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ABSTRACT

Ethnic Differences in Duration and Timing of Exposure to Neighbourhood Disadvantage during Childhood

This paper examines ethnic differences in childhood neighborhood disadvantage among children living in the Netherlands. In contrast to more conventional approaches for assessing children's exposure to neighborhood poverty and affluence (e.g., point-in-time and cumulative measures of exposure), we apply sequence analysis to simultaneously capture the timing and duration of exposure to poor and nonpoor neighborhoods during childhood. Rich administrative microdata offered a unique opportunity to follow the entire 1999 birth cohort of the Turkish, Moroccan, Surinamese, and Antillean second generation and a native Dutch comparison group from birth up until age 15 (N=24,212). Results indicate that especially Turkish and Moroccan children were more likely than native Dutch children to live in a poor neighborhood at any specific stage within childhood, but particularly throughout childhood. Although differences became substantially smaller after adjusting for parental and household characteristics, ethnic differences remained large and statistically significant. In addition, the impact of household income on children's neighborhood income trajectories was found to be weaker for ethnic minority children than for native Dutch children. Our findings are discussed in relation to theories on spatial assimilation, place stratification, and residential preferences.

JEL Classification: I30, J60, P46, R23

Keywords: childhood, ethnicity, life course, neighborhood, sequence analysis

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Introduction

The importance of residential neighborhoods in shaping children's lives has been studied extensively (Pebley & Sastry, 2004). Growing up in a deprived neighborhood is thought to impede children's well-being and development due to, amongst others, a lack of successful role models, exposure to high levels of crime within their local communities, scarce institutional resources, and environmental health hazards (Galster, 2012). Motivated by the relevance of the neighborhood context for children in particular, various studies have focused on children's neighborhood socioeconomic status as an outcome in itself. Previous research in the US has shown substantial racial and ethnic inequality in this regard, with black children having much higher odds of residing in poor neighborhoods than children from white families (Briggs & Keys, 2009; Sharkey, 2008; Timberlake, 2007, 2009). In European research, however, little attention has been paid to factors shaping children's neighborhood environments (for exceptions, see Morris, 2017; van Ham et al., 2014).

Prior studies have often measured children's neighborhood socioeconomic status at a single point in time. These measures are increasingly criticized because children's neighborhood characteristics may change over time (Kleinepier & van Ham, 2017; Sharkey & Faber, 2014). In response, recent work has developed more dynamic measures of neighborhood experiences, mainly by studying the duration of exposure to poor and nonpoor neighborhoods (Wodtke et al., 2011). For example, Timberlake (2007) showed that racial differences in the cumulative exposure to poor neighborhoods over the childhood life course are greater than racial differences at any single point in time. However, while measures of duration of exposure avoid some of the shortcomings of point-in-time measures of neighborhood quality, an exclusive focus on duration of exposure obscures another potentially important aspect of children's neighborhood histories: the timing of exposure. Despite many studies showing that family poverty during early childhood versus adolescence has heterogeneous effects on later outcomes (e.g., Wagmiller et al., 2006), research on neighborhood deprivation has largely neglected age-specific variation in children's exposure to disadvantage (for exceptions, see Anderson et al., 2014; Wodtke, 2013).

This paper examines ethnic differences in childhood exposure to poor and nonpoor neighborhoods among children in the Netherlands, focusing on the second generation of the four largest non-Western immigrant groups in the country (Turks, Moroccans, Surinamese, Antilleans) and native Dutch. Our study has three core aims. The first aim is to better capture ethnic differences in children's exposure to neighborhood disadvantage by using sequence analysis to simultaneously take into account the duration and timing of exposure (Abbott & Tsay, 2000). Drawing on different theoretical perspectives, differences in children's neighborhood socioeconomic status may be related to observed factors (e.g., family income, marital status) and unobserved factors (e.g., preferences, discrimination) (Timberlake, 2009). The second aim of this study, therefore, is to examine the extent to which ethnic differences in children's patterns of exposure to neighborhood deprivation can be explained by differences in parental socioeconomic status and family structure. Research furthermore suggests that, at least in the US context, the impact of socioeconomic status on exposure to neighborhood poverty differs by race/ethnicity (South & Crowder, 1997; Swisher et al., 2013). As such, the third aim of this study is to assess whether ethnicity moderates the relationship between household resources and children's exposure to poor neighborhoods.

We use longitudinal microdata from the Dutch population registers, allowing us to reconstruct individual neighborhood histories on a large research population over an extended period of time. Specifically, an entire birth cohort of the Turkish, Moroccan, Surinamese, and Antillean second generation and a 5% random sample of native Dutch children are followed

on an annual basis from birth in 1999 up until age 15 in 2014 (N=24,212). Our analyses thus cover almost the entire childhood life course.

Background

In this section we outline the relevant literature on ethnic differences in children's neighborhood socioeconomic status. Families with young children have been found to change residence relatively frequently (Tønnessen et al., 2016). Recent empirical research indicates that there is substantial variation over time in children's neighborhood characteristics, particularly among those who moved (Kleinepier & van Ham, 2017). These findings highlight the need to take a longitudinal approach to the study of children's neighborhood socioeconomic status. Importantly, furthermore, children usually do not have a choice in where they live until they reach the age of majority, and so their neighborhood histories depend on the choices and constraints faced by their parents. In the remainder of this section, we therefore focus on parental and household characteristics – rather than characteristics of the children themselves – in order to formulate hypotheses on ethnic differences in children's neighborhood trajectories. For context, we first provide background on why and when the ethnic minorities' parents in this study arrived in the Netherlands.

Migrant populations in the Netherlands

Currently, about one in five of the 17 million inhabitants of the Netherlands has an immigrant background, i.e. has at least one parent born abroad, including those born abroad themselves (first generation) and those born in the Netherlands (second generation). These people can be about equally divided into those of Western and non-Western origin. Turks, Moroccans, Surinamese, and Antilleans make up a sizable share of the population of non-Western origin, comprising respectively 2.3, 2.3, 2.1, and 0.9 percent of the total population of the Netherlands. All other origin groups are considerably smaller (especially the second generations) and cover a heterogeneous population in terms of migration history and time of residence in the Netherlands (Statistics Netherlands, 2017).

Turkish and Moroccan immigrants were initially recruited in the 1960s and early 1970s in order to fill unskilled occupations in the Netherlands. They were typically low or uneducated men who originated from the rural parts in their origin countries. Although these so-called 'guest workers' were expected to stay temporarily in the Netherlands, many decided to permanently settle in the Netherlands and gradually brought over their wife and children in the 1970s and early 1980s (family reunification). Many of these children, in turn, married partners from Turkey and Morocco in the 1980s and 1990s (marriage formation).

Surinamese and Antillean immigrants come from former Dutch colonies. Most of them were therefore familiar with the Dutch language and culture upon arrival in the Netherlands. Many Surinamese immigrants moved to the Netherlands just before Surinam obtained its independence in 1975, as they were able then to retain Dutch citizenship. Migration from the Antilles has traditionally been dominated by short-term student migration, but limited employment opportunities in the Antilles in the 1980s and 1990s have led to more diverse and more permanent migration flows towards the Netherlands.

All four ethnic minority groups have been found to have a disadvantaged socioeconomic position, but in general Turks and Moroccans experience a larger gap in educational attainment and labor market outcomes with respect to the native Dutch than do Surinamese and Antilleans. For instance, around one in three Turkish and Moroccan immigrants has attained no more than primary education, as compared to some 15 percent among Surinamese and Antillean immigrants and 6 percent among native Dutch (Huijnk &

Andriessen, 2016). Consequently, particularly Turkish and Moroccan immigrants are facing difficulty finding employment, and if they do, they are often in low-skilled and unstable jobs (Huijnk & Andriessen, 2016). The homeownership rate is also much lower among the ethnic minority groups than among the native Dutch: Moroccans are least often home owners, followed by Antilleans, Turks, and Surinamese (Zorlu et al., 2014).

Finally, there are important demographic differences between the ethnic groups under study. Due to relatively high fertility rates and multigenerational living arrangements, Turkish and Moroccan households are almost twice as large as those of the native Dutch, while the average size of Surinamese and Antillean households is close to the Dutch average (Heering et al., 2002). Single mother families are much more common among Surinamese and Antilleans than among Turks, Moroccans, and native Dutch (Kleinepier & de Valk, 2016). In line with this, previous research indicates that Surinamese and Antillean migrants have higher union dissolution rates than the native Dutch, while there is no significant difference between the native Dutch and Turks and Moroccans in this regard (Rooyackers et al., 2015).

Spatial assimilation

Spatial assimilation theory contends that immigrants often start out at the bottom of the socioeconomic ladder upon arrival in a new society. Consequently, many immigrants initially settle in poor neighborhoods with a relatively high proportion of ethnic minorities, sometimes referred to as 'ethnic enclaves' (Massey & Denton, 1985). From the spatial assimilation perspective, these ethnic enclaves are considered a negative phenomenon. The key expectation is that by improving their socioeconomic position and becoming more proficient in the language of the host society, immigrants will move away from ethnic enclaves to higher socioeconomic status neighborhoods (Alba & Logan, 1993). In other words, the spatial assimilation model predicts that immigrants' neighborhood attainment goes hand-in-hand with their social and economic mobility. It has been argued, however, that the process of assimilation and integration may take many years or even multiple generations to complete, especially when the cultural and linguistic distance between the country of origin and the country of destination is large (Crowder & South, 2005). Thus, when 'full assimilation' has yet to take place, ethnic differences in children's neighborhood status may simply reflect ongoing group differences in their parents' resources.

Regarding socioeconomic predictors of neighborhood attainment, previous research has shown that children whose parents are highly educated, work in high-paid jobs, and own rather than rent their dwelling are less likely to live in poor neighborhoods (Sampson & Sharkey, 2008; South et al., 2016). Furthermore, longitudinal studies indicate that abrupt changes of financial circumstances within families are important drivers of changes in neighborhood status. For example, recent research indicates that paternal job loss increases the probability of moving to a deprived neighborhood, suggesting that economic pressures of job loss may force families to 'downgrade' their neighborhood status (Morris, 2017). As previously outlined, the ethnic minorities' parents under study are more likely to have a disadvantaged socioeconomic status than the parents of native Dutch children.

Research on neighborhood attainment has further emphasized the role of sociodemographic characteristics, particularly household size and parental union status. Children from single parents and larger families are more likely than children from smaller and intact families to grow up in poor neighborhoods (South et al., 2016; Wodtke et al., 2011). Similar to paternal job loss, children whose parents recently divorced or separated have a higher risk of moving into a deprived neighborhood (Morris, 2017; Wodtke et al., 2011). As discussed before, Turkish and Moroccan households are generally larger than those of the native Dutch, while single mother families and partnership dissolution are more common among Surinamese and Antilleans.

Place stratification and residential preferences

The place stratification model problematizes the notion of spatial assimilation theory that ethnic minorities are fully able to convert their socioeconomic resources into better quality neighborhoods. Accordingly, the neighborhood attainment of ethnic minorities is further constrained by prejudice and discrimination by various actors in the housing and credit market (Charles, 2003; Massey & Denton, 1985). Direct empirical support for effects of discrimination on ethnic inequality in neighborhood socioeconomic status has been limited, however, predominantly due to a lack of suitable data. The typical analytical approach to test the place stratification model has been to control for socioeconomic and sociodemographic characteristics and interpret the ethnic residual (or unexplained difference) as the effects of discrimination (Timberlake, 2009). For example, Zorlu et al. (2014) found a particularly large unexplained gap in homeownership between native Dutch and Moroccan immigrants. The authors argue that, given that Moroccans in particular are often seen as a problematic group in terms of integration into the Dutch society, the unexplained difference in homeownership rates may be explained by ethnic discrimination.

However, ethnic residuals in neighborhood socioeconomic status can also reflect other, non-discriminatory factors. Immigrants may also prefer to reside with persons of the same ethnicity (Adelman, 2005). Moreover, Zorlu and Mulder (2010) suggest that preferences to live near family members are stronger for ethnic minorities than for the native Dutch. Kullberg et al. (2009) show that non-Western immigrants in the Netherlands also prefer to live in close proximity to ethnic-specific facilities, such as ethnic shops, restaurants, community spaces, and certain religious institutions. These facilities are typically located in neighborhoods with a relatively high share of ethnic minorities, which generally have higher poverty rates as well. Thus, whereas spatial assimilation and place stratification theory presume that people will or attempt to move to more affluent neighborhoods when their socioeconomic status improves, the literature on residential preferences suggests a more voluntary clustering of immigrants in less affluent neighborhoods.

Theories on place stratification and residential preferences further suggest that the relationship between parental resources and children's neighborhood socioeconomic status may differ by ethnicity. There are two competing lines of reasoning in this regard. On the one hand, the 'strong' version of the place stratification model assumes that immigrant parents are less able to convert their resources into more advantaged neighborhoods due to discrimination on the housing and credit markets (Alba & Logan, 1993). In addition, preferences to live close to coethnics may suggest that immigrant parents will reside in poor neighborhoods also when they have the opportunity to live in more affluent areas. From this perspective, it can be argued that the effect of parental resources on children's neighborhood status is weaker for ethnic minorities than for the majority population. Indeed, previous research found that the impact of higher education on young adult's neighborhood income status was weaker for ethnic minorities than for the native Dutch (de Vuijst et al., 2017).

On the other hand, the 'weak' version of place stratification theory posits that parental resources will have a stronger effect on the likelihood of growing up in a nonpoor neighborhood for ethnic minority children than for children of native-born parents (Alba & Logan, 1993). Accordingly, due to the barriers to residential mobility faced by minorities, only the most advantaged members of ethnic minority groups will have access to affluent neighborhoods. In contrast, due to their advantaged position, people from the ethnic majority population are presumed to be able to avoid poverty neighborhoods almost regardless of their socioeconomic status. This would imply that socioeconomic resources are hardly predictive of the native population's likelihood to live in nonpoor neighborhoods. South and Crowder (1997) showed that the effect of educational attainment on the likelihood of moving out of

poor neighborhoods is stronger for blacks than for whites. Likewise, in the Dutch context, Uunk (2017) observed a stronger income effect on the likelihood of owning a home for Turkish and Moroccan immigrants than for the native Dutch.

Hypotheses

Based on the literature outlined above, we formulate three hypotheses that are tested in the empirical section of this paper. First, we expect that Turkish, Moroccan, Surinamese, and Antillean second-generation children are more likely than native Dutch children to be exposed to neighborhood deprivation during their childhood (*Hypothesis 1*). Although the underlying theoretical mechanisms are distinct, spatial assimilation, place stratification, and residential preference theories all point to the expectation that ethnic minority children are more likely than others to reside in lower-income neighborhoods.

The theories do differ, however, in their view on the importance of parental and household characteristics in this regard. While spatial assimilation theory suggests that ethnic differences in children's neighborhood trajectories are explained by parental and household resources, theories on place stratification and residential preferences suggest that group differences are attributed to other, unobserved factors. Our second hypothesis, therefore, is that differences in trajectories of neighborhood income status between Turkish, Moroccan, Surinamese, and Antillean second-generation children and native Dutch children are partially mediated by parental and household characteristics (*Hypothesis 2*).

Finally, given the contrary views on the moderating effect of ethnicity on the relationship between parental resources and children's neighborhood status, we propose two competing hypotheses. We focus on the most important determinant of neighborhood socioeconomic status, namely the ability to pay for a residence in low-poverty neighborhoods (Timberlake, 2009). That is, we hypothesize that the effect of household income on children's neighborhood income trajectories is weaker (*Hypothesis 3a*) or stronger (*Hypothesis 3b*) for ethnic minority children than for native Dutch children.

Data and methods

The analyses are based on longitudinal microdata derived from the System of Social statistical Datasets (SSD), made available by Statistics Netherlands (Bakker et al., 2014). The SSD consists of several interlinked administrative registers, including the municipal population register and tax register, which contain demographic and socioeconomic information on the entire population of the Netherlands. Data were available for the period 1999–2014. We select all Turkish (n=5,598), Moroccan (n=5,702), Surinamese (n=4,147), and Antillean (n=1,367) second-generation immigrant children and a 5% random sample of native Dutch children (n=7,398) who were born in the Netherlands in 1999. We exclude a small group of children who themselves and/or whose both parents died or emigrated during the observation period. Thus, each child is observed over a span of 16 years, i.e. from birth in 1999 up until age 15 in 2014. In total, our research population includes 24,212 children.

We operationalize neighborhoods using 500x500 meter grids. In order to measure children's neighborhood socioeconomic status, we use data on the full population to compute the average individual monthly income in each neighborhood grid cell, for each year of observation. Individual income was measured as the sum of income from a variety of sources, including income from wages, self-employment, pensions, social security, and student loans. Subsequently, we create quintiles based on the neighborhoods' average income from the poorest to the wealthiest of tracts. We treat the top 20 percent of the neighborhood income

distribution as affluent, the bottom 20 percent as deprived, and the remaining 60 percent as middle income neighborhoods.

Methods

In order to simultaneously capture the timing and duration of exposure to neighborhood disadvantage during childhood, we apply sequence analysis (Abbott & Tsay, 2000). In sequence analysis, each individual life course trajectory is represented as a string of characters. Each child is observed from birth up to the age 15 on an annual basis. The number of possible combinations between these 16 years of observation and the three states (i.e., deprived, middle-income, or affluent neighborhood) is very large and thus raises problems of complexity when comparing the trajectories. Therefore, we identify subtypes of children's neighborhood trajectories to reduce the large number of distinct sequences into groups that can be easily interpreted.

We first calculate optimal matching (OM) distances between all children's neighborhood trajectories using R's TraMineR package (Gabadinho et al., 2011). The OM algorithm measures pairwise distances between sequences by establishing how much it 'costs' to transform one sequence into another in terms of three elementary operations: insertion, deletion, and substitution. A cost is assigned to each of the operations by the researcher. We set insertion/deletion costs to 1 and define substitution costs as the inverse of transition frequencies, assigning higher substitution costs to less common transitions (cf. Kleinepier & de Valk, 2016). After OM distances have been calculated, we develop a typology of children's neighborhood trajectories using partitioning around medoids cluster analysis. In this clustering method, the number of clusters needs to be specified in advance. We therefore test a range of cluster solutions (2-20 cuts) and use the average silhouette width (ASW) criterion to select the 'optimal' number of clusters. As a robustness check, we reconstructed the typology using different cost settings in OM and Ward's clustering algorithm. Reassuringly, only minor differences were observed.

Subsequently, we run a series of binary logistic regression models, using each of the clusters as the outcome variable. We estimate three models for each cluster. Model 1 includes only the dummy variables for ethnic origin of the child. In Model 2, we add parental and household characteristics in order to assess the extent to which they explain associations between children's ethnicity and neighborhood socioeconomic status. Importantly, however, comparisons of logit coefficients of the same variable across nested models can be misleading because the dependent variable is scaled differently in each model (Mood, 2010). We address this issue by using the Karlson–Holm–Breen (KHB) method (for details, see Karlson et al., 2012). Finally, in model 3, we add interaction terms to examine whether the impact of household income on children's neighborhood socioeconomic status differs by ethnicity.

Independent variables

Ethnic origin of the children is based on the country of birth of their parents (our sample only includes children who were born in the Netherlands). Following the standard definition of Statistics Netherlands, children with at least one parent born abroad were classified as second-generation Turkish, Moroccan, Surinamese, or Antillean, depending on the respective country of birth of the parent(s). If both parents were born abroad, but in different countries, the country of birth of the mother is dominant. Those with both parents born in the Netherlands are classified as native Dutch. *Mixed parentage* is a dummy variable that denotes whether the child has one foreign-born parent and one native-born parent (0=no, 1=yes).

Parental educational level is derived from the Central Register for Enrolment in Higher Education. This register indicates whether a person has obtained a degree in higher education (i.e. bachelor degree or higher) in the Netherlands from 1986 onwards.

Unfortunately, this means that we have no information on degrees obtained abroad or before 1986. We therefore assess the educational level of the father and the mother separately using three categories: 1=low/medium educated, 2=highly educated, and 3=unknown. *Parental employment status* is measured by dividing the number of years that the father / mother was employed by 16 (i.e., total years of observation). *Equivalent household income* is constructed in several steps. We first calculate the children's average monthly household income for each year of observation and correct all values for inflation relative to the base year 1999. Because the needs of a household grow with each additional member, but in a disproportionate way, we divide the total household income in each year by the square root of household size in the given year (see OECD, 2013). We then calculate the mean equivalent household income over the years 1999–2014 and use a natural logarithmic specification of this variable to account for the typical right-skewed distribution of income. *Housing tenure* is a dummy variable indicating whether the parental dwelling in 1999 was owner-occupied (0=no, 1=yes).

Residential mobility indicates the number of times the child changed residences. We distinguish between four categories: 1=no moves, 2=one move, 3=two moves, and 4=three or more moves. *Household size* is measured as the number of people living in the same household as the child in 1999 (including the child). Only a very small number of households consisted of more than 12 persons; the latter are therefore grouped at the level of 12 people. *Parental union status* is distinguished into three categories: 1=parents remained together, 2=parents never lived together after child was born, and 3=parents divorced, separated, or one parent died during observation period. A small group (3.1%) of children whose parents started living together after initially living apart are grouped with the first category (remained together) because coding them separately did not produce substantially different results. *Age difference with parents* is measured in years. We account for this because the reasons for and outcomes of moving may change throughout the life course (South et al., 2016).

<<<Table 1 here>>>

Results

Typology of children's neighborhood trajectories

Since the number of possible sequences is extremely large, we have reduced the entire set of sequences into population subgroups by means of optimal matching followed by cluster analysis. Several cluster solutions were tested, of which the 6-cluster solution was determined to be optimal (ASW=.47). Figure 1 shows the sequence index plot for each of the six clusters. In these plots, each individual is represented by a separate horizontal line. The color of the line indicates the type of neighborhood along chronological age – red for deprived, yellow for middle-income, and green for affluent neighborhoods.

Cluster 1 (*consistent deprivation*) is characterized by living in a deprived neighborhood throughout the entire childhood life course. In any given year, more than 85 percent of these children were living in a low-income neighborhood. This does not necessarily mean that these children had never changed residences during the observation period, but if they moved, they moved to neighborhoods similar to those they moved from. Children in cluster 2 (*early deprivation*) were typically born in a deprived neighborhood, but moved towards more affluent neighborhoods as they grew older. Indeed, about 66 percent of these children were living in a deprived neighborhood at birth, as compared to 11 percent at age 15. Children in cluster 3 (*adolescent deprivation*) followed the opposite path: they were mainly born in middle-income neighborhoods, but increasingly moved towards deprived

neighborhoods. About 10 percent of these children lived in a deprived neighborhood at birth, compared to 82 percent at age 15.

Children in clusters 4–6 all had little exposure to neighborhood disadvantage throughout childhood. Cluster 4 (*consistent middle-income*) comprises children who had lived in middle-income neighborhoods during (almost) the entire childhood life course. Over the complete observation period, more than 88 percent of these children were living in a middle-income neighborhood. Cluster 5 (*consistent affluence*) is characterized by a long period of living in an affluent neighborhood. For most of the observation, about 80 to 90 percent of the children in this cluster were living in an affluent neighborhood, except for the first two years of observation when this number was around 65 percent. Finally, cluster 6 (*early affluence*) predominantly includes children who were living in an affluent neighborhood during early childhood, but moved towards less affluent neighborhoods as they grew older. About 67 percent of these children were born in a high-income neighborhood, while only 15 percent of them lived in an affluent neighborhood at age 15.

<<<Figure 1 here>>>

Ethnic differences in children's neighborhood trajectories

We show the percentual distribution over the clusters for the different ethnic groups separately in Table 2. As can be seen in the table, ethnic minority children were much more concentrated in the consistent deprivation trajectory (cluster 1) than native Dutch children. This is in particular the case for the Turkish and Moroccan second generations, of which more than 40 percent has been exposed to long-term neighborhood disadvantage during childhood. Conversely, the consistent affluent trajectory (cluster 5) was very uncommon among Turkish and Moroccan second-generation children. Native Dutch children were most frequently exposed to long-term neighborhood affluence. The middle-income trajectory (cluster 4) was common among all ethnic groups, but especially for native Dutch. Finally, regarding the trajectories characterized by change in neighborhood status, the differences between ethnic groups are relatively small. Children from immigrant families were slightly more often exposed to neighborhood deprivation early (cluster 2) or late (cluster 3) in childhood, while the early affluence trajectory (cluster 6) was more common among native Dutch children.

<<<Table 2 here>>>

Table 3 displays odds ratios from a series of binomial logistic regression models relating cluster membership to a variety of explanatory variables. The first models (under Model 1) include only the dummy variables for ethnic origin of the child. In the next set of models (under Model 2), we added parental and household characteristics. To test Hypothesis 1, we rely on Model 1. In line with our first hypothesis, ethnic minority children were significantly more likely than native Dutch children to be classified in one of the three trajectory groups with substantial exposure to neighborhood deprivation during childhood (clusters 1 to 3). Consequently, ethnic minority children were less likely to grow up in middle-income and affluent neighborhoods (clusters 4 to 6) than native Dutch children. Turkish and Moroccan children differed stronger from native Dutch than Surinamese and Antilleans, and differences were particularly large for consistent exposure to neighborhood deprivation (cluster 1) and affluence (cluster 5).

<<<Table 3 here>>>

In support of Hypothesis 2, the coefficients associated with ethnic origin decreased substantially with the inclusion of parental and household characteristics in Model 2 for all trajectory types. Ethnic differences in early exposure to neighborhood deprivation (cluster 2) even became non-significant after these variables are included. We used the KHB method (Karlson et al., 2012) to estimate the unbiased change in ethnic group differences between Models 1 and 2 . The results showed that parental and household characteristics significantly reduced ethnic differences in cluster membership with $p<.001$ for all trajectory types. Specifically, including these variables was found to reduce ethnic differences by 37-57 percent for cluster 1; 74-107 percent for cluster 2; 25-39 percent for cluster 3; 39-44 percent for cluster 4; 50-65 percent for cluster 5; and 57-72 percent for cluster 6 (depending upon ethnic group). Comparing the relative mediating power of each variable, we found that equivalent household income is by far the most important mediator.

Finally, Table 4 presents the interaction effects of ethnicity on the relationship between equivalent household income and children's neighborhood trajectories. Consistent with Hypothesis 3a, the analysis reveals that the impact of equivalent household income on children's neighborhood trajectories was generally weaker for ethnic minority children than for native Dutch children. For example, the negative effect of household income on consistent exposure to neighborhood deprivation (cluster 1) was significantly less negative for children from Turkish, Moroccan, Surinamese, and Antillean origin. Likewise, the positive income effect on consistent exposure to neighborhood affluence (cluster 5) was weaker for all second-generation groups except for the Antillean. Moreover, in the consistent middle-income trajectory (cluster 4), we observe a small negative effect of household income for native Dutch children, whereas this effect was slightly positive for ethnic minority children.

<<<Table 4 here>>>

Discussion

A growing body of literature recognizes that what matters for children is not only their current residential location, but also their past neighborhood experiences (Sharkey & Faber, 2014). Research has therefore increasingly focused on how long children have been exposed to deprived neighborhoods during childhood, but has typically ignored *when* in childhood the exposure occurs. We aimed to overcome this limitation by simultaneously taking into account the duration and timing of children's exposure to poor and nonpoor neighborhoods using sequence analysis. We specifically focused on ethnic differences in children's neighborhood trajectories, comparing the children of the four largest non-Western immigrant groups in the Netherlands (Turks, Moroccans, Surinamese, and Antilleans) with native Dutch children.

The sequence analysis indicated that children's neighborhood trajectories followed one of six general patterns. In three of these patterns, children had lived in a deprived neighborhood at some point during childhood, but differed in terms of timing and duration of exposure. Some children experienced neighborhood disadvantage both early and late in childhood (i.e., throughout childhood), while other children were exposed to a deprived neighborhood either early in childhood or during adolescence. The bivariate analyses showed that ethnic minority children (especially Turkish and Moroccan children) were more likely than native Dutch children to live in poor neighborhoods at any specific stage within childhood, but particularly throughout childhood. Indeed, about four out of ten Turkish and Moroccan second-generation children had experienced long-term neighborhood disadvantage during childhood, as compared to only about one out of ten native Dutch children. These results are even more striking considering recent research showing that individuals'

neighborhood characteristics during childhood are a strong predictor for their exposure to deprived neighborhoods up to more than a decade after leaving the parental home, especially for ethnic minorities (de Vuijst et al., 2017; van Ham et al., 2014). This suggests that, in line with research from the US (Sharkey, 2008), a substantial share of immigrant families resides in the poorest quintile of neighborhoods over two consecutive generations.

The main objective of the multivariate analyses was to examine the extent to which ethnic differences in children's neighborhood trajectories can be explained by parental and household resources. In accordance with spatial assimilation theory, ethnic differences indeed became substantially smaller after accounting for these variables. However, even after taking all kinds of parental and household characteristics into account, ethnic minority children were significantly more likely than native Dutch children to be exposed to neighborhood poverty throughout childhood or during adolescence. Additionally, we found that the effect of household income on children's neighborhood trajectories was generally weaker for ethnic minority children than for native Dutch children. This means that, in contrast to the spatial assimilation hypothesis, immigrant families do generally not have the same 'locational returns' from economic resources as do native Dutch families.

Drawing upon theories of place stratification, one possible explanation for these findings is that ethnic minorities may have limited access to nonpoor neighborhoods due to discriminatory practices by lenders, realtors, and homeowners. An alternative explanation is that immigrant families may prefer to live in a neighborhood with at least a substantial number of coethnics and/or ethnic-specific facilities, which generally have a lower average family income than neighborhoods dominated by the majority population. Unfortunately, with the data at hand we could not confirm which one of these explanations is the more correct. Nevertheless, qualitative research revealed that ethnic minorities in the Netherlands experienced no discrimination on the housing market, while many of them mentioned that having a network of family or friends close by is important (Kullberg et al., 2009). In addition, after controlling for all covariates, we found no ethnic differences in moving out of poverty neighborhoods, while a substantial ethnic residual remained for moving into poverty neighborhoods. It has been argued that moving into poor neighborhoods may in large part be voluntary mobility, whereas discrimination is mainly a barrier for moving out of poor areas (Crowder & South, 2005). Thus, if discrimination would be primarily responsible for ethnic differences in neighborhood status, we would expect to find a large unexplained ethnic gap for moving out of poor neighborhoods, and not the other way around. We are tempted to conclude, therefore, that ethnic differences in neighborhood attainment are more likely to result from immigrants' desires to live with coethnics than from discrimination.

The present study has several limitations that should be noted. While the register data we used entail important advantages over survey data, they do not provide information on several factors that might be decisive for immigrants' neighborhood attainment, for example their Dutch language proficiency. It is also unfortunate that the data on parental educational level are incomplete, particularly among ethnic minority groups. We therefore likely underestimated the relevance of the spatial assimilation theory. Furthermore, since sequence analysis focuses on the comparison of whole trajectories, it does not allow for the inclusion of time-varying covariates. We therefore averaged out various time-varying characteristics of the family (e.g., household income) over the observation period. Although prior research suggests that neighborhood effects on individual socioeconomic outcomes are small (Miltenburg & van de Werfhorst, 2017), we cannot rule out reverse causality for some variables.

Despite these limitations, this is one of the first European studies examining ethnic differences in children's neighborhood socioeconomic status. It furthermore represents one of the few empirical analyses that capture both duration and timing of exposure to neighborhood disadvantage during childhood, providing a much more complete picture of children's

neighborhood experiences. Future studies may elaborate on our work by examining how different patterns of exposure (timing and duration) to neighborhood disadvantage during childhood are associated with children's outcomes in later life.

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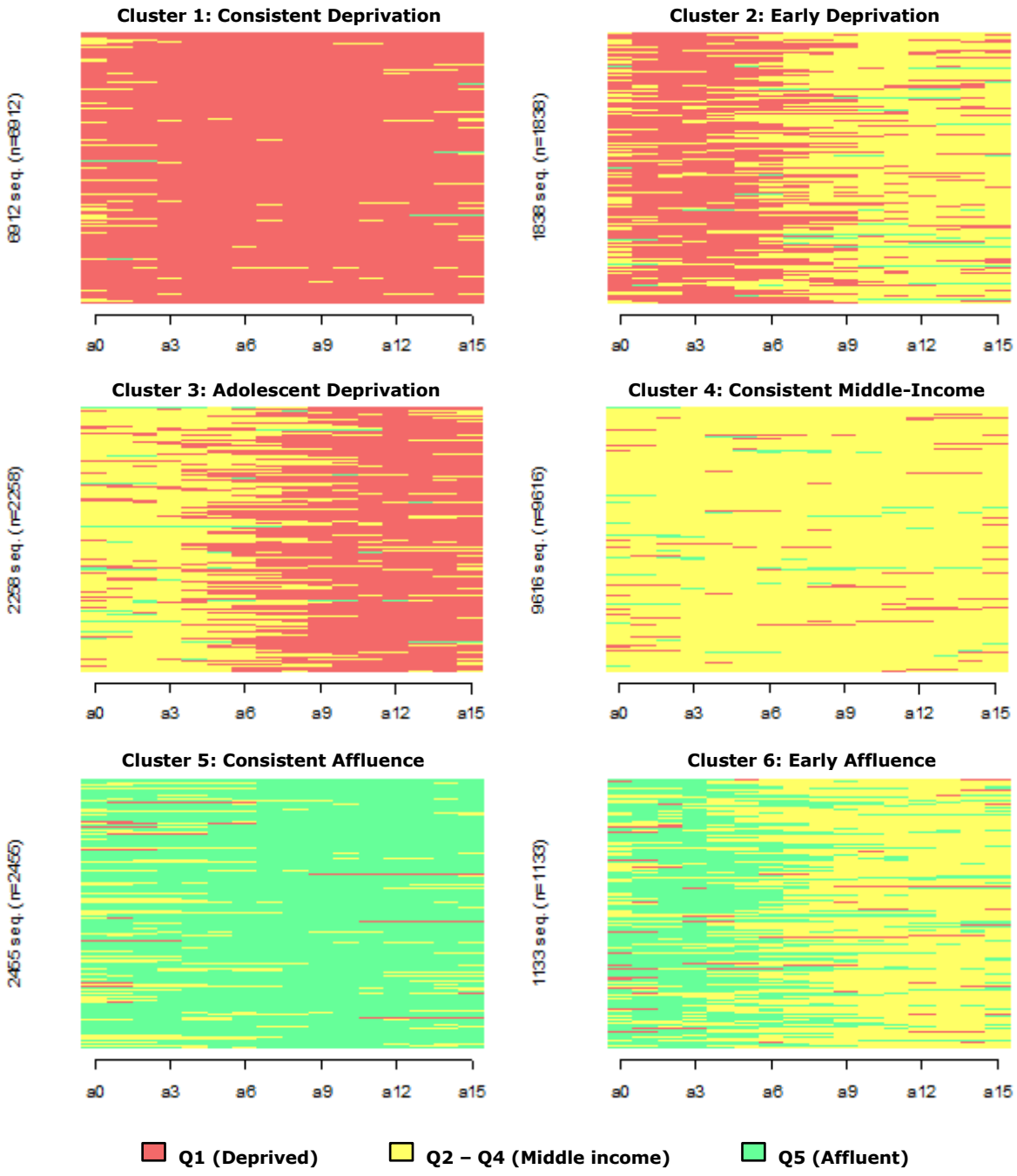

Figure 1. Sequence index plots of six clusters of children's neighborhood trajectories

Table 1. Descriptive statistics of independent variables, by ethnic group

	Turkish (N=5,598)		Moroccan (N=5,702)		Surinamese (N=4,147)		Antillean (N=1,367)		Dutch (N=7,398)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Mixed parentage	0.21		0.12		0.41		0.56		0.0	
Father's educational level										
Low / medium	0.35		0.34		0.25		0.23		0.37	
High	0.09		0.08		0.15		0.16		0.34	
Unknown	0.56		0.57		0.60		0.60		0.30	
Mother's educational level										
Low / medium	0.41		0.36		0.34		0.36		0.41	
High	0.10		0.10		0.22		0.25		0.36	
Unknown	0.49		0.54		0.44		0.39		0.23	
Father's labor participation	0.72	0.33	0.61	0.39	0.71	0.38	0.62	0.42	0.92	0.20
Mother's labor participation	0.36	0.34	0.27	0.34	0.66	0.35	0.57	0.38	0.73	0.34
Eq. household income (logged)	7.23	0.46	7.09	0.45	7.50	0.54	7.41	0.60	7.76	0.48
Parents homeowners	0.22		0.08		0.37		0.31		0.76	
Residential mobility										
0 moves	0.40		0.45		0.31		0.31		0.48	
1 move	0.40		0.40		0.36		0.36		0.34	
2 moves	0.14		0.10		0.19		0.17		0.11	
≥3 moves	0.07		0.05		0.14		0.16		0.07	
Household size	4.33	1.31	4.55	1.66	3.68	1.10	3.72	1.17	3.81	1.02
Parental union status										
Stable union	0.77		0.80		0.56		0.52		0.83	
Dissolution	0.19		0.16		0.24		0.18		0.15	
Never lived together	0.04		0.04		0.20		0.30		0.02	
Age difference with father	30.46	5.40	34.63	6.53	33.15	5.99	32.58	6.52	33.51	4.71
Age difference with mother	27.50	5.07	28.82	5.63	29.95	5.15	29.84	6.08	31.14	4.15

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

Table 2. Percentual distribution over the neighborhood trajectory clusters, by ethnic group

	Turkish (N=5,598)	Moroccan (N=5,702)	Surinamese (N=4,147)	Antillean (N=1,367)	Dutch (N=7,398)
1. Consistent Deprivation	43.6	41.5	23.3	26.1	10.6
2. Early Deprivation	8.0	8.3	8.9	10.1	5.6
3. Adolescent Deprivation	11.3	11.6	10.0	10.2	5.6
4. Consistent Middle-Income	31.1	31.2	38.3	35.9	54.3
5. Consistent Affluence	3.5	4.9	13.0	12.1	17.3
6. Early Affluence	2.5	2.6	6.5	5.6	6.8
Total	100	100	100	100	100

Note: Percentages may not total 100 due to rounding.
Source: System of Social statistical Datasets (SSD).

Table 3. Logistic regression analyses of neighborhood trajectory clusters on ethnic groups: odds ratios

	(1) Consistent Deprivation		(2) Early Deprivation		(3) Adolescent Deprivation		(4) Consistent Mid-Income		(5) Consistent Affluence		(6) Early Affluence	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Ethnic group (ref=native Dutch)												
Turkish	7.71***	3.22***	1.52***	0.98	2.22***	1.78***	0.35***	0.52***	0.13***	0.35***	0.30***	0.59***
Moroccan	6.58***	2.35***	1.56***	1.07	2.27***	1.92***	0.36***	0.56***	0.20***	0.56***	0.33***	0.73*
Surinamese	3.48***	2.28***	1.77***	1.13	2.01***	1.58***	0.45***	0.60***	0.42***	0.66***	0.71***	0.91
Antillean	4.60***	2.40***	2.07***	1.21	2.09***	1.57***	0.38***	0.56***	0.33***	0.53***	0.56***	0.79
Mixed parentage (ref=no)	0.43***	0.57***	0.86*	0.86*	0.85**	0.81**	1.46***	1.31***	2.89***	2.17***	1.86***	1.38***
Father's educational level (ref=low/med)												
High		0.87**		0.89		0.97		1.06		1.18*		1.02
Unknown		0.96		1.09		1.05		1.01		0.95		1.07
Mother's educational level (ref=low/med)												
High		0.93		0.99		0.99		1.00		1.05		1.03
Unknown		0.99		0.96		0.95		1.02		1.07		1.00
Father's labor force participation		0.75***		1.17		0.99		1.40***		1.92***		1.34*
Mother's labor force participation		0.82***		1.23*		0.89		1.34***		0.94		1.25*
Equivalent household income (logged)		0.46***		0.69***		0.81**		0.97		3.77***		1.63***
Parents homeowners (ref=rented)		0.67***		0.73***		1.01		1.23***		1.17***		1.25**
Residential mobility (ref=0 moves)												
1 move		0.64***		2.65***		1.58***		0.78***		1.37***		1.72***
2 moves		0.59***		3.27***		2.14***		0.72***		1.09		2.14***
≥3 moves		0.43***		4.52***		3.00***		0.62***		0.87		2.99***
Household size		1.13***		1.04		0.98		0.95***		0.92***		0.89***
Parental union status (ref=stable union)												
Dissolution		0.91*		0.82**		1.15*		1.03		1.08		1.17
Never lived together		1.13		1.11		1.00		0.86*		1.03		1.05
Age difference with father		0.99**		0.99*		1.00		1.01		1.02***		1.00
Age difference with mother		0.97***		0.99		0.99		1.01*		1.05***		1.03**
Nagelkerke R^2	0.16	0.24	0.01	0.07	0.02	0.05	0.06	0.08	0.05	0.19	0.04	0.07

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

Table 4. Interaction effects between ethnic origin and household income: logit coefficients

	(1) Consistent Deprivation	(2) Early Deprivation	(3) Adolescent Deprivation	(4) Consistent Mid-Income	(5) Consistent Affluence	(6) Early Affluence
Ethnic group (ref=native Dutch)						
Turkish	–4.17***	–3.11**	–5.73***	–6.49***	2.32	–4.20**
Moroccan	–4.83***	–5.15***	–5.86***	–5.11***	5.42***	–0.73
Surinamese	–2.91**	–3.12**	–2.84**	–3.42***	3.18**	0.47
Antillean	–2.21	0.39	–2.42	–4.24***	–1.90	–1.35
Equivalent household income	–1.39***	–0.74***	–0.74***	–0.33***	1.57***	0.47***
HH income × Turkish	0.74***	0.43**	0.84***	0.77***	–0.44**	0.48*
HH income × Moroccan	0.80***	0.73***	0.88***	0.59***	–0.81***	0.04
HH income × Surinamese	0.51***	0.44**	0.43**	0.37***	–0.46***	–0.08
HH income × Antillean	0.42**	–0.03	0.37	0.47***	0.16	0.14

*Note: *** p <.001; ** p < .01; * p <.05.*
Included are controls for mixed parentage, parental educational level, parental labor force participation, housing tenure, residential mobility, household size, parental union status, and age difference with parents (coefficients not presented).
Source: System of Social statistical Datasets (SSD).