood groups, 1999 and 2013

	ALL OTHER NEIGHBORHOODS		RESTRUCTURED NEIGHBORHOODS		ADJACENT NEIGHBORHOODS		CONTROL NEIGHBORHOODS	
	1999	2013	1999	2013	1999	2013	1999	2013
Average median neighborhood income	20,506 (5,942)	21,796 (6,723)	14,528 (2,337)	15,180 (3,416)	17,353 (4,420)	17,568 (5,536)	14,800 (4,237)	15,140 (5,661)
Average percentage unemployed	5.9 (6.3)	4.4 (4.5)	16.1 (6.7)	9.8 (5.0)	10.7 (7.8)	7.8 (5.6)	16.6 (17.6)	10.7 (6.6)
Average percentage rented dwellings	40.5 (27.7)	39.7 (23.4)	80.6 (16.0)	67.9 (14.4)	64.7 (25.2)	59.5 (21.4)	79.2 (19.2)	68.3 (20.6)
Average number of households	326 (357)	356 (377)	1,313 (809)	1,294 (825)	716 (562)	780 (595)	775 (502)	801 (523)
Average total demolished dwellings		7 (17)		292 (190)		26 (33)		6 (8)
N		**3,908**		**393**		**921**		**142**

Note: Standard deviations in parentheses
Source: System of Social statistical Datasets (SSD)

The average number of demolished dwellings between 1999 and 2013 was 292 in the restructured neighborhoods and the average share of rented dwellings decreased to 67.9% in 2013, reflecting an average reduction of almost 15%. The average number of demolished dwellings in the control neighborhoods was much lower: 6. However, the average share of rented dwellings also decreased substantially in these neighborhoods: from 79.2% to 68.3%. The average number of demolished dwellings was 26 in adjacent neighborhoods and the average share of rented dwellings decreased to 59.5%. The average number of demolished dwellings was 7 in the rest of the Netherlands, and these neighborhoods have also experienced a small decrease in the average share of rented dwellings: from 40.5% in 1999 to 39.7% in 2013. While the decrease in the share of rented dwellings in the restructured neighborhoods can most likely be ascribed to physical restructuring, the decrease in the share of rented dwellings in the other neighborhoods can be the result of other factors. As the Dutch policy of urban restructuring went hand-in-hand with the liberalization of the housing market, homeownership was increasingly stimulated and many rented dwellings were sold off to owner-occupiers (Uitermark & Bosker, 2014).

Table 4.3 presents the results from the stratified OLS regression on neighborhood income change. The results from the first stratum show no significant results between the restructured and control neighborhoods (reference group), the adjacent neighborhoods, and all other neighborhoods in the Netherlands.

TABLE 4.3 Regression coefficients from the stratified OLS regression with robust standard errors

	STRATUM 1	STRATUM 2	STRATUM 3	STRATUM 4	STRATUM 5
Control neighborhoods			-2484.89*	-1070.54**	-1393.59***
Adjacent neighborhoods	-195.00	-333.10	-2150.75**	-1121.34**	-1039.55***
All other neighborhoods (ref = restructured neighborhoods)	1813.83	138.30	-1813.64*	-912.12**	-839.87***
Median neighborhood income 1999	0.69***	0.80***	0.94***	1.00***	1.13***
Amsterdam	-3342.01***	-1459.07*	-1112.63*	-603.10	380.21*
Rotterdam	912.36	1154.56	267.89	719.56**	385.46*
The Hague	2258.03	1826.98	65.56	162.68	-685.64***
Utrecht (ref = all other cities)	1764.47	42.67	-101.17	-1593.50	-263.33
Constant	7191.73*	6014.92	3845.34***	957.92*	-1656.72***
Adjusted R^2	0.39	0.57	0.73	0.78	0.78
N	1,083	1,063	1,073	1,072	1,071

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

This suggest that in low-density areas, the change in the median neighborhood income is similar across all neighborhoods. The median equivalized neighborhood income in 1999 was included as a baseline covariate to control for floor and ceiling effects. The median equivalized neighborhood income in 1999 has a positive effect on the change in the average neighborhood income ($b = 0.69$, $p < 0.001$). To test if the changes in the average neighborhood income are not just driven by housing market dynamics in the four largest cities, dummy variables have been included. Compared to the rest the Netherlands, we find no significant differences in the neighborhood income in low-density neighborhoods in Rotterdam, The Hague, and Utrecht. Low-density neighborhoods in Amsterdam seem to have experienced a significantly lower increase in the neighborhood income than the rest of the Netherlands ($b = -3342.01$, $p < 0.001$).

The results for the second stratum show no significant differences between restructured and control neighborhoods and adjacent neighborhoods, and all other neighborhoods. For these neighborhoods, the median neighborhood income in 1999 is the most important predictor ($b = 0.80$, $p < 0.001$). There are no significant differences between Rotterdam, The Hague, Utrecht, and the rest of the country. Neighborhoods in Amsterdam show as significantly lower increase in the median neighborhood income ($b = -1459.07$, $p < 0.05$).

We find significant differences in the change in the neighborhood income between the neighborhood groups in the third, fourth, and fifth stratum. In all three strata, the restructured neighborhoods show a significantly higher increase in the median neighborhood income between 1999 and 2013. In the fifth stratum, the control neighborhoods show a significantly lower increase in the median neighborhood income compared to the restructured neighborhoods ($b = -1393.59$, $p < 0.001$). Both the adjacent neighborhoods and all other neighborhoods also show a significantly lower change in the median neighborhood income compared to the restructured grids, ($b = -1039.55$, $p < 0.001$) and ($b = -839.87$, $p < 0.001$), respectively. This finding implies that in higher density areas, the restructured grids have seen the most change in the median neighborhood income.

In high-density neighborhoods, the average neighborhood income in 1999 has a positive effect on neighborhood income change ($b = 1.00$, $p < 0.001$) and ($b = 1.13$, $p < 0.001$) in the fourth and fifth stratum, respectively. The median neighborhood income in 1999 is the strongest predictor of neighborhood change in both models ($\beta = 0.89$, and $\beta = 0.92$). The importance of the median neighborhood income in 1999 illustrates a strong degree of path-dependency (Zwiers et al., 2017). Neighborhoods with a high median income in 1999 have experienced an increase in the median neighborhood income over time: neighborhoods that did well in 1999 do better in 2013. In a similar vein, we find that Amsterdam and Rotterdam experience significantly more change

compared to all other neighborhoods in the fifth stratum (b = 380.21, p < 0.05) and (b = 385.46, p < 0.05). As many inner-city neighborhoods in Amsterdam and Rotterdam have become increasingly popular over time, both cities have experienced processeses of gentrification resulting in strong rises in house prices and neighborhood income (Hochstenbach & Van Gent, 2015). Contrarily, high-density neighborhoods in the Hague have experienced a significantly lower increase in the median neighborhood income compared to the rest of the country (b = -1656.72, p < 0.001), which indicates a processes of neighborhood decline.

Most of the change in the median neighborhood income seems to occur at the top end of the density distribution. The models for the fourth and fifth stratum both explain 78% of the variation in the change in the median neighborhood income. This seems to suggest that processes of gentrification and decline together with large-scale urban restructuring seem to have had major effects on neighborhood socioeconomic change in high-density areas.

To understand to what extent these socioeconomic changes can be explained by a changed population composition, we analyzed the changes in the share of different income groups in the four neighborhood types. Table 4.4 presents the share of low-, middle-, and high-income groups in 1999 and 2013. The share of low-income households increased in all four neighborhood groups. The control neighborhoods experienced the highest increase in the share of low-income households, 6.8%, compared to 4.7% in the adjacent neighborhoods, and 2.6% in the restructured neighborhoods. The rest of the country saw the smallest increase in low-income households, 1.7%. Despite processes of forced relocation, the restructured neighborhoods continue to be accessible to low-income households over time. The share of middle-income households increased by 0.3% in the control neighborhoods and the restructured neighborhoods, compared to 1.3% in the adjacent neighborhoods and 3.1% in the rest of the country. The share of high-income households decreased substantially in all four neighborhood groups: 3.2% in the control neighborhoods, 3.3% in the adjacent neighborhoods, and 2.3% in all other neighborhoods. The restructured neighborhoods experienced a small decline of 0.2% in the share of high-income households, suggesting that physical restructuring has had a positive effect on the ability of these neighborhoods to attract and maintain high-income households.

As urban restructuring was expected to have a positive effect on the socioeconomic situation of the sitting population, we analyzed changes in the median household income. The median household income has decreased in all four neighborhood types over the 1999-2013 period. The control and adjacent neighborhoods experienced an average decline of 959 and 985 euros in the median household income among the population in-situ, showing a 5.4% and 5.3% decrease. The decline in the median

household income in the restructured neighborhoods is similar to the decline in the rest of the country: 415 compared to 491 euros, reflecting a decline of 2.6% and 2.3%, respectively.

TABLE 4.4 Population change in the four neighborhood types, 1999 and 2013

	ALL OTHER NEIGHBORHOODS			RESTRUCTURED NEIGHBORHOODS			ADJACENT NEIGHBORHOODS			CONTROL NEIGHBORHOODS		
	1999	2013		1999	2013		1999	2013		1999	2013	
Percentage low-income households	33.6 (14.0)	35.3 (15.4)	+1.7	50.5 (8.2)	53.1 (10.7)	+2.6	42.1 (12.6)	46.8 (14.5)	+4.7	49.3 (16.9)	56.1 (17.4)	+6.8
Percentage medium-income households	27.6 (9.4)	30.7 (9.5)	+3.1	26.9 (4.8)	27.2 (6.1)	+0.3	27.0 (6.5)	28.3 (7.4)	+1.3	26.9 (8.9)	27.2 (9.8)	+0.3
Percentage high-income households	36.3 (15.9)	34.0 (16.5)	-2.3	20.0 (7.4)	19.8 (8.8)	-0.2	28.2 (12.4)	24.9 (13.5)	-3.3	19.9 (10.0)	16.7 (12.7)	-3.2
Median household income population in-situ	21,504	21,013	-491	15,910	15,495	-415	18,651	17,666	-985	17,719	16,760	-959
N		3,908			393			921			142	

Note: Standard deviations in parentheses
Source: System of Social statistical Datasets (SSD)

§ 4.5 Discussion and conclusion

This paper has analyzed the effects of large-scale demolition and new construction on neighborhood income change over time and has studied changes in the population composition. We find that restructured neighborhoods have experienced the largest increase in the median neighborhood income. Focusing on a low spatial scale, our results indicate that large-scale demolition and new construction has strong positive effects on the neighborhood income developments of deprived neighborhoods.

Restructured neighborhoods have been most successful in attracting and maintaining higher income groups compared to all other neighborhoods. The decline in the median income among the population in-situ was relatively small in the restructured

neighborhoods. Although it is difficult to assess to what extent this can be attributed to urban restructuring, it does seem to indicate that restructured neighborhoods have become more resilient to decline over time. While it is often argued that the demolition of low-cost rental housing and the construction of owner-occupied and private-rented dwellings leads to the displacement of low-income households (e.g Boterman & Van Gent, 2014), we find that restructured neighborhoods continue to be accessible to low-income households. Although some low-income households have had to relocate elsewhere as a result of restructuring, this process of displacement appears to have been temporary. However, it is unclear to what extent these neighborhoods experience exclusionary displacement (Marcuse, 1986). The decline in the share of social housing in these neighborhoods might make the neighborhood (financially) inaccessible to the most disadvantaged residents, forcing them to move to other low-income neighborhoods. This might be a possible explanation for the large increase in the share of low-income households in the adjacent and control neighborhoods.

Although it is often assumed that improvements to the housing stock lead to a better reputation of the entire area (VROM, 1997), and that increased house prices have spatial spillover effects on nearby dwellings and neighborhoods (Deng, 2011; Ellen & Voicu, 2006), we do not find evidence for positive spillover effects to adjacent neighborhoods. On the contrary, adjacent neighborhoods actually seem to suffer from urban restructuring. Adjacent neighborhoods have experienced a relatively large increase in the share of low-income households, most likely as a result of forced relocation (Posthumus et al., 2013). In addition, adjacent neighborhoods have seen the largest decrease in the share of high-income households and the largest decline in the median household income among the population in-situ. Although it is difficult to assess to what extent these developments are direct spillover effects of urban restructuring, it does indicate that the positive effects of urban restructuring do not extent beyond the restructured neighborhood. Future research should focus on the specific spillover effects of restructuring on nearby areas over time, as spillover effects might take time to take effect.

The findings from the present study shed new light on the effectiveness of urban policies. Many studies have been unable to isolate an effect of urban policies on neighborhood change, which can be explained by the relatively short-time span, the focus on large administrative units, the difficulty in measuring 'urban policies', and finding a suitable control group. The present study has therefore focused on physical restructuring on the level of 500 by 500 meter grids over a 15-year time period. The use of a measure of demolition and new construction as the main indicator of physical restructuring allowed us to identify a reliable control group. However, identifying a suitable control group is challenging in this field of research. Our control group was very similar to our treatment group in terms of socioeconomic status, but differed substantially in urban density. Because we selected control neighborhoods from different cities, we cannot

be certain that different labor markets and/or housing markets played a role in our findings. In addition, it is possible that the control neighborhoods were targeted for urban restructuring but on a different scale or with different interventions. Our control neighborhoods also experienced a decline in the share of rented housing, which can most likely be attributed to the sales of rented housing. Analyzing the effects of sales policies on neighborhood income developments was however beyond the scope of this study but would be an intriguing avenue for future research.

Despite these limitations, our findings provide enough evidence to suggest that physical restructuring has positive effects on neighborhood socioeconomic change. As neighborhoods are generally relatively stable over time, large-scale demolition seems an effective way to fundamentally change the built environment and population composition in a neighborhood within a relatively short period of time. The change in the median neighborhood income in restructured neighborhoods is significantly higher than in any of the other neighborhoods, which shows that physical restructuring functions as a shock that induces neighborhood change through selective migration (Meen et al., 2013). The question remains to what extent restructured neighborhoods will be able to maintain their improvements and continue along this trend. The present study has focused on the effects of urban restructuring on the neighborhood level, whether urban restructuring has positive effects on individual outcomes is still subjected to debate.

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

Merle Zwiers, Maarten van Ham, David Manley
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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.

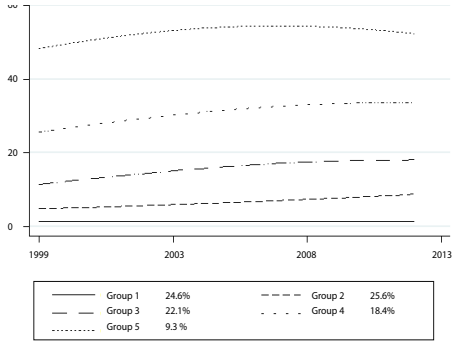

FIGURE 5.1 Trajectories of the five neighborhood groups
Source: System of Social statistical Datasets (SSD)

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.

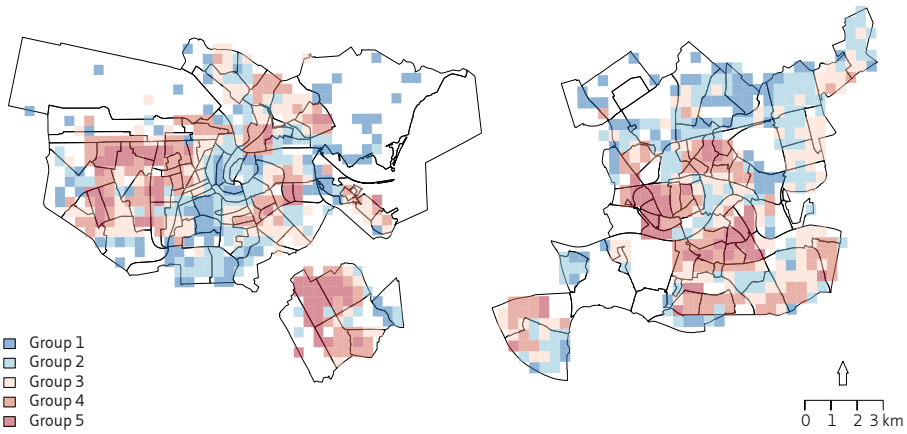

FIGURE 5.2 Geography of the trajectory groups in Amsterdam and Rotterdam
Source: System of Social statistical Datasets (SSD)

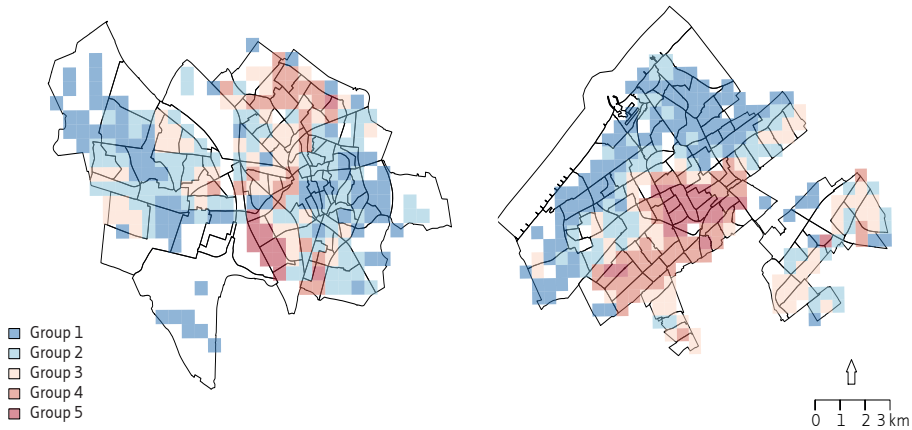

FIGURE 5.3 Geography of the trajectory groups in The Hague and Utrecht
Source: System of Social statistical Datasets (SSD)

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).

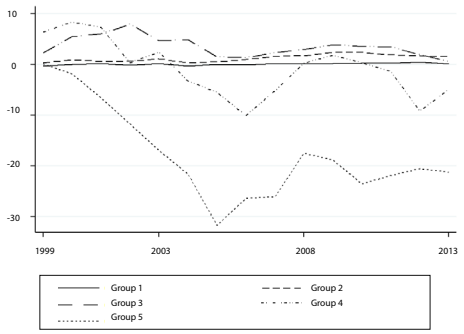

FIGURE 5.4 Ethnic net migration rates by trajectory group
Source: System of Social statistical Datasets (SSD)

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.

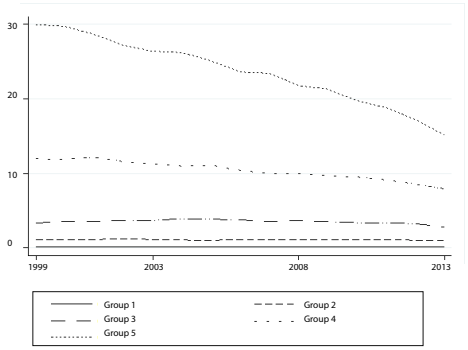

FIGURE 5.5 Ethnic natural change by trajectory group
Source: System of Social statistical Datasets (SSD)

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.

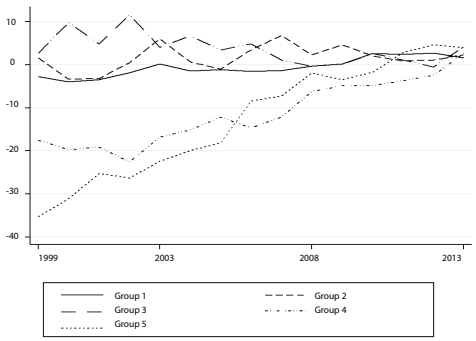

FIGURE 5.6 Native Dutch's net migration rates by trajectory group
Source: System of Social statistical Datasets (SSD)

§ 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

6 Intergenerational continuity of ethnic segregation: Socio-spatial assimilation of third generation immigrants in the Netherlands

Merle Zwiers
Under review

§ 6.1 Introduction

Ethnic segregation continues to be a persistent feature of Western European cities (e.g. Jivraj & Khan, 2015; Lymperopoulou & Finney, 2017; Zwiers et al., 2018a). Ethnic segregation is often understood as the result of a lack of socio-spatial assimilation and is thought to have hampering effects on social integration, mobility, and interethnic contact, thereby posing a threat to inclusive diverse societies (Kaplan & Douzet, 2011; Monkkonen & Zhang, 2013; Van Ham & Tammaru 2016). In 2016, the four largest ethnic groups in the Netherlands – Moroccans, Turks, Surinamese, and Antilleans – comprised 7.6% of the total population (Statistics Netherlands, 2017). This relatively small share of the population tends to be overrepresented in particular (deprived) neighborhoods where they comprise half of the population (Zwiers et al., 2018a). Patterns of ethnic segregation of these four ethnic groups have remained relatively stable in the Netherlands over the past few decades (Zwiers et al., 2018a). Ethnic segregation is often viewed as the result of a process of assimilation that develops over the course of generations (Peach, 1996). As the first generation tends to concentrate in particular neighborhoods after recent immigration, the second generation generally shows more spatial dispersal and movement to more mixed neighborhoods (e.g. Massey, 1985). Indeed, many studies confirm that second generation immigrants show more spatial mobility into non-concentration neighborhoods as a result of socioeconomic assimilation (e.g. Bolt & Van Kempen, 2010a; South et al., 2005). However, these findings only apply to a small share of immigrants, as most immigrants continue to lag behind in educational and labor market outcomes compared to the native population

(Huijnk & Andriessen, 2016; Statistics Netherlands, 2016b). It has been argued that this lack of socioeconomic assimilation inhibits their socio-spatial mobility, explaining the persistence of ethnic concentration neighborhoods in the Netherlands (Bolt & Van Kempen 2010a).

In the Dutch context, this idea of gradual social and economic assimilation over the course of generations is implicitly captured in the official definition of ethnicity (Kooiman et al., 2012). In the Netherlands, an individual is considered to be an ethnic minority when he/she has at least one parent abroad, distinguishing between those born abroad themselves (first generation) and those born in the Netherlands (second generation) (Statistics Netherlands, 2016a). According to this definition, third generation immigrants who are born in the Netherlands and whose parents are both born in the Netherlands, but with one or more grandparents from an immigrant background, are defined as native Dutch (Statistics Netherlands, 2016c). Behind this definition of ethnic group membership lies the assumption that third generation immigrants are socially, economically, and culturally integrated into Dutch society. According to the spatial assimilation hypothesis, this would be reflected in spatial integration as well, meaning that the third generation would predominantly live in non-concentration and more ethnically mixed neighborhoods, leading to decreasing levels of ethnic segregation. However, to date, there are no studies that have analyzed the socio-spatial behavior and outcomes of third generation immigrants in the Netherlands.

The official definition of ethnicity also has important empirical consequences. Because third generation individuals are not included as minority group members in the definition of ethnicity, they tend to 'disappear' in official statistics (cf. Kesler & Schwartzman, 2015). As a result, it is unclear how the residential mobility behavior of third generation immigrants will affect ethnic segregation. When second generation immigrants have children, the share of immigrants in a neighborhood will decrease as these children are officially defined as native Dutch. In addition, when third generation immigrants move into ethnic concentration neighborhoods, statistically, this would be interpreted as an inflow native Dutch, decreasing the share of immigrants in a neighborhood. Third generation immigrants might, however, still be very different from the native Dutch population in cultural, social, and economic terms. Neighborhoods with high shares of third generation immigrants might be considered as ethnically diverse - or even ethnic concentration - neighborhoods by other residents, thereby affecting the neighborhood preferences and/or residential mobility behavior of other ethnic groups (cf. Schelling, 1971). Processes of 'White flight' or 'White avoidance' in response to the residential mobility behavior of third generation immigrants might have additional effects on ethnic segregation (Crowder & South, 2008; South & Crowder, 1998).

The main aim of the present study is to explore the extent to which the definition of ethnicity influences conclusions about ethnic segregation by focusing on the residential patterns of third generation immigrants in the 31 largest Dutch cities between 1999 and 2013. The analysis consists of two parts: first, aggregate statistics of the share of third generation immigrants in different types of neighborhoods are analyzed which shows that ethnic concentration neighborhoods will most likely see the largest increase in the share of third generation immigrants over time. Second, I focused on third generation home-leavers and their spatial mobility behavior which contributes to our understanding of intergenerational processes of socio-spatial assimilation. My findings show that third generation immigrants continue to be overrepresented in ethnic concentration neighborhoods which raises questions about the assumed unidirectional process of socio-spatial assimilation. Ethnic segregation seems to be the continuing trend among third generation immigrants. The official definition of ethnicity in the Netherlands, which assumes socio-spatial assimilation, seems to mask the persistent intergenerational continuity of ethnic segregation.

§ 6.2 Ethnic segregation and socio-spatial assimilation

A substantial body of research has been devoted to document and explain processes of ethnic segregation. Many researchers view ethnic segregation as being closely related to social, economic, and cultural assimilation into society. According to the spatial assimilation model, ethnic segregation is a logical phenomenon after recent immigration. New immigrants often live in neighborhoods with other co-ethnics for mutual support (Massey, 1985). Research has shown that these ethnic concentrations after recent immigration are beneficial in terms of social networks and access to resources that contribute to the success of the second generation (e.g. Portes & Bach, 1985; Portes & Jensen, 1989). As the second generation is likely to have a greater assimilation into the host society, they are also more likely to convert their cultural capital and socioeconomic accomplishments into improved residential opportunities (Gordon, 1964; Massey & Mullen, 1984; Massey, 1985). This process of socio-spatial assimilation is reflected in ethnic residential behavior that is similar to that of the native population, demonstrating moves away from ethnic concentrations and into more mixed neighborhoods (e.g. Alba & Logan, 1993; Bolt & Van Kempen, 2010a; Sabater, 2010; Simpson & Finney, 2009). Studies have shown that ethnic segregation tends to decrease over the course of generations, which has been ascribed to processes of socio-spatial assimilation (Bolt & Van Kempen, 2010a; Simpson et al., 2008; Simpson & Finney, 2009). However, not all second generation immigrants have been able to experience upward socioeconomic

mobility, limiting their opportunities to leave concentration neighborhoods (Bolt & Van Kempen, 2010a). Critics of the assimilation model have argued that social assimilation is not a unidirectional process and that assimilation can also be segmented (Jensen & Chitose, 1994; Portes & Zhou, 1993). From the perspective of segmented assimilation, immigrants can experience assimilation and upward socioeconomic mobility; but also downward mobility as a result of little success in education or on the labor market; or upward socioeconomic mobility while continuing to live in ethnic concentration areas (Jensen & Chitose 1994).

Studies on the spatial assimilation of second generation immigrants find a strong intergenerational continuity in neighborhood choice: compared to their native peers, second generation immigrants continue to be more likely to move into and less likely to leave ethnic concentration neighborhoods (Bolt & Van Kempen, 2010a; Zorlu & Mulder, 2010). While it is often assumed that the persistent existence of ethnic concentrations is the result of a lack of social and economic mobility, it seems that socioeconomic status only offers a partial explanation for the neighborhood choices of second generation immigrants (cf. Galster, 1988; 1989; Musterd, 2005; Zorlu & Mulder, 2010). Researchers have argued that self-segregation could be an important explanation as young people from an immigrant background might prefer to live close to family or other members from the same ethnic background, because of strong social networks (Philips et al., 2007). Another important explanation is the availability of housing and/or access to the housing market (Bolt et al., 2008). Many studies have documented the persistent discrimination of immigrants that constrains the housing choices of ethnic minority groups (Aalbers, 2013; Philips, 2006). In addition, access to and the location of social or public housing can play a large role in reproducing ethnic segregation over generations (Musterd, 2005).

There is however some evidence of spatial assimilation over the course of generations. Compared to the first generation, second generations immigrants are less likely to move to concentration neighborhoods (Bolt & Van Kempen, 2010a; Kleinepier & Van Ham, 2017; Zorlu & Mulder, 2010). This gives reason to assume that this trend will continue among the third generation. In many European countries, the third generation is, however, still relatively young as large-scale immigration took place after the Second World War. In the Netherlands, first and second generation Moroccans, Turks, Antilleans and Surinamese comprise almost 1.3 million individuals, while the relatively young third generation consists only of some 95,000 individuals under the age of 50, or comprising 0.6% of the population in 2016 (Statistics Netherlands, 2017). The young age structure of the third generation implies that many of them are still living in the parental home. As such, it is unclear to what extent they display processes of socio-spatial assimilation. However, research has provided some insight into the degree of socioeconomic assimilation of the third generation. Studies on early educational outcomes of the third generation show

significant differences between the third generation and their Dutch peers. Although third generation immigrants do better in school compared to the first and second generation (Statistics Netherlands, 2016b), they are still more likely to drop out of school than their Dutch peers (Goedhuys et al., 2010).

There are also important differences between third generation individuals from different ethnic backgrounds. Of all ethnic groups, third generation children with a Moroccan parentage perform the poorest in school, followed by third generation children from a Turkish background (Statistics Netherlands, 2016b). Third generation children with a Surinamese parentage perform better than third generation Moroccans and Turks, while third generation Antilleans perform the best in school compared to all other ethnic groups (Statistics Netherlands, 2016b). In addition, third generation Antilleans show the largest increase in school performance compared to the first and second generation (Statistics Netherlands, 2016a).

§ 6.3 The official definition of ethnicity

Definitions of ethnicity are used to classify people into ethnic groups based on subcultures with a common place of origin, language, ancestry, and cultural traditions (Stillwell & Van Ham, 2010). For newly arrived immigrants it is often relatively easy to distinguish between individuals and define different ethnic groups. However, over generations, this has become increasingly complex as a result of ethnic intermarriage and intergenerational change. In the Dutch context, ethnicity is based on the country of birth of the parents. A person is considered to be an immigrant when he/she has at least one parent born abroad. This definition distinguishes between those born abroad themselves (first generation) and those born in the Netherlands (second generation) (Statistics Netherlands, 2016b). Third generation immigrants who are born in the Netherlands and whose parents are Dutch-born are considered to be of Dutch birth or ancestry. Although third generation immigrants have one or more immigrant grandparents, they are officially considered to be native Dutch (Statistics Netherlands, 2016c). Behind this definition lies the assumption that these third generation immigrants are no longer substantially different from the native Dutch in social, cultural, and economic terms (Kooiman et al., 2012).

The use of this definition of ethnicity however complicates research on socio-spatial assimilation. By classifying third generation immigrants as native Dutch, they tend to disappear in official statistics (cf. Kesler & Schwartzman, 2015). This has consequences

for studies on socio-spatial assimilation and ethnic segregation. When second generation immigrants have children, the share of immigrants in a neighborhood decreases. Similarly, as coded by the official statistics, the in-migration of third generation immigrants into an area demarked as being 'ethnically concentrated' will have an apparent deconcentrating effect. At the moment, these effects are limited because the third generation is relatively small and still very young. However, as the size of the third generation grows over time, these effects will increase and new concentrations of third generation, or later generations, immigrants will be easily overlooked. Although it is assumed that third generation immigrants are assimilated into Dutch society, in the current literature, it is unclear to what extent this is the case. Third generation immigrants might still be very different from the native Dutch population. According to the segmented assimilation hypothesis, a lack of socioeconomic assimilation has an effect on spatial assimilation, resulting in continued segregation and residence in ethnic concentration neighborhoods – which, in turn, further complicates socioeconomic assimilation (Massey & Denton, 1993; Zhou, 1997). However, even when third generation immigrants are similar to the native population in socioeconomic terms, they might still identify with their own ethnic group which might lead to processes of self-segregation. Moreover, natives and other ethnic groups might not be indifferent to the residential behavior of third generation immigrants (e.g. Crowder et al., 2012; Kaufmann & Harris, 2015; Schelling, 1971). Neighborhoods with high shares of third generation immigrants might be considered as ethnically diverse - or even ethnic concentration - neighborhoods by other residents, thereby affecting the residential preferences of natives (Van Ham & Feijten, 2008). The in-migration of third generation immigrants might therefore stimulate processes of 'White flight' (e.g. Crowder & South, 2008; Schelling, 1971). Ethnic heterogeneity in neighborhoods stimulates the out-mobility of the native population to more 'White' neighborhoods (Clark & Coulter, 2015; Kaufmann & Harris, 2015). Alternatively, ethnically diverse neighborhoods might cause the native population to avoid such neighborhoods (Clark, 1992; Quillian, 2002). As such, the residential mobility of third generation immigrants can have important consequences for ethnic segregation.

The use of the official definition of ethnicity also has important consequences for cross-country comparative research. Many European countries rely on the country of origin as the main indicator of ethnicity, which implies that identifying later generations is difficult, if not impossible (Kesler & Schwartzman, 2015). As a result, studies on ethnic segregation in these countries might come to very different conclusions when compared to countries that use census data using self-defined ethnicity as a definition. While both definitions – i.e. country of origin and self-defined ethnicity – are faced with the challenge of selective disappearance of later generations of immigrants in official statistics (see Kesler & Schwartzman, 2015 on the issue of self-defined ethnicity), there is little consensus in the existing literature on the consequences of this selective disappearance.

However, it is likely that it leads to an underestimation of ethnic minority disadvantage (Kesler & Schwartzman, 2015). Methodologically, analyzing third generation ethnic minority socio-spatial assimilation will contribute to our understanding of how to use or interpret statistics on group inequality.

§ 6.4 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. I focused on the four largest non-western migrant groups in the Netherlands: Moroccans, Turks, Surinamese, and Antilleans. Third generation immigrants are identified based on the country of origin of the grandparents. I selected all third generation immigrants who lived with their parents in 1999 and had left the parental home at any point in the following years (2000-2013), giving 1,593 third generation home-leavers between the ages 15 and 35. Because of the disproportionately small group of third generation home leavers, a 5% random sample of their native Dutch peers has been selected as a control group (N = 16,553).

Neighborhoods are operationalized using 500 by 500 meter grids. The use of 500 by 500m grids ensured the comparability of geographical units, keeping geographical boundaries constant over time and allowing for a detailed analysis on a low spatial scale. I focused on the share of the four largest non-western immigrant groups relative to the total population in a neighborhood. They have been classified into five groups based on the share of first and second generation immigrants, as identified in a previous study on empirical trajectories of the ethnic population composition in the Netherlands (Zwiers et al., 2018a). Using this classification scheme, the first group consists of neighborhoods with less than 5% immigrants; the second where the immigrant population is between 5 and 15%; the third neighborhoods with 15 to 25% immigrants; the fourth of neighborhoods with 25 to 35% immigrants; and the fifth where the immigrant population is more than 35%. Neighborhoods in this last group are defined as ethnic concentration neighborhoods. Neighborhoods with less than 10 residents have been excluded from the analyses for privacy reasons. I focused on the 31 largest cities in the Netherlands, leading to a total of 6,355 neighborhoods, and an average population of 895 in 2013.

Two binary logistic regression models with cluster-corrected standard errors have been estimated to analyze the probability of moving to an ethnic concentration neighborhood after leaving the parental home. Cluster-corrected standard errors account for the

possible unobserved correlations between individuals that originate from similar neighborhoods. Model 1 includes only the dummy variables for the ethnic background of the parental home-leavers. Because of the relatively small numbers of third generation immigrants, Moroccans and Turks, and Surinamese and Antilleans, have been grouped together. Previous research has argued that the socioeconomic position and historical background of Moroccans and Turks is similar, as is those of the Surinamese and Antilleans (e.g. Zorlu & Van Gaalen, 2016). In Model 2 several socioeconomic control variables have been added to assess the extent to which the association between ethnicity and residential mobility can be explained by socioeconomic assimilation. I controlled for the level of ethnic concentration in the parental neighborhood, as previous work has shown that there is a strong correlation between the characteristics of the parental neighborhood and the characteristics of the destination neighborhood of home-leavers (De Vuijst et al., 2017; Van Ham et al., 2014). As socio-spatial assimilation is strongly related to socioeconomic status (e.g. Bolt & Van Kempen, 2010a), I controlled for the parental income in the year before leaving home and individual income in the first year after having left the parental home. Income was defined as the sum of incomes from wages, benefits, and student scholarships. A dummy variable for enrolment in higher vocational training and university has been included. I further controlled for relationship status (i.e. having a partner or being single), gender, age, and the year of home leaving. An overview of the descriptive statistics is presented in Table 6.3.

The comparison of changes in the coefficients across nested models is not as straightforward in non-linear models as it is in linear models. The reason for this is that the uncontrolled and controlled coefficients can differ not just because of confounding but also because of a rescaling of the model (for details, see Karlson et al., 2010). I therefore use the Karlson-Holm-Breen (KHB) method to analyze how much of the effect of ethnicity on the probability of moving to an ethnic concentration neighborhood can be explained by the socioeconomic control variables. The analyses have been reproduced on different subsets of the data. All analyses yield similar results.

§ 6.5 Results

Table 6.1 presents the share of ethnic minorities by generation in the different neighborhood groups in 1999 and 2013. First generation immigrants tend to be overrepresented in ethnic concentration neighborhoods (groups 4 and 5).

TABLE 6.1 Share of immigrants by neighborhood group, 1999 and 2013

	GROUP 1 (< 5% immigrants)		GROUP 2 (5-15% immigrants)		GROUP 3 (15-25% immigrants)		GROUP 4 (25-35% immigrants)		GROUP 5 (>35% immigrants)	
	1999	2013	1999	2013	1999	2013	1999	2013	1999	2013
Percentage first generation	0.7 (1.5)	0.6 (0.8)	3.9 (2.8)	4.4 (1.8)	8.7 (4.6)	9.9 (1.9)	13.3 (6.6)	15.1 (2.5)	22.8 (9.8)	24.3 (5.7)
Percentage second generation	0.5 (1.1)	0.7 (0.9)	2.6 (1.9)	4.5 (1.8)	5.7 (2.9)	9.6 (1.9)	8.4 (3.8)	14.5 (2.4)	14.1 (5.7)	22.5 (5.8)
Percentage third generation	0.1 (0.4)	0.2 (0.5)	0.2 (0.5)	0.6 (0.8)	0.3 (0.3)	0.8 (0.6)	0.4 (0.4)	1.2 (1.1)	0.6 (0.7)	1.4 (1.0)
Average number of residents	465 (628)	488 (654)	1,143 (919)	1,218 (919)	1,330 (989)	1,408 (975)	1,611 (1,301)	1,672 (1,258)	2,168 (1,446)	2,185 (1,399)
N		**3,817**		**1,483**		**498**		**250**		**307**

Note: Standard deviations in parentheses
Source: System of Social statistical Datasets (SSD)

The distribution of first generation immigrants between the different neighborhood groups is, however, relatively stable over time. The share of second generation immigrants increased substantially in the ethnic concentration neighborhoods between 1999 and 2013. Neighborhoods in group 4 saw an average increase of second generation immigrants of 6.1%, while neighborhoods in group 5 experienced an average increase of 8.4%. This increase can be explained by the fact that the second generation continues to grow as they are still relatively young and there is a lot of endogamous partnership between first and second generation immigrants, which means that their children are also defined as second generation immigrants (cf. Statistics Netherlands, 2016a). As third generation immigrants are a relatively small group, they tend to comprise a very small share of the total population in the different neighborhood groups. Nevertheless, third generation immigrants tend to display the same trend as the second generation: the share of third generation immigrants increases the most in ethnic concentration neighborhoods in groups 4 and 5.

These results seem to indicate that the distribution of third generation immigrants resembles the distribution of second generation immigrants, suggesting that, as the third generation grows, they will be overrepresented in ethnic concentration neighborhoods. However, a possible explanation for this finding is the fact that the majority of the third generation are under the age of 18 (Statistics Netherlands, 2016c), meaning that many of them are most likely still living in the parental home. The increase in the share of third generation immigrants in ethnic concentration neighborhoods could thus simply be the result of natural increase, i.e. childbirth among the second generation (see also Zwiers et al., 2018a).

TABLE 6.2 Percentage third generation home leavers across destination neighborhoods

	GROUP 1 (< 5% immigrants)	GROUP 2 (5-15% immigrants)	GROUP 3 (15-25% immigrants)	GROUP 4 (25-35% immigrants)	GROUP 5 (>35% immigrants)
Moroccans	9.4	25.0	25.0	9.4	31.3
Turks	9.7	25.0	20.2	12.9	32.4
Surinamese	20.3	32.7	16.9	12.1	18.0
Antilleans	28.0	35.2	13.7	8.8	14.3
N	**317**	**507**	**270**	**184**	**315**

Source: System of Social statistical Datasets (SSD)

To better understand the spatial distribution of third generation immigrants, I therefore focus on the residential mobility behavior of a group of third generation parental home-leavers. Table 6.2 presents the destination neighborhood types of third generation home-leavers. More than one third of all Moroccan and Turkish home-leavers, 40.7% and 45.3% respectively, move to ethnic concentration neighborhoods in groups 4 and 5. Only 9.4% of Moroccan and 9.7% of Turkish home-leavers move to the more native-dense neighborhoods in group 1. However, both groups display mobility into more mixed neighborhoods: 50.0% of Moroccan home-leavers move into neighborhoods in groups 2 and 3 compared to 45.2% of Turkish home-leavers. Surinamese and Antillean home-leavers more often move into neighborhoods in group 1: 20.3% Surinamese and 28.0% Antillean third generation immigrants move into native-dense neighborhoods. Similar to Moroccan and Turkish home-leavers, Surinamese and Antilleans also display mobility into mixed neighborhoods in groups 2 and 3: 49.6% and 48.9% respectively. However, Surinamese (30.1%) and Antillean (23.1%) home leavers move less often to ethnic concentration neighborhoods in groups 4 and 5.

Table 6.3 presents the means of the study variables by ethnic group. One third of Moroccan (31%) and Turkish (32%) home-leavers have moved to an ethnic concentration neighborhood. The share of Surinamese and Antillean home-leavers that have moved to an ethnic concentration neighborhood is much lower: 18% and 14% respectively. Although it is assumed that third generation immigrants are no longer different from their native Dutch peers, only 6% of the natives has moved to an ethnic concentration neighborhood. Similarly, Moroccans and Turks more often grew up in ethnic concentration neighborhoods in groups 4 and 5: 53% and 43% compared to 27% of Surinamese, 18% Antillean, and 9% Dutch home-leavers. Surinamese and Antillean home-leavers more often originate from more native-dense neighborhoods in group 1, 28% and 32%, compared to only 6% of the Moroccan and 7% of the Turkish home leavers. 47% of the native Dutch grew up in native-dense neighborhoods.

TABLE 6.3 Means of study variables by ethnic group

	MOROCCANS	TURKS	SURINAMESE	ANTILLEANS	DUTCH
Concentration neighborhood 5	0.31	0.32	0.18	0.14	0.06
Origin neighborhood 5	0.28	0.29	0.17	0.11	0.04
Origin neighborhood 4	0.25	0.14	0.10	0.07	0.05
Origin neighborhood 3	0.13	0.22	0.14	0.13	0.10
Origin neighborhood 2	0.28	0.28	0.32	0.36	0.34
Origin neighborhood 1	0.06	0.07	0.28	0.32	0.47
Parental income	36,648 (26,166)	37,825 (29,384)	46,792 (39,179)	55,234 (70,664)	49,989 (38,066)
Income	8,322 (6,306)	8,008 (6,439)	12,410 (10,159)	12,067 (9,604)	17,098 (11,529)
Student	0.31	0.51	0.44	0.38	0.30
Single	0.69	0.75	0.54	0.61	0.52
Partner	0.16	0.12	0.32	0.29	0.41
Year of home leaving	2010 (2.33)	2010 (2.17)	2007 (4.01)	2008 (3.83)	2006 (4.04)
Age	20 (1.73)	19 (1.76)	22 (3.20)	21 (2.90)	23 (3.52)
Male	0.50	0.44	0.47	0.43	0.51
N	**32**	**248**	**1,006**	**307**	**16,553**

Note: Standard deviations in parentheses
Standard deviations not reported for dichotomous variables
Source: System of Social statistical Datasets (SSD)

The parental income of Moroccan and Turkish home-leavers is generally lower than that of Surinamese and Antillean home-leavers: on average, 36,648 and 37,825 compared to 46,792 and 55,234 respectively. This finding is in line with other studies that have concluded that Moroccan and Turkish immigrants have a lower socioeconomic status than Surinamese and Antillean immigrants (Huijnk & Andriessen, 2016). In the same vein, the individual income of Moroccan and Turkish home-leavers is generally lower than that of Surinamese and Antillean home-leavers: 8,322 and 8,008 compared to 12,410 and 12,067. The individual income of native Dutch home-leavers is much higher: 17,098 on average.

The results from the logistic regression models with cluster corrected standard errors are presented in Table 6.4. Model 1 presents the main effects for the two ethnic groups. Third generation Moroccan and Turkish home-leavers are 6.89 times more likely to move to an ethnic concentration neighborhood than natives ($b = 1.93$, $p < 0.001$). Surinamese and Antillean home leavers are 3.01 times more likely to move to an ethnic concentration neighborhood than natives ($b = 1.11$, $p < 0.001$). The socioeconomic control variables have been added to Model 2. Controlling for several socioeconomic characteristics reduced the likelihood to move to an ethnic concentration neighborhood for both ethnic groups, although they are still significantly more likely to move to an ethnic concentration neighborhood than natives, 2.03 and 1.58 times respectively. Individual income has a significantly negative effect on the likelihood to move to an ethnic concentration neighborhood ($b = -0.11$, $p < 0.01$). Spatial assimilation seems to be dependent on socio-economic status: a higher income is generally associated with moves into more ethnically mixed or native neighborhoods (e.g. Bolt & Van Kempen, 2010a; Catney & Simpson, 2010). The effect of parental income is not significant, which can be explained by the strong effect of the level of ethnic concentration in the parental neighborhood. As the level of ethnic concentration often correlates with income, the effect of the parental income is likely mediated by the level of ethnic concentration. The share of first and second generation immigrants in the parental neighborhood appears to be the most important predictor: the higher the share of ethnic minorities in the parental neighborhood the more likely an individual is to move to an ethnic concentration neighborhood. Individuals from a parental neighborhood with a high level of ethnic concentration (group 5) are 27.40 times more likely to move to an ethnic concentration neighborhood compared to individuals from more native-dense neighborhoods (group 1) ($b = 3.31$, $p < 0.001$). This finding is in line with other studies that found that the characteristics of the parental neighborhood are an important predictor for the type of neighborhoods that individuals end up in after leaving the parental home (De Vuijst et al., 2017; van Ham et al., 2014).

I used the KHB method (Karlson et al., 2010) to assess the influence of the socioeconomic control variables on the changes in the ethnic group differences between Model 1 and 2. I found that individual income and parental income in addition to the level of ethnic concentration in the parental neighborhood significantly reduced the ethnic differences in the likelihood of moving to an ethnic concentration neighborhood. Individual income and parental income had a significant but marginal effect in reducing ethnic differences (around 1%), however, the level of ethnic concentration in the parental neighborhood (neighborhood groups 4 and 5) reduced the effect of an ethnic parentage for Moroccan and Turks by 55% and for Surinamese and Antilleans by 46%. The level of ethnic concentration in the parental neighborhood is thus by far the most important mediator.

TABLE 6.4 Results from the logistic regression models with cluster corrected standard errors

	MODEL 1		MODEL 2	
	b	OR	b	OR
Moroccans Turks	1.93***	6.89	0.71***	2.03
Surinamese Antilleans (ref = natives)	1.11***	3.01	0.45***	1.58
Origin neighborhood 5			3.31***	27.40
Origin neighborhood 4			1.78***	5.95
Origin neighborhood 3			1.15***	3.16
Origin neighborhood 2 (ref = origin neighborhood 1)			0.52***	1.69
Parental income (log)			0.05	1.05
Income (log)			-0.11**	0.90
Student			0.14	1.14
Single			0.05	1.05
Partner (ref = other)			0.12	1.13
Year of home leaving			0.00	1.00
Age			-0.04***	0.96
Male (ref = female)			0.09	1.09
Constant	-2.68***	0.07	-9.53	0.00
Wald chi²	**278.48*** **		**1494.43*** **	
Pseudo R²	**0.03**		**0.18**	
N	**18,143**		**18,143**	

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

§ 6.6 Discussion and conclusion

The socio-spatial assimilation of ethnic minorities is considered crucial for the development of inclusive, diverse societies. A large body of research assumes that socio-spatial assimilation develops over the course of generations, suggesting that later generations will no longer be substantially different from the native population, illustrated by a similar socioeconomic status and similar residential mobility behavior. This assumption of socio-spatial assimilation is also reflected in the official definition of ethnicity: third generation immigrants who are Dutch-born and whose parents are Dutch-born, but who have one or more grandparents from a migrant background, are

defined as native Dutch. The present study aimed to analyze the extent to which this third generation displays socio-spatial assimilation and to assess its outcomes in terms of ethnic segregation.

In the analysis, I find that third generation home leavers continue to 'lag behind' in socioeconomic status compared to their native Dutch peers. Although the parental income and individual income of Surinamese and Antillean home-leavers is higher than that of Moroccan and Turkish home -eavers, the parental income and individual income of native Dutch home-leavers is generally higher compared to all four ethnic groups. In addition, home-leavers from an immigrant background more often grew up in ethnically concentrated neighborhoods compared to their native peers, with Moroccan and Turkish home-leavers most often originating from ethnic concentration neighborhoods. Taking into account these socioeconomic differences, I find that third generation immigrants continue to be more likely to move to ethnic concentration neighborhoods, with Moroccan and Turkish home-leavers showing the highest likelihood. This finding is in line with studies on second generation immigrants that display a similar pattern (Bolt & Van Kempen, 2010a; Kleinepier & Van Ham, 2017; Zorlu & Mulder, 2010). More importantly, these findings raise questions about the socio-spatial assimilation of third generation immigrants as they continue to be more socioeconomically disadvantaged compared to their native Dutch peers. In addition, third generation immigrants might still be very different from the native Dutch culturally, which might be an explanation for why they are more likely to move into ethnic concentration neighborhoods after controlling for socioeconomic differences. Third generation immigrants might very much identify with their ethnic background, or might prefer to live close to family and other members from the ethnic community.

Third generation immigrants are officially defined as native Dutch in the official statistics. The discussion of who is considered to be an immigrant and who is not is often controversial, however, as a result of the current definition third generation immigrants disappear in official statistics. This is problematic as the definition falsely assumes socio-spatial assimilation when the results of my analysis demonstrate that there continue to be significant socioeconomic and cultural differences between the third generation and the native population. As a result of this definition, inequalities between individuals with a migrant background will be overlooked. I find evidence for the intergenerational continuity of socio-spatial disadvantage, resulting in persistent ethnic segregation. Third generation immigrants tend to display more or less the same residential mobility behavior as the second generation, which over time, will most likely result in increasing ethnic concentrations.

The third generation is a relatively young and small group in many European countries. However, over time as the population ages, and as a result of ethnic intermarriage, this

group will continue to grow. The results from the present study suggest that there might be strong socio-spatial differences between this generation and the native population. The residential mobility behavior of the third generation is likely to have important consequences for ethnic segregation. Future research should focus on the extent to which the residential choices of third generation immigrants are the result of limited socioeconomic resources or ethnic self-segregation. In addition, researchers should focus on the behavior of the native population in terms of 'White flight' or 'wealth flight'. Ethnic segregation appears to be a persistent feature of contemporary cities which does not automatically decrease over the course of generations or as a result of socio-economic assimilation. Rather, there appears to be a strong intergenerational path-dependence on ethnic residential mobility behavior. Growing up in ethnic concentration neighborhoods has long-lasting effects on the socio-spatial behavior of young people (see also Sharkey & Sampson, 2008; Swisher et al., 2013; De Vuijst et al., 2017; Zorlu & Mulder, 2010). Researchers should be aware that having a migrant background might continue to play an important role in group inequalities over multiple generations.

TOC

7 Conclusion

§ 7.1 Background

Many European cities are faced with growing inequalities between different ethnic and income groups which is reflected in their distribution across the urban environment (Tammaru et al., 2016). Most cities are now characterized by distinctive spatial patterns where the rich tend to cluster together in high-quality neighborhoods in favorable locations, while the poor are overrepresented in disadvantaged neighborhoods dominated by social/public housing (Hulchanski, 2010; Van Eijk, 2010). In many cities, such spatial patterns of income inequality tend to show a strong overlap with ethnic inequality, illustrated by an overrepresentation of ethnic minorities in low-income concentration neighborhoods. However, spatial patterns of inequality can change over time as a result of processes of neighborhood change, which can significantly alter the urban geography of cities and regions. There has been a lack of longitudinal studies on neighborhood change and previous research has mainly focused on specific case-studies of gentrification and decline. As such, relatively little is known about the prevalence and rate of change across all neighborhoods in a city or larger urban region (Tunstall, 2016). The time-period, frequency, and composition of mechanisms that influence neighborhood trajectories may vary and neighborhood change can be non-linear, temporary, or long-lasting (cf. Galster, 2012).

This dissertation started from the idea that a longitudinal approach can be used as both a theoretical and methodological framework to analyze neighborhood change. A longitudinal approach will contribute to more insight into different pathways of neighborhood change over time and the role of various drivers of change. This dissertation sought to answer the following research questions: *(1) What trajectories of neighborhood change can be identified over time? (2) To what extent can neighborhood change be explained by population dynamics and housing stock characteristics?* To answer these questions, this dissertation analyzed the longer-term processes underpinning socioeconomic neighborhood change and the path-dependent role of the housing stock. It further examined how urban restructuring programs affected neighborhood change by shaping residential mobility through demolition and new construction. Focusing on ethnic neighborhood change, this dissertation examined changes in the

ethnic population composition over time through residential mobility and demographic change and its effects on ethnic segregation.

The analyses were based on Dutch population register data retrieved from the System of Social statistical Datasets (SSD) provided by Statistics Netherlands. The SSD contains individual-level geocoded data on the full Dutch population, in addition to housing stock characteristics. This dissertation analyzed neighborhood change on a relatively low spatial scale using 500 by 500 meter grids. Three out of four empirical chapters in this dissertation focused on the 1999 to 2013 period. One chapter used the last Dutch census of 1971 to provide a long-term perspective on neighborhood change. This dissertation employed innovative methodologies for the analysis of neighborhood change, viz. sequence analysis in combination with a tree-structured discrepancy analysis and Latent Class Growth Models (LCGMs). Both methods allows for the analysis of neighborhood trajectories and the classification of trends of neighborhood change.

§ 7.2 Summary of findings

This dissertation consisted of five chapters, one theoretical and four empirical chapters. These chapters are complete research papers, each with their own research question, theoretical framework, empirical analyses, results and discussion section. All papers have been published in peer-reviewed journals or are currently under review. The main findings from these chapters are summarized below. Section 7.3 then reflects upon this dissertation's main contributions to the literature and provides some suggestions for future research. The following section (7.4) discusses the limitations of this dissertation. Section 7.5 concludes with a discussion of the policy implications.

§ 7.2.1 The Global Financial Crisis and neighborhood decline

The Global Financial Crisis (GFC) and the subsequent recession has led to rising inequalities between the rich and the poor, particularly in terms of income and housing. Such macro-economic processes tend to have specific spatial outcomes, such as increased segregation, increased concentrations of poverty, and negative neighborhood effects (European Commission, 2010; Glaeser et al., 2009). It is well established that the GFC has had unequal effects across households, with vulnerable households being affected

the most, in terms of negative equity, unemployment, and declining incomes (Dreier et al., 2014; OECD, 2013a). It can therefore, be expected that the impacts of the GFC are most pronounced in disadvantaged neighborhoods, fuelling processes of neighborhood decline. An overwhelming amount of research has analyzed the effects of the GFC on the economy and/or the housing market, however, there have been few studies that have focused on how the GFC has affected the processes of neighborhood change.

Chapter 2 bridged two streams of literature by reviewing the literature on the consequences of the GFC and connecting it to the literature on neighborhood decline. This chapter hypothesized that the GFC will accelerate processes of neighborhood decline in disadvantaged neighborhoods and formulated ten ways in which different developments might affect neighborhood decline. The main goal of chapter 2 was to further the intellectual debate on neighborhood decline and to call for more research on the spatial consequences of the GFC and subsequent recession and government reforms, specifically on neighborhoods as an important territorial dimension of increasing inequality.

The GFC has had important consequences related to the availability of affordable housing in many countries. A growing number of disadvantaged households in need of affordable housing, in addition to stricter allocation of social housing to low-income households and limited production of new social housing, can lead to increased concentrations of poverty over time. Stricter rules on mortgage lending affects homeownership rates and is likely to lead to large differences in housing and neighborhood quality between renters and homeowners, giving rise to a spatial divide based on tenure (Forrest & Hirayama, 2015). Differences between generations in terms of housing opportunities are fuelled by the GFC, causing wealth and social class to become an increasingly stratifying factor over generations (Forrest & Hirayama, 2015; Hochstenbach & Boterman, 2017). In both cases, these developments can lead to increased socioeconomic segregation. Moreover, austerity programs and budget cuts imply that the involvement of governments and government-funded institutions in disadvantaged neighborhoods is decreasing, which can spur processes of neighborhood decline.

There is a need for more research on the long-term effects of the GFC, as a growing spatial gap between wealthy and disadvantaged neighborhoods, renters and homeowners, and privileged and less privileged families can be expected. Longitudinal research can provide insight in the ways in the GFC affected the urban geography and the extent to which the effects are temporary or long-lasting. A better understanding of how different mechanisms interact to influence neighborhood trajectories and spatial patterns of increasing inequality is necessary for effective policymaking in the aftermath of the GFC and the recession.

§ 7.2.2 The path-dependency of low-income neighborhoods

It is well-known that many large cities throughout Europe have experienced increased socio-spatial polarization over time (Tammaru et al., 2016). The literature suggests that the housing stock and the built environment of neighborhoods play an important role in processes of neighborhood change (e.g. Meen et al., 2013; Prak & Priemus, 1986). For example, gentrification has been related to the favorable location of neighborhoods and the architectural aesthetics of the housing stock which attracts higher income groups (e.g. Bridge, 2001; Zukin, 1982, 2010). Decline, on the other hand, is explained by the relative depreciation and declining quality of the housing stock (Prak & Priemus, 1986; Van Beckhoven et al., 2009). Few studies have however analyzed how the housing stock shapes neighborhood trajectories over time. Studies in this field are generally limited by (1) a short-time perspective, reducing neighborhood change to the difference between two relatively close together points in time, and; (2) a focus on specific case-studies of gentrification or decline. As a result, it is unclear to what extent neighborhoods with a similar housing stock experience similar processes of change over time – or to what extent processes of gentrification and decline are the exception to the rule. In addition, the question remains how these processes of neighborhood change affect other neighborhoods. Neighborhoods are part of a larger urban geography and processes of neighborhood change can spill over to other neighborhoods, for example through rising or declining house prices, or relative depreciation.

Chapter 3 presented a longitudinal approach for analyzing neighborhood change by focusing on detailed neighborhood trajectories. By analyzing the trajectories of low-income neighborhoods in the 31 largest cities in the Netherlands over the 1971 to 2013 period, chapter 3 investigated the relationship between the housing stock and spatial patterns over time. Using sequence analysis and a tree-structured discrepancy analysis, chapter 3 showed that neighborhoods exhibit a high degree of path-dependency. Neighborhoods with high shares of social housing in 1971 display a pattern of increased poverty concentration and neighborhood decline over time. A substantial increase in the share of owner-occupied housing in neighborhoods with a relatively high share of social housing contributes to more upward neighborhood trajectories.

Chapter 3 contributes to an understanding of longitudinal, contextualized patterns of neighborhood change. The results showed that neighborhoods with similar housing stock characteristics experience similar developments over time. The share of social housing in 1971 appears to be a crucial predictor of downward neighborhood trajectories. The results also illustrated how changes in one group of neighborhoods relate to the trajectories of other neighborhoods which suggests that processes of

stability, downgrading, and upgrading are not isolated processes but instead work together to shape the urban geography.

§ 7.2.3 The effects of physical restructuring on neighborhoods

In the decades before the GFC, many European governments implemented urban restructuring programs to regenerate disadvantaged neighborhoods. Urban restructuring aimed to break up concentrations of poverty by changing the spatial distribution of low-income residents through housing diversification (e.g. VROM, 1997). The demolition of social housing and the construction of more expensive owner-occupied or private-rented dwellings would stimulate the in-migration of middle- and high-class households, arguably leading to processes of neighborhood upgrading (Kleinhans, 2004). Many have however been critical about the effectiveness of urban restructuring programs in actually achieving neighborhood change (e.g. Lawless, 2011; Permentier et al., 2013; Tunstall, 2016; Wilson, 2013). The lack of evidence for the effects of urban restructuring on neighborhood change can be explained by three methodological limitations. First, urban restructuring programs consisted of several people- and area-based interventions that differed in size and scope between neighborhoods which makes it difficult to 'measure' urban restructuring. Second, urban restructuring programs generally targeted specific parts of neighborhoods while the rest of the neighborhood often remained unchanged. This implies that the effects of urban restructuring have to be large to change the trajectory of the entire neighborhood. Third, few studies have analyzed the effects of urban restructuring over longer periods of time, while the literature suggests that change takes time to take effect (e.g. Meen et al., 2013; Tunstall, 2016).

Chapter 4 overcame these limitations by focusing on the effects of demolition and new construction on a low spatial scale, i.e. 500 by 500 meter grids, over a 15-year period. Using propensity score matching, chapter 4 compared changes in the median neighborhood income between restructured neighborhoods, control neighborhoods, adjacent neighborhoods, and all other neighborhoods in the 31 largest Dutch cities between 1999 and 2013. Restructured neighborhoods have experienced the largest increase in the median neighborhood income as a result of attracting and maintaining higher income groups. Urban restructuring appears to have negative spillover effects in terms of an increased share of low-income households in adjacent and control neighborhoods.

The findings from chapter 4 shed new light on the effectiveness of urban restructuring programs to improve disadvantaged neighborhoods. Large changes to the housing stock

as a result of demolition and new construction can lead to neighborhood upgrading by changing the population composition of neighborhoods. Urban restructuring has been successful in breaking up concentrations of poverty by changing the spatial distribution of disadvantaged residents. However, urban restructuring has important consequences for the larger urban area as processes of displacement lead to a growing share of disadvantaged residents in other neighborhoods, potentially setting off new processes of neighborhood decline.

§ 7.2.4 Trajectories of ethnic neighborhood change

The share of ethnic minorities in many large European cities has increased over the past few decades and continues to grow (Vertovec, 2007) which raises questions about increased patterns of ethnic segregation. While some have argued that ethnic segregation decreases over time as a result of processes of spatial assimilation (e.g. Simpson & Finney, 2009), others have shown that ethnic segregation is persistent, illustrated by spatially segregated concentrations of ethnic minorities and natives (e.g. Johnston et al., 2016). Although it has long been assumed that residential mobility is the most important driver of ethnic segregation, a small body of research argues that the effects of residential mobility need to be understood in relation to demographic events (e.g. Bader & Warkentien, 2015; Simpson et al., 2008).

To understand patterns of ethnic segregation, many studies rely on classifying neighborhoods based on their ethnic population composition. A large body of research has used single-number indices to analyze ethnic segregation, reducing segregation to a static characteristic of neighborhoods and cities at a specific point in time (e.g. Duncan & Duncan, 1955; Massey & Denton, 1993, Peach, 1996). The use of indices fails to provide inside into contemporary patterns and varying degrees of population mix (Johnston et al., 2010; Poulsen et al., 2011). A different stream of research has therefore created typologies of neighborhoods based on the ethnic population composition (e.g. Johnston et al., 2010; Poulsen et al., 2001). However, these typologies are highly dependent on group sizes and tend to rely on arbitrary thresholds (Peach, 2009). Both approaches are limited in their ability to identify patterns of ethnic neighborhood change over time.

Chapter 5 used a LCGM to analyze trajectories of ethnic neighborhood change in the four largest cities in the Netherlands between 1999 and 2013. This approach allows for the identification of trends in the ethnic population composition over time by creating an empirical typology of ethnic neighborhood change. Despite a substantial growth in the ethnic population, chapter 5 found that neighborhoods show relative stability in

the ethnic population composition over a 15-year period. Although ethnic minorities are increasingly moving away from concentration neighborhoods, processes of natural growth play an important role in maintaining levels of ethnic segregation.

Chapter 5 found persistent patterns of ethnic segregation that are closely related to socioeconomic status. On the one end of the spectrum, there are 'White citadels' characterized by a native-majority population, high incomes, and high housing market values; on the other end, there are ethnic concentration neighborhoods characterized by multiple forms of disadvantage. Large-scale demolition and new construction as a result of urban restructuring has stimulated residential mobility out of disadvantaged neighborhoods, stimulating a trend towards ethnic deconcentration and increased spatial mixing, however, continuous high natural growth tends to slow this trend down. Chapter 5 contributes to an understanding of diverging processes of ethnic segregation over time and illustrates how residential mobility and demographic change reproduce the urban geography along ethnic and socioeconomic lines.

§ 7.2.5 Intergenerational continuity of ethnic segregation

Ethnic segregation appears to be a persistent feature of European cities. The literature argues that ethnic segregation will decrease over the course of generations. Once later generations are more socially and economically assimilated into society, they will arguably display the same residential mobility behavior as the native population (Massey, 1985). Studies indeed confirm that second generation ethnic minorities show more spatial dispersal and movement to more mixed neighborhoods (e.g. Bolt & Van Kempen, 2010a). The assumption of socio-spatial assimilation over the course of generations is implicitly captured in the official Dutch definition of ethnicity (Kooiman et al., 2012). Third generation ethnic minorities that are born in the Netherlands and whose parents are both born in the Netherlands, but with one or more grandparents from an immigrant background, are defined as native Dutch. It is assumed that these third-generation ethnic minorities are no longer socially, economically, and culturally different from the native Dutch.

The use of this definition has important empirical consequences. In the field of neighborhood change research, the use of this definition might lead to inaccurate conclusions about ethnic segregation. For example, when third generation ethnic minorities move into ethnic concentration neighborhoods, this will be interpreted as an inflow of natives, decreasing the share of ethnic minorities in a neighborhood. Similarly, childbirth among the second generation will also lead to a decreasing share of ethnic

minorities in a neighborhood, as their children are officially defined as native Dutch. In reality, third-generation ethnic minorities might still be very different from the native population in cultural, social, or economic terms, which might influence the residential preferences or behavior of other ethnic groups (cf. Schelling, 1971), and can thus play a role in processes of neighborhood change over time.

Chapter 6 analyzed intergenerational patterns of ethnic segregation by focusing on the residential patterns of third generation parental home-leavers in the 31 largest Dutch cities between 1999 and 2013. This chapter showed that third generation ethnic minorities continue to be overrepresented in ethnic concentration neighborhoods. An important explanation for this finding is the lower socioeconomic status of ethnic minorities compared to their native peers.

Chapter 6 sheds new light on intergenerational patterns of socio-spatial disadvantage which play a role in persistent ethnic segregation over time. The Dutch definition of ethnicity is problematic because it implies that later generations of ethnic minorities 'disappear' in official statistics, causing inequalities between individuals with a migrant background to be overlooked. This chapter also contributes to an understanding of how official definitions can have a major impact on statistical research and conclusions.

§ 7.3 Discussion of findings

This dissertation has adopted a longitudinal approach to analyze patterns of neighborhood change on a relatively low spatial scale. The findings from this dissertation contribute to the literature on neighborhood change in four ways. First, this dissertation has illustrated that neighborhoods remain relatively stable over time in their socioeconomic and ethnic status and that change takes several decades to take effect. Second, it highlighted the important role of the housing stock in shaping neighborhood trajectories. Third, this dissertation revealed the ways in which different population dynamics interact to inhibit or generate neighborhood change to reproduce socio-spatial inequalities. Fourth, the innovative methods that are explored in this dissertation contribute to broadening the scope of statistical methods for the longitudinal analysis of neighborhood change.

§ 7.3.1 Neighborhood stability and change

The main contribution of this dissertation to the literature on neighborhood change is the conclusion that neighborhoods tend to be relatively stable in their socioeconomic and ethnic status over time. This finding is in line with studies on the UK and Australia that have highlighted the temporal stability of neighborhoods (Meen et al., 2005; Meen et al., 2013; Tunstall, 2016). Neighborhood change appears to take several decades to take effect: this dissertation found relatively little neighborhood change over a 15-year period, but has shown large changes to the urban geography over 40 years (see also Hulchanski, 2010).

Three out of four chapters in this dissertation have analyzed neighborhood change over a 15-year period. This is a relatively short time span in this field of research, however, this dissertation required high-quality individual-level geocoded data which was mostly available from 1999 onwards. Chapter 3 overcame this limitation by using the last Dutch census of 1971 to provide a long-term perspective on neighborhood change. Research in this field ideally requires detailed individual-level geocoded data over several decades, however, there tends to be a trade-off between data quality and data availability. The growing availability of high-quality data from different sources over longer periods of time will be greatly beneficial for future neighborhood change research.

This dissertation challenges the dominant view that gentrification and decline are widespread processes that quickly transform neighborhoods and cities. This dissertation failed to identify extreme trajectories of gentrification or decline over a 15-year period, which implies that these processes are rather exceptional, only occurring in a limited number of neighborhoods (see also Cortright & Mahmoudi, 2014; Tunstall, 2016), and are generally slow processes that take decades to change the urban geography. These findings underline the importance of a longitudinal approach to identify different neighborhood pathways to understand how they shape the urban geography over longer periods of time.

§ 7.3.2 The role of the housing stock

This dissertation has highlighted the determining role of the housing stock in processes of neighborhood change. Neighborhoods tend to exhibit a high degree of path-dependency where initial advantages and disadvantages, in terms of location and housing quality, are reinforced over time (Meen et al., 2013). This dissertation has found that the share of

social housing in 1971 is an important determinant of future processes of neighborhood decline. Previous studies have also pointed to the relationship between (post-war) social housing and neighborhood decline (Prak & Priemus, 1986; Van Beckhoven et al., 2009).

Changes to the housing stock of neighborhoods have the ability to alter the trajectory of a neighborhood by stimulating selective residential mobility (Nygaard & Meen, 2011). This dissertation has shown how urban restructuring programs have changed the housing composition of disadvantaged neighborhoods. The demolition of social housing and new construction of owner-occupied or more expensive private-rented housing has led to processes of neighborhood upgrading by attracting and maintaining higher income groups. However, neighborhoods are part of a larger urban system and changes in one neighborhood are likely to affect other neighborhoods as well (Bråmå, 2013; Musterd & Ostendorf, 2005a). Urban restructuring programs tend to have negative spillover effects on other neighborhoods in terms of a growing share of low-income residents as a result of displacement. Future research should assess to what extent these negative spillover effects are temporary or leading to new processes of neighborhood decline over time.

§ 7.3.3 Population dynamics

This dissertation has illustrated how different population dynamics interact to maintain the status quo. Chapter 5 identified stable patterns of ethnic segregation over a 15-year period, while chapter 6 found that third generation ethnic minorities display high rates of residential mobility into ethnic concentration neighborhoods. The enduring existence of ethnic concentration neighborhoods appears to be related to the intergenerational persistence of disadvantaged socioeconomic status for members of ethnic minority groups. It is likely that this status limits residential opportunities, causing overrepresentation in disadvantaged neighborhoods. The extent to which ethnic segregation is the result of the residential 'choices' made by ethnic minority individuals preferring colocation with family and friends (Philips et al., 2007) is a question that this dissertation has not addressed. Future research should aim to provide more insight in the relative role of residential preferences and constraints in processes of ethnic segregation.

The findings from this dissertation suggest that urban restructuring programs have had a small deconcentrating effect by stimulating ethnic residential mobility out of concentration neighborhoods, however, this effect is impeded by natural growth. The relatively high fertility rate among ethnic minorities implies that they have a high rate of natural increase which is reflected spatially. While residential mobility has long been

seen as the most important driver of ethnic segregation, this dissertation has added to the small, but growing literature on the important role of demographic change (e.g. Bader & Warkentien, 2015; Simpson & Finney, 2009).

§ 7.3.4 Methodological contributions

This dissertation has explored innovative methods to analyze longitudinal neighborhood change. Many studies in this field have relied on percentile shifts or point-in-time measures to analyze change, or have focused on specific case-studies of gentrification and decline. These approaches provide little insight into different patterns of change which has led to an important gap in the literature. Two longitudinal methods have proven to be valuable methods for neighborhood change research.

Chapter 3 employed sequence analysis in combination with a tree-structured discrepancy analysis to analyze long-term neighborhood trajectories. Sequence analysis provides insight into detailed neighborhood pathways illustrating how neighborhoods move through different states over time (cf. Gabadinho et al., 2011). A tree-structured discrepancy analysis groups neighborhoods that experience similar trajectories together based on explanatory variables (cf. Studer, 2011). This dissertation has illustrated how variation in neighborhood pathways can be explained by the housing stock. This combination of methods allows for an approach that incorporates both long-term neighborhood change and a more detailed analysis of neighborhood trajectories, illustrating how differences between neighborhoods vary over time. One of the main contributions of the combination of sequence analysis and a tree-structured discrepancy analysis is the analysis of the relationship between trajectories and their contexts.

Chapter 5 used a Latent Class Growth Model (LCGM) to create an empirical typology of ethnic neighborhood change over time. LCGMs allow for the identification of trend over time by categorizing neighborhoods based on their unique growth trajectories of the ethnic population composition (cf. Nagin, 2005). The main contribution of LCGMs lies in the ability to identify trends over time, which provides insight into diverging patterns of change based on timing and pace. LCGMs are a promising method for neighborhood change research, especially in combination with the availability of high-quality annual data over longer periods of time.

§ 7.4 Challenges and limitations

This dissertation has analyzed longitudinal patterns of neighborhood change over a 15-year period on a low spatial scale, which is quite exceptional in this field of research. The analysis of various pathways of neighborhood change and their drivers, together with the use of innovative methodologies, is an important contribution to the field. However, this dissertation also faced a number of limitations that are discussed below.

§ 7.4.1 Gentrification

Although this dissertation has analyzed processes of neighborhood change, it has not specifically focused on processes of gentrification. While some refer to urban restructuring as a form of state-led gentrification (e.g. Uitermark & Bosker, 2014), this dissertation viewed gentrification as a more market-driven process of neighborhood change that occurs without direct government involvement. Gentrification can be characterized as a process where the advantages of the location, high-quality, and architectural aesthetics of the housing stock and built environment are reinforced over time, stimulating the in-migration of higher income groups and the out-migration of lower income groups, while urban restructuring is focused on improving disadvantaged neighborhoods through housing diversification. Although some of the mechanisms might be similar, processes of neighborhood upgrading as a result of urban restructuring programs are nowhere near as extreme as processes of gentrification in terms of rising neighborhood incomes, rising house prices, and large-scale selective mobility. The use of the term gentrification for different processes leads to an overestimation of the prevalence of gentrification, fuelling the view that gentrification is a widespread process that quickly changes neighborhoods and cities. Despite the bulk of studies on the topic, we have a limited understanding of the prevalence, extent, and rate of processes of gentrification across neighborhoods and cities. There is a need for more longitudinal research on neighborhood trajectories to get more insight in the extent of gentrification as a phenomenon and the share of all neighborhoods affected (see also Tunstall, 2016).

§ 7.4.2 Ethnic minorities

This dissertation has limited its focus on the four largest non-western migrant groups in the Netherlands for two reasons: (1) they have been at the heart of the debate on ethnic concentrations and ethnic disadvantage, and; (2) the four largest groups have the longest immigration history, producing a sizeable second generation and a growing third generation. As such, the four largest ethnic groups are interesting for research on ethnic neighborhood change, because processes of socio-spatial assimilation can be expected over the course of generations that can have important effects on the urban geography. However, the spatial distribution of the four largest ethnic groups is likely to be related to residential behavior and distribution of other non-western and western ethnic groups in the Netherlands. While many studies have analyzed ethnic segregation and the spatial concentration of ethnic minorities, relatively few studies have compared patterns of segregation across different ethnic groups. Future research would benefit from analyzing the residential patterns of different ethnic groups and the ways they interact to shape the urban geography along ethnic lines.

§ 7.4.3 Methodological limitations

This dissertation has explored two innovative methodologies for the analysis of longitudinal neighborhood change. While both methods have proven to be valuable tools for neighborhood change research, there are some limitations to them as well. Sequence analysis, in combination with a tree-structured discrepancy analysis, allows the analysis of neighborhood pathways and their contexts. In a stepwise approach, the tree-structured discrepancy analysis uses the most important predictor variable and its most important values to split the neighborhood sequences into two distinctly different groups. These two groups can then be seen as two groups of neighborhoods that follow different pathways over time, based on the differences in the level of the predictor variable. However, it is unclear to what extent these predictor variable levels are arbitrary cut-off points or if they can be interpreted as threshold values for processes of neighborhood change. This limitation reflects the nature of the modelling process and underlines the need to string theoretical reasoning beneath the models. In addition, the tree-structured discrepancy analysis currently only facilitates a split into two groups, however, it is likely that in reality more than two directions of neighborhood change can be identified. Fortunately, researchers are working on alternative algorithms that could facilitate more than two splits (Studer et al., 2010) which would make this new methodology highly suitable for neighborhood change research.

LCGMs allow for the identification of trends of neighborhood change based on similarities in timing and pace of change. However, model convergence and selection is a well-known issue with LGCMs and consequently, it is difficult to be certain about the 'true' number of trends over time which can be problematic in subsequent analyses (Warren et al., 2015). Ultimately, this limits the ability to use the identified neighborhood trends in further analyses on neighborhood outcomes. As a solution, researchers can use multiple indicators to determine the optimal number of groups (see also Jung & Wickrama, 2008; Nagin, 2005; Nylund et al., 2007). Researchers should however always be sensitive to the fact that the true number of groups is difficult to identify and use theory and prior research for model selection.

§ 7.5 Policy implications

This dissertation has focused on longitudinal patterns of neighborhood change and has found that neighborhoods are generally stable in their ethnic and socioeconomic status over time. This dissertation has argued that the housing stock plays a large role in maintaining relative stability and has shown how changes to the housing stock can stimulate processes of neighborhood change. Furthermore, this dissertation has illustrated how patterns of ethnic segregation remain stable over the course of generations and has analyzed the relative impact of residential mobility and demographic change. These findings have important societal implications and can contribute to effective policy making.

First and foremost, policy makers should be aware of the relative stability of neighborhoods over time. Without large-scale changes to the housing stock, neighborhood change takes time to take effect, often exceeding standard policy time. Moreover, although large-scale urban restructuring programs have been successful in upgrading disadvantaged neighborhoods, policy makers should keep in mind that these effects are very localized. While it is sometimes argued that urban restructuring has failed because it did not improve the socioeconomic position of individual households, this dissertation has illustrated that urban restructuring has had positive effects on the neighborhood level. Urban restructuring has contributed to breaking up concentrations of poverty by changing the spatial distribution of low-income residents, however, other neighborhoods have experienced an increase in the share of low-income households as a result of displacement. The Dutch policy of social mixing appears to have functioned as a buffer against new concentrations of poverty, maintaining relatively low levels of socioeconomic segregation (Musterd & Ostendorf, 2005b). However, this dissertation

has also argued that the GFC and subsequent austerity programs and budget cuts are likely to have specific spatial outcomes, affecting vulnerable neighborhoods and leading to new processes of neighborhood decline and socio-spatial segregation. The question remains to what extent the merits of urban restructuring and social mixing will be maintained over time.

The rise of neoliberalism since the late twentieth century as the dominant political and economic ideology has impacted social housing systems by introducing market forces to the provision of social housing (Taylor, 2017). This shift towards the marketization of social housing has been accelerated by the GFC. Some cities aim to stimulate processes of gentrification through the sales of social rented housing which reduces the size and quality of the social housing stock. It is, however, unclear to what extent the sales of social housing actually lead to gentrification or how they affect neighborhoods and cities. Reducing the size and quality of the housing stock can have important spatial consequences in terms of access to affordable housing and milking in the private rented sector (cf. Dol & Kleinhans, 2012; Aalbers, 2013). Policy makers should realize that reducing the social housing stock in large cities leads to exclusionary displacement (Marcuse, 1986), making (large parts of) cities inaccessible to low-income groups and having a major impact on the entire geography of cities and regions.

This dissertation has argued that enduring ethnic segregation can be explained by intergenerational ethnic disadvantage. The persistent existence of ethnic concentration neighborhoods seems to be the result of the relatively low socioeconomic status of ethnic minorities that are dependent on the availability of social housing. While urban restructuring programs seem to have stimulated ethnic residential mobility, high natural growth has contributed to the persistent existence of ethnic concentration neighborhoods. The question remains to what extent spatial patterns of ethnic disadvantage should be targeted by urban (re)development, or by investing in education and labor market participation. As studies have shown that socioeconomic mobility tends to lead to more residential opportunities and spatial dispersal (cf. Van Kempen & Bolt, 2010; Zorlu & Mulder, 2010), investing in socioeconomic opportunities appears to be key to combating spatial disadvantage.

This dissertation has highlighted how official definitions of ethnicity influence empirical conclusions. In the Netherlands, ethnic origin is defined on the basis of the country of birth of the parents. Although this is a relatively objective indicator, it tends to ignore other aspects of ethnic origin including visible minority status through skin color, as well as other invisible but clear markers such as language and culture. This dissertation has revealed that this definition only captures two generations, causing third generation ethnic minorities to disappear in official statistics. However, later generations of ethnic minorities might still be characterized by other aspects of ethnic origin which might play

an important role in group differences. As society is becoming increasingly ethnically diverse, policy makers should be aware that there are ethnic differences and group inequalities even though they might not be visible in official statistics.

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Curriculum Vitae

Merle Zwiers was born in Almere (the Netherlands) on August 6, 1987. In 2005, she started her bachelor in Anthropology at the University of Amsterdam. After studying a semester abroad in San Francisco, she graduated in 2009. Merle obtained her Master's degree in Sociology at the University of Amsterdam with distinction (cum laude) in 2011. She worked as a junior researcher for the research project 'Solidarity in the 21st Century' at the Amsterdam Institute for Advanced Labor Studies (University of Amsterdam) from 2009 to 2014. Merle also worked as a junior lecturer at the Erasmus University Rotterdam from 2011 to 2012. In 2013, Merle started her PhD in Urban Sociology/ Social Geography at OTB – Research for the Built Environment, Delft University of Technology. Her PhD was part of the ERC project 'Deprivedhoods' led by prof. dr. Maarten van Ham. Merle's PhD dissertation focused on longitudinal neighborhood change in the Netherlands, using quantitative research methods such as sequence analysis and Latent Class Growth Models. During her PhD, Merle was a member of the editorial board of the International Journal of Housing Policy. Merle also worked as a statistics trainer at Tridata from 2015 onwards. From 2015 to 2016, Merle supervised 10 students with their master thesis on organizational change at the Erasmus University Rotterdam. Since April 2018, Merle has been working as a Senior Data Analist combining data analysis with strategic business consulting.

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