

DISCUSSION PAPER SERIES

IZA DP No. 10526

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and School-Level Variation in Individual
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ABSTRACT

Parents and Peers: Parental Neighbourhood- and School-Level Variation in Individual Neighbourhood Outcomes over Time

There is a link between the socio-economic outcomes of parents and their children over the life course. Intergenerational transmissions were repeatedly shown for socioeconomic characteristics and (dis)advantage, but recently also for residential neighbourhood status. Previous research from the Netherlands, Sweden, and the US shows that children from disadvantaged parental neighbourhoods experience long-term exposure to similar neighbourhoods as adults. However, there are multiple parallel socio-spatial contexts besides the residential space to which individuals are exposed on a daily basis, such as households, schools, and places of work and leisure, which may also influence their outcomes. For children and adolescents, the school environment may be especially important. This study contributes to the literature by examining the joint influence of the parental background, the parental neighbourhood, and a compositional measure of the school environment, on the neighbourhood trajectories of Dutch adolescents after leaving the parental home. We use longitudinal register data from the Netherlands to study a complete cohort of school-going home-leavers, who were followed from 1999 to 2012. We fit cross-classified multilevel models, in order to split up the variance components of schools and parental residential neighbourhoods over time. We find that poverty concentration in the parental neighbourhood plays an important role in determining their children's residential outcomes later in life. Some variation in individual neighbourhood outcomes at the level of the secondary school remains unexplained.

JEL Classification: I30, J60, P46, R23

Keywords: intergenerational neighbourhood effects, secondary school, peer effects, contextual effects, register data

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Introduction

There is a large body of literature on the effect of the residential environment on individual life outcomes and attainments; so-called neighbourhood effects [1-11]. However, an individual's neighbourhood does not necessarily represent the main, and only socio-spatial context to which they are exposed in everyday life [12-14]. There are multiple contexts besides the residential environment, which unfold in parallel to one another, in which individuals reside and interact on a daily basis, such as their households, schools, as well as work and leisure locations [15-16]. These socio-spatial environments are interrelated, and can affect individual lives in numerous ways. For this reason, they cannot be overlooked in a wider discussion on the reasons behind individual deprivation, poverty, and a wide range of personal outcomes over time [17].

The effect of a specific socio-spatial context can vary over time and over the life course. For instance, the current working environment will likely be of particular importance to current everyday interactions, perhaps more so than previous work settings. However, there is a strong belief that events in an individual's life are strongly affected by their previous experiences over time. This is a central premise to life course theory, which purports that in addition to effects arising from multiple interrelated socio-spatial contexts, these effects can *accumulate over time* [18-20]. For example, instinctively, it makes sense to assume that the longer or more frequent the exposure to a negative situation, environment, or behavioural example, the stronger its negative effects will be on an individual [15]. Research has established that patterns can even be found between generations; showing a clear link between the outcomes of parents and their children over long periods of time. Socioeconomic characteristics and (dis)advantage have repeatedly been shown to transfer between generations [21-22], and recently, residential neighbourhood status has been shown to follow similar patterns [23, 10, 15, 24]. Studies from the Netherlands, Sweden, and the United States have shown that children who grew up in deprived parental neighbourhoods were more likely to reside in similarly poor neighbourhoods as adults over their life course (ibid.).

Existing literature focusses on the intergenerational transmission of neighbourhood characteristics, without explicitly taking the possible effect of other socio-spatial contexts into account. This paper contributes to an emerging body of literature by examining the *joint* influence of the parental background, the parental neighbourhood, and a compositional measure of the secondary school environment. We focus on the neighbourhood careers of Dutch adolescents, up to 12 years after leaving the parental home. Looking at a young subpopulation at the start of our measurement period, we believe the secondary school (high school) environment to be of particular importance to their individual outcomes, as it is one of the settings where they have to spend the majority of their time. By examining multiple socio-spatial contexts in life [16], we thus expand on previous research into the intergenerational transmission of neighbourhood characteristics, and follow a life course approach to understanding broader *contextual* effects on personal neighbourhood outcomes over time.

In this study we make use of longitudinal register data provided by Statistics Netherlands, which has been geo-coded at the individual level. Using these data we were able to follow a complete cohort of parental home leavers for a period of 13 years, from 1999 to 2012. After the necessary data selections, we track 18,169 young Dutch inhabitants, that attend 389 different schools and live across 10,678 different parental neighbourhoods (500x500m grids). We have complete individual neighbourhood histories available for this subpopulation, after they leave the parental home, as well as information on their school environment and core demographic and socioeconomic characteristics. We were fortunate enough to have this data on education to our disposal, especially since school-related data is commonly unequivocally scarce in the field of neighbourhood effects research [25]. We fit intricate cross-classified multilevel models, in order to split up the variance components of both socio-spatial settings, assessing their level of influence on individual neighbourhood outcomes over time.

Theoretical background

Over their life course, individuals move through an array of overlapping socio-spatial contexts, in which they live, work, attain education, and spend leisure time [16, 15, 11]. Within all these contexts or domains, people have their day-to-day social interactions, and are additionally exposed to a wide range

of constraints and freedoms that can emerge from environmental, institutional, and geographical influences (see [4] for an extensive discussion of these influences at the residential neighbourhood level). These contextual factors are believed to influence individual outcomes over time. Social interaction may, for example, fuel processes of social contagion or imitation; lead to the collective acceptance of (dys)functional norms and values; or affect individual network range due to the composition of the socio-spatial context [26, 9, 4]. On the environmental and geographical level, depending on the domain, individuals may be exposed to advantages such as beneficial support systems in the workplace, or disadvantages such as poor public services in the residential neighbourhood. Additionally, all such mechanisms can be affected by the societal structure and institutional level in which they are embedded. For example, students attending a “bad” school or university can experience social stigmatisation, which can reiterate their disadvantaged position making it increasingly hard to shed (*ibid.*).

While the literature does not identify a single most important causal mechanism from the list provided above, all such factors emerging from multiple socio-spatial contexts are commonly believed to be inescapably interrelated *and* to accumulate in their effect on personal outcomes over time [18-20]. Therefore, any point in an individual’s biography must be seen in the light of foregoing experiences in their lives, which is the central premise to life course theory (see [11] for an extensive discussion). In line with this approach, an increasing number of authors now stress that combinations and accumulations of socio-spatial settings over the life course, full dynamic individual histories, are vital to truly understand the connection between contextual factors and a given individual outcome [24, 27, 4, 10, 15, 11]. In this study we take a closer look at two socio-spatial domains that can play an important role in adolescence; the residential neighbourhood, both before and after leaving the parental home, and the secondary school environment.

The impact of the neighbourhood

The residential neighbourhood context is believed to be related to individual (dis)advantages. Affluent residential neighbourhoods, for instance, were shown to positively affect the social mobility of their residents, as well as their educational attainment and levels of income [28-29, 10]. Deprived neighbourhoods, on the other hand, were shown to negatively affect a large variety of personal outcomes, ranging from childhood achievement to delinquent behaviour (for a compilation see [1]) [30, 31, 6]. Most of these studies were still unable to examine long-term individual neighbourhood experiences, often due to a lack of longitudinal geo-coded data [24, 4, 10, 15, 11]. Therefore, the belief in the direct influence of the neighbourhood on its inhabitants was often based on cross-sectional measures of individuals’ neighbourhood characteristics and their instant effect on current individual outcomes [15, 11, 24, 10]. In recent years however, as data quality and longitudinal data spans improved, researchers have increasingly been able to approach the understanding of neighbourhood effects *over time* [23, 10, 15, 11], even spanning across generations.

Previous research conducted in the Netherlands [15], found that children from poor parental neighbourhoods were more likely to live in similarly poor neighbourhoods later in life, up to 13 years after leaving the parental home (*ibid.*). This finding was in line with research conducted in Sweden and the United States [23, 10, 24], which additionally showed that neighbourhood experiences over time had a strong cumulative effect on current individual residential outcomes. The parental neighbourhood is believed to be a predictor for their children’s individual neighbourhood outcomes through a number of core transmission and inheritance mechanisms [32, 24, 10, 15). First of all, a large number of studies have found parental income to affect their offspring’s income, which in turn influences socioeconomic attainment and selection into deprived neighbourhoods over time [33-35]. For this reason, part of an intergenerational pattern in neighbourhood outcomes can result from this income transmission. Second of all, from a very early age, children inherit norms, values, and attitudes from their parents and the environments to which they are exposed [4, 15]. As norms can shape attitudes towards, among others, socioeconomic factors later in life, they can further shape individual neighbourhood histories, thus playing an important role in the intergenerational transmission of neighbourhood characteristics, independent to the income mechanism described above [36] (for an extensive discussion see [4]). Third

of all, adult children may simply prefer similar neighbourhoods to the ones they grew up in because of a sense of familiarity, belonging, or proximity to their family (see [15]).

The impact of the school environment

Education is one of the most important attainable resources over an individual's life course, which can strongly determine future schooling and career opportunities, and subsequently has the potential to positively affect income levels and upward social mobility. Previous research in the Netherlands has shown that educational attainment can in fact discontinue the intergenerational transmission of neighbourhood disadvantage [15]. Individuals who grew up in poor neighbourhoods, and who attained a higher education, were shown to be less likely to live in concentrated poverty after leaving the parental home, compared to their counterparts with a lower education. These findings highlight the influence of educational attainment on personal outcomes over time. It is important to note that this last result primarily applied to the native Dutch individuals within the research population. For individuals from a deprived parental neighbourhood *and* a non-Western ethnic minority background, higher educational attainment did not decrease their chance of living in concentrated poverty (*ibid.*), which was substantially higher than that of the native Dutch. In addition to the actual education gained at secondary school, the school environment and its composition are believed to play a further contextual role in determining personal outcomes later in life.

Many mechanisms in the residential neighbourhood, to which transmission or inheritance of neighbourhood characteristics are often attributed, also translate to the school environment and its potential effect on individual outcomes over time. The secondary school that adolescents attend is often an important basis of their everyday interactions with peers. Much like the residential environment [4, 15], the school environment can thus be seen as a social platform where young individuals are exposed to behavioural examples and social norms, as well as a multitude of values and attitudes of other pupils. All these factors can subsequently shape future choices and outcomes in life. Peers can serve as role models by providing examples to others, not only on behavioural norms and standards, but also on bigger transitions in the life course. While some behaviours are commonly deemed more susceptible to peer influences than others, for instance students' educational aspirations and outcomes (see for example [37-38]), a dominant notion in research on role model effects emphasises the importance of direct exposure to behavioural examples. It has long been put forward that the mere occurrence of an event or behaviour in a social environment makes it more likely for this behaviour to be transferred to others (*ibid.*). The role model mechanism, to which peer influence are often attributed, is thus largely in line with our previous discussion on potential effects arising through interaction processes such as social contagion or imitation (see [4, 15]). We strongly believe these peer processes to be among the driving contextual factors that can determine personal outcomes over time.

In this study, we examine how individual neighbourhood trajectories develop after leaving the parental home, given the impact of the parental background, the parental neighbourhood, and the composition of the secondary school environment.

Data

In this study, we used administrative register data provided by Statistics Netherlands, compiled into the longitudinal System of Social statistical Datasets (SSD hereafter) in a Remote Access facility. The SSD is an integrated database comprised of various surveys and registers, which contain core demographic, socio-economic and consistent geographical observations on the entire Dutch population tracked from 1995 to 2014. Using the SSD, we could thus distinguish this information for individuals in our selected subpopulation, and we could additionally access the characteristics of their parents and further family members [39]. All available registers are linked at the individual level, which allowed us to examine individual neighbourhood outcomes over time. Since 1999, the quality of the SSD registers increased in terms of the available number of socio-economic and demographic observations [15]. For the most recent years, not all registers have been released in full for public use. For these reasons, the

measurement period for this study ranged from 1999 to 2012. We thus followed individuals for a period of 14 years.

In this study, we made a number of population selections. To establish our subpopulation, we selected individuals from four different birth cohorts; born within 1980 to 1983. We thus restricted the selection to individuals aged 16 to 19 in 1999. Further requirements entailed that individuals were not allowed to lack information on parental characteristics and residential location, or to have died or emigrated during the measurement period. They further had to have full demographic, socioeconomic and residential information available at the individual level, and were required to be school-going and living with their parents in 1999. The individuals had to have left the parental home in 2000, starting their individual neighbourhood trajectory (*ibid.*). We used one year of geographical observations to define the subpopulation's neighbourhood experiences before leaving the parental home, namely 1999. As previous research has shown neighbourhood characteristics to be highly correlated throughout childhood, we do not expect this selection to have produced bias in representing the childhood neighbourhood experience at large [32, 40, 41, 15, 11]. Lastly, if the individual and their partner (registered partnership or marriage) were both present in our subpopulation, one of them was dropped at random, so as to avoid dependencies between person-records. We subsequently reorganised the data into person-year format. Table 1 provides an overview of core descriptive statistics at the individual-level for our subpopulation, which consisted of 18 169 young Dutch inhabitants (N).

Table 1. Descriptive statistics of anchor population in 1999 (in the parental home), 2000 (having left the parental home), 2006, and 2012

	1999	2000	2006	2012
Age Mean (<i>Std. dev.</i>)	17.97 (.86)	18.97 (.86)	24.97 (.86)	30.97 (.86)
Share Males	38.65	38.65	38.65	38.65
Ethnic background				
Dutch	86.28	86.28	86.28	86.28
Moroccan	1.23	1.23	1.23	1.23
Turkish	1.34	1.34	1.34	1.34
Surinamese	1.38	1.38	1.38	1.38
Antillean/Aruban	.56	.56	.56	.56
Other non-western	2.26	2.26	2.26	2.26
Other western	6.95	6.95	6.95	6.95
Share students ^a	-	97.44	24.10	1.68
Higher education (high prof./university) ^a				
No	-	67.70	22.50	9.93
Yes	-	32.30	77.50	90.07
Level of secondary school education				
Vmbo/Mavo /Havo (low/middle)	40.51	40.51	40.51	40.51
Vwo/Atheneum/Gymnasium (high)	59.49	59.49	59.49	59.49
Share with children	.02	.11	3.59	35.91
Share single household ^b	-	65.29	42.61	25.33
Share primary income from benefits	23.65	2.22	8.08	10.68
Share primary income from work	76.35	97.78	91.92	89.32
Income (1 000 EUR) Mean (<i>Std. dev.</i>)	3.38 (5.38)	8.17 (6.94)	22.01 (13.70)	40.43 (24.25)
Housing tenure ^{c d}				
Homeowner	80.77	49.17	44.88	62.00
Rent	19.21	50.78	54.67	37.48
Residential location				
4 biggest municipalities	6.57	23.88	30.83	35.53
35 following biggest municipalities	22.65	60.05	42.13	32.59
Other municipality	70.79	16.07	27.04	31.87
N	18 169	18 169	18 169	18 169

Note: unless otherwise indicated, values are reported in percentages. As some variables contain missing or unknown values, not all values will sum up to 100%

^a All anchors were required to be in secondary school in 1999

^b All anchors were registered as “children within the parental home” in 1999, the ‘single household’ category was therefore not applicable for this year

^c The homeowner category refers to the record of the building in the national housing registers, not the individual residing in it. Therefore, the homeowner category may include individuals who rent from a landlord/lady who did not officially declare their property to be let out to tenants

^d The housing tenure in 1999 refers to the parental home

In practice, we expect that pupils will typically attend schools that are in close proximity to their parental home. When looking at a basic summary of the number of schools per neighbourhood in our data, we see that while in one neighbourhood pupils go to 9 different schools, in 22.54% of neighbourhoods they go to only one, see table 2 below. When taking a closer look at the schools per neighbourhood however, we did find that in those neighbourhoods in which young inhabitants go to more than one school, the majority still attend the same school, resulting in a higher overlap between young neighbours and fellow pupils in practice than the 22.54% might suggest.

Table 2. School-neighbourhood connection: percentage of pupils by number of parental neighbourhoods at t⁰ (1999)

	%
Neighbourhood sends young inhabitants to 1 school	22.54
Neighbourhood sends young inhabitants to 2 schools	16.67
Neighbourhood sends young inhabitants to 3 schools	13.61
Neighbourhood sends young inhabitants to 4 schools	10.49
Neighbourhood sends young inhabitants to 5 schools	9.13
Neighbourhood sends young inhabitants to 6 schools	7.20
Neighbourhood sends young inhabitants to 7 schools	6.37
Neighbourhood sends young inhabitants to 8 schools	4.65
Neighbourhood sends young inhabitants to 9 schools	3.15
Neighbourhood sends young inhabitants to 10 schools	2.22

Note: unless otherwise indicated, values are reported in percentages. As Statistics Netherlands did not allow us to include neighbourhoods that send their young inhabitants to more than 10 schools (to avoid the possibility of exposing specific residential locations and its inhabitants), not all values will sum up to 100%

The SSD provides geographical information on the individual level, most of which is highly consistent over time. We had access to multiple spatial levels differing in size. Standard Dutch administrative units, such as postal code areas, are commonly relatively large and instable over time, which makes them less likely to reflect their inhabitants’ perceived neighbourhood environment. We therefore selected 500x500 meter grid cells to define the neighbourhood boundaries in this study. The Netherlands is comprised of 34 094 inhabited 500x500 meter grid cells which contain 496 inhabitants on average [15]. Grids allow us to compare equally-sized, small spatial units throughout the Netherlands, the boundaries lines of which are constant over time. We argue that these grids are a suitable spatial scale at which to examine individual neighbourhood histories. Our subpopulation attended 389 different schools and lived across 10,678 different parental neighbourhoods (grids).

In our focus on neighbourhood outcomes over time, we constructed a scale to depict the concentration of poverty within a residential neighbourhood, i.e. within the grid, which served as one of our parental neighbourhood-level variables. Using economic data on the entire Dutch population, we constructed income-quintiles¹. Quintile 1 contained all inhabitants who fell within the higher 20 percent of incomes, while quintile 5 contained those who were among the lowest 20 percent of incomes. We subsequently constructed neighbourhood-quintiles, in order to define poverty concentrations based on the share of low-income neighbours (ibid.). Neighbourhoods in neighbourhood quintile 1 have the lowest concentration of poverty, while those in the quintile 5 have the highest concentration of poverty; deprived neighbourhoods hereafter. This latter neighbourhood quintile is used throughout the analyses

¹ Personal income was defined as the sum of income from a variety of sources, consisting of wages, benefits, and student scholarships (see de Vuijst et al. 2015)

as the parental neighbourhood predictor variable ‘concentration of lowest incomes’. In addition to the concentration of lowest incomes, we included a measure for the ‘share of ethnic minorities’ in the parental neighbourhood as an additional neighbourhood-level predictor variable.

Using a similar method, we created a compositional measure of the secondary school environment of our subpopulation in 1999, the year before leaving the parental home. Using the previously constructed income-quintiles, we created school-quintiles, in which schools in quintile 1 have a low concentration of peers from low income parents, whereas schools in quintile 5 have a high concentration of these pupils. The fifth quintile was again used to depict the highest concentration within the models.

Additionally, as a school-level predictor variable, we included a measure indicating the educational level the pupils were enrolled in. In the Dutch educational system, the majority of schools offer several levels of education, ranging from low/middle (VMBO/MAVO/HAVO) to high (VWO). In this study, we are very fortunate to have access to data on education and to some data on schools. Nevertheless, the Dutch registers do not contain information on contact frequency between individuals or subjective measures on experiences in the school environment. By creating a measure for pupils’ educational level, essentially a smaller unit within the school environment, we aim to capture the fellow pupils that individuals are likely in regular contact with, due to the fact that they will share courses and social events. In doing so, we hope to approach a peer influence mechanism which can be at play in the school environment, and which can affect later outcomes in life.

Analytic strategy

Recent research from the Netherlands, Sweden, and the United States has shown that individuals who grew up in deprived parental neighbourhoods experienced long-term exposure to similar neighbourhoods over their life course [10, 23, 24, 15]. In this study, we used cross-classified multilevel models in order to examine how individual neighbourhood outcomes are likely to develop after leaving the parental home, given the parental background, the parental neighbourhood, and the composition of the secondary school. We argue that cross-classified models are suitable as individuals in our data were nested in specific parental neighbourhood/school environment combinations. Therefore, they were hierarchically classified on more than one dimension [42]. Using the cross-classified models, we were able to split up the variance components of both spatial settings, in order to assess their relative importance to individual neighbourhood outcomes over time. The dependent variable in these models was the probability of residing in a deprived neighbourhood over time after leaving the parental home (also see [15]).

The cross-classified model can be seen as a constrained three-level model, with pupils (level 1) nested in parental neighbourhoods (level 2) nested in a single artificial super cluster (level 3) [43]. This single artificial super cluster represents the single education authority in the Netherlands encompassing all schools in the data. The 389 different schools in our data, result in a 389 by 389 variance-covariance matrix. Entering the schools into the models by means of the single cluster simply sets all variances to equal, and all covariances to zero (hence, constrained model), providing us with a single random part parameter; or between-school variance component (ibid.). We fitted the cross-classified models in five steps. In models 0 and 1 (the null or empty models), we only included the intercept, neighbourhood random effects (model 0), and school random effects (model 1). We thus split the total variance in residing in concentrated poverty over time into separate variance components over the levels in the models. In model 2, we added individual level predictor variables, and further adjusted for individual background characteristics, which will briefly be discussed below. In model 3, we added the parental neighbourhood level predictor variable ‘concentration of lowest incomes’, as previously discussed. And finally, in model 4, we added the school level predictor variable ‘share peers from low income parents’, as well as a measure indicating the educational level the pupils were enrolled in at secondary school, ranging from low to high.

Cross-classified models, as specified above, assume school and neighbourhood effects to be additive by default. However, even after controlling for neighbourhood main effects, the effect that a school environment may have on its pupils’ outcomes later in life can differ for pupils from different parental neighbourhoods: as the effects of secondary schools and parental neighbourhoods on individual

neighbourhood outcomes might interact [43]. For this reason, in order to relax this additive random effects assumption, we included a random school-by-parental neighbourhood interaction classification in all our models, allowing for school and parental neighbourhood effects to be potentially non-additive (interaction parameters not reported/discussed).

We adjusted for a selection of individual, household, and school characteristics, described in table I (among others) above, which were included from model 2 onwards. Individual annual income is included as a core socio-economic observation. We further included the individual's gender; their age; whether they were single; homeownership/rent; and whether they belonged to one of the main ethnic minority groups in the Netherlands (Moroccans, Turks, Surinamese, and Antilleans/Arubans). We also adjusted for the income of the parental household, in 1999. All variables included were centred around their mean. Due to restrictions on the Remote Access server-capacity of Statistics Netherlands, all models were run (repeatedly) on a random sample of 25% of our subpopulation (N = 4,542).

Results

Table 3 shows the results from the cross-classified multilevel models on the individual probability of residing in poverty concentration after leaving the parental home. In the model 1, we see a simple decomposition of the total variance in individual neighbourhood outcomes into separate school and parental neighbourhood variance components, respectively estimated at .120 and .189. In comparison to model 0, we find that the addition of the school-level variance component only moderately affects the variation in neighbourhood outcomes at the parental neighbourhood level, thus far showing distinct effects of both spatial settings on individual neighbourhood outcomes after leaving the parental home.

Table 3. Cross-classified multilevel model on individual chance of residing in poverty concentration/deprived residential neighbourhood after leaving the parental home (2000-2012)

	(1)		(2)		(3)		(4)		(5)	
	<i>Coeff.</i>	<i>SE</i>								
Male					.473***	.073	.462***	.071	.450***	.072
Single					.460***	.073	.451***	.072	.446***	.072
Age					-.120**	.044	-.118**	.043	-.110**	.044
Ethnic minorities (ref=no)					.422***	.134	.364**	.144	.370**	.143
Rent (ref=homeowner)					.485***	.074	.481***	.073	.478***	.073
Income (1 000 EUR)					-.286***	.046	-.280***	.045	-.275***	.045
Income parents (at t ⁰)					-.213***	.070	-.185**	.070	-.187**	.069
<i>Parental neighbh. characteristics</i>										
Concentration lowest incomes							.289***	.070	.288***	.070
Share ethnic minorities							.003	.004	.004	.004
<i>School characteristics</i>										
Concentration peers poor parents									-.017	.013
Educational level (ref=low)										
Middle/high									-.092	.083
_cons	-1.003***	.039	-1.194***	.081	-1.140***	.069	-1.119***	.070	-1.091***	.070
<i>Random-effects parameters</i>										
	Est.	SE								
Between-school variance	-	-	.120	.055	.060	.033	.061	.034	.052	.032
Between-neighbh. variance	.191	.075	.189	.073	.138	.074	.022	.105	.019	.106
N	4 542		4 542		4 542		4 542		4 542	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In model 2 we find that after adding personal level predictor variables, the between-school variance in individual neighbourhood outcomes is reduced to .060, while the between-parental neighbourhood variance is now .138. These results indicate that these individual measures have substantial explanatory power in determining neighbourhood outcomes over time, as one would expect, and further highlight that there are large disparities between the individuals in our subpopulation at the start of their individual residential neighbourhood history. Looking at the fixed part parameter estimates, the effects of the personal characteristics on neighbourhood outcomes are in line with those found in previous studies. In particular, individuals whose parental income levels are higher are less likely to reside in deprived neighbourhoods in their own residential trajectory as adults. Compared to the estimates found in null model 1, the combined effect of the personal characteristics, and parental characteristics in model 2 (as well as the neighbourhood exposure that took place over the measurement period) explains 50% ($-.05 = (.060 - .120) / .120$) of school variance, and 27% of parental neighbourhood variance in individual neighbourhood outcomes over time. This entails that with the addition of the personal characteristics, half of the variance in individual neighbourhood outcomes at the level of the secondary school is yet to be specified, as well as an even larger percentage of variance at the level of the parental neighbourhood.

In model 3 we find that the parental neighbourhood-level predictor variable “concentration of the lowest incomes” further reduces the between-parental neighbourhood variance in individual residential outcomes from .138 to .022; indicating that at the parental neighbourhood level, poverty concentration is a core explanatory factor in determining children’s neighbourhood outcomes after leaving the parental home. This finding reconfirms previous results in the Netherlands, and demonstrates once more the importance of parental neighbourhood deprivation in explaining individual neighbourhood outcomes, even after controlling for personal characteristics and parental income. This result thus re-emphasises the importance of exposure to neighbourhood deprivation *over time*, even spanning across generations, on personal outcomes. Within this model, the combined effect of the included estimates now explains 88% ($-.88 = (.022 - .189) / .189$) of parental neighbourhood variance in individual neighbourhood outcomes over time, compared to null model 1. The school-level variance also moderately decreases in comparison to model 2 after adding the neighbourhood level predictor variables, from, .060 to .052. In other words, some of the variance in individual neighbourhood outcomes attributed to the level of the secondary school can in fact be explained by the concentration of low incomes in the parental neighbourhood. Since there is a substantial percentage of parental neighbourhoods in which children attend one particular school, as shown in table II and its accompanying discussion above, the decrease of the school-level variance in model 3 is likely due to this overlap. We did not find a significant result for the share of ethnic minorities in the parental neighbourhood.

In the final model 4 we included the full range of controls and predictor variables at the parental, individual, parental neighbourhood, and the secondary school level on the individual chance of residing in a deprived neighbourhood after leaving the parental home. We find that there is a remainder of variance at the level of the secondary school in these individual neighbourhood outcomes, that is not explained by the addition of our school-level predictors. Both the share of peers with low income parents, and the educational level of the student’s class, do not show significant results. An LR test between model 4 and 3 does show that the two added school-level predictors improve the fit of the model. Additionally, the inclusion of the school-level variables has slightly reduced both the between-school variance in individual neighbourhood outcomes, from .060 to .052, and the between-parental neighbourhood variance, from .022 to .019, though be it very marginally so. This finding may partly be due to the fact that we have good but limited school-level data to our exposal, which may not cover the basis of the peer influence mechanism which is likely at play in the secondary school environment, through which later outcomes in life can be affected. Extensions to these school-level predictors, such as the share of students from an ethnic minority background did not explain the remaining school-level variation in individual neighbourhood outcomes (analyses not shown).

Discussion and conclusion

In this study, we focussed on the neighbourhood outcomes of Dutch adolescents after leaving the parental home. We examined the joint influence of the parental background (parental income), the parental neighbourhood, and a compositional measure of the school environment: multiple factors and socio-spatial contexts that may influence individual chances of residing in poverty concentration. In doing so, we contribute to the literature in two distinct ways. First of all, we add to the small, but growing, body of literature that takes a dynamic, long-term perspective to neighbourhood effects. These studies show that individual residential outcomes are not only influenced by the current residential environment but by neighbourhood experiences *over time*, even spanning across generations [24, 23, 10, 44, 15]. We too find that poverty concentration in the parental neighbourhood increases individual chances of residing in similarly poor neighbourhoods later in life, even after controlling for parental income *and* taking into consideration the influence of the secondary school environment. Second of all, firmly inspired by life course theory, we add to the literature by assessing multiple socio-spatial contexts and their specific level of influence on neighbourhood outcomes over time. During adolescence, the parental neighbourhood and the school environment are likely to be among the dominant socio-spatial contexts in which individuals spend a large proportion of their time. By adding the school environment into previously established models on the intergenerational transmission of neighbourhood characteristics, we found that *both* spatial settings explain variance in the neighbourhood outcomes of young individuals throughout the analyses. Furthermore, by adding in this additional socio-spatial context, we did improved the explanatory power of the models.

Using the longitudinal register data from the Netherlands, we were not able as yet to determine the school-level predictor variables that could be behind the lingering between-school effect on individual neighbourhood outcomes over time. Unfortunately, information on the composition of the school environment as an additional socio-spatial context is scarce, and we did not find an effect for the concentration of peers with low income parents, or the pupils' educational level. Affecting the interpretation of the mechanisms behind both a parental neighbourhood and a school effect, we do not have information on subjective observations, for instance on contact regularity or frequency, or the transmission of norms and values between peers or between parents and children. For this reason, the added predictors and controls in our models may not serve as sufficient proxies to cover these types of complex intra-family and intra-peer mechanisms behind individual neighbourhood outcomes over time. We hope that this study will encourage future research using subjective observations on these possible underlying mechanisms at play.

Combined, the results from this study show that there is variation in individual neighbourhood outcomes after leaving the parental home at both the parental neighbourhood and the school level, controlling for parental income and individual characteristics. Poverty concentration is shown to be at the heart of the effect of the parental neighbourhood, reconfirming that intergenerational residence in deprived neighbourhoods strongly, and negatively affects individual neighbourhood outcomes over the life course. In this context, to our knowledge, we are the first to additionally assess compositional measures of the school environment, showing the importance of assessing the separate impact of this socio-spatial context within one comprehensive modelling framework. Therefore, the results of this study reinforce previous findings on intergenerational neighbourhood patterns, and further support a distinct life course perspective which encourages the examination of neighbourhood effects over time *and* the need to examine additional, parallel socio-spatial contexts which make up contextual effects on individual outcomes at large.

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