

DAVID KNAPP

The relationship between residential
segregation, school segregation
and family context



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LIST OF ORIGINAL PUBLICATIONS

This thesis is based on the following publications, which are referred to in the text by Roman numerals:

- I Tammaru, T., **Knapp, D.**, Silm, S., van Ham, M., Witlox, F. (2021) Spatial Underpinnings of Social Inequalities: A Vicious Circles of Segregation Approach. *Social Inclusion*, 9(2), 65-76. DOI: 10.17645/si.v9i2.4345
- II Kalm, K., **Knapp, D.**, Kährrik, A., Leetmaa, K., Tammaru, T. (2024) Minorities moving out from minority-rich neighbourhoods: does school ethnic context matter in inter-generational residential desegregation? *European Sociological Review*, 40(2), 208–225. DOI: 10.1093/esr/jcad025
- III **Knapp, D.**, Tammaru, T., Leetmaa, K., Kalm, K. (2023) Family, school, neighbourhood or all three: Differences in tertiary educational achievement among the Russian ethno-linguistic minority in Tallinn Urban Region, Estonia. *Research in Social Stratification and Mobility*, 87, 100845, DOI: 10.1016/j.rssm.2023.100845

Author’s contribution to the articles denoted by: ‘*’ a minor contribution, ‘**’ a moderate contribution, ‘***’ a major contribution.

	Articles		
	I	II	III
Original idea	**	*	***
Study design	**	**	***
Data processing and analysis	**	**	***
Interpretation of the results	**	***	***
Writing the manuscript	**	**	***

1. INTRODUCTION

The persistence of segregation in cities worldwide has meant the topic is an important focus for researchers and policymakers. While the effects of segregation are well-documented—e.g., differences in income, educational level, and exposure to violence and crime; difficulty for migrants integrating into the host society; and lack of social cohesion—the causes and processes behind it are less understood. The phenomenon of segregation is increasingly thought of as occurring across multiple, interconnected life domains—e.g., neighbourhoods, schools and other educational institutions, workplaces and leisure activities (Tammaru et al. 2010; van Ham & Tammaru 2016). The spatial sorting of different households into different neighbourhoods according to ethnicity and especially income and wealth not only generates residential segregation, but also segregation in other domains, such as schools and workplaces, as people tend to use services and amenities close to where they live. Therefore, it is no longer sufficient to study segregation in isolated domains, but it is necessary instead to examine segregation across multiple domains at once.

Inequality and segregation are now understood to operate intergenerationally too. The circumstances in which individuals grow up can have a significant influence on their outcomes later in life, such as their educational level, income and socioeconomic status. As these outcomes are important in determining the choice set of neighbourhoods available to an individual or household in adulthood, childhood circumstances also affect where someone lives later in life. Hence, people as adults tend to live in neighbourhoods that have similar characteristics to the neighbourhoods in which they grew up (Sharkey 2008). Children are most strongly influenced by the characteristics of their parents and immediate household, the characteristics of their neighbours in the areas in which they grow up and the characteristics of the students in the schools they attend. The result is that segregation and inequality can be conceived of as a “vicious circle”, whereby individuals who grow up in segregated neighbourhoods and attend segregated schools are most likely to live in segregated neighbourhoods and work in segregated workplaces as adults. Research has shown that neighbourhood and school characteristics are often closely related, and residential segregation is frequently reproduced in schools (e.g., Frankenberg 2013). Therefore, understanding how residential segregation, school segregation and family context affect and are affected by each other is key to developing a fuller comprehension of the “vicious circle” of inequality and segregation across multiple domains and generations.

Existing research has established that residential and school segregation are strongly connected. Proximity-based student allocation methods, such as catchment areas, mean that school composition usually mirrors the composition of the catchment area and, therefore, the local neighbourhood(s). While the intergenerational effects of neighbourhood characteristics have been well-documented (e.g., Sharkey 2008; Hedman & van Ham 2021), the role and significance of school characteristics, especially sociodemographic composition, have not been studied

extensively. The often close relationship between school and neighbourhood composition means that some of the observed effect of neighbourhood characteristics may be in fact mediated by schools.

This thesis seeks to expand the understanding of the relationship between school segregation and both neighbourhood segregation and family context by further developing theories on the transmission of segregation between different domains and generations and by undertaking empirical studies in two previously neglected areas: the role of school ethnic composition alongside childhood neighbourhood characteristics and family context in the ethnic composition of the neighbourhood lived in as an adult, and the role of school ethnic composition alongside childhood neighbourhood characteristics and family context in the likelihood of achieving tertiary education.

Therefore, this thesis comprises theoretical and empirical parts. The theoretical part (**Article I**) develops the “vicious circle of segregation” concept to better explain how spatial segregation is transmitted from one life domain to another through the sorting of different people and households into different neighbourhoods, schools, workplaces and other activity sites, and the contextual effects that result from interactions with other people in them. Furthermore, it explains how desegregation in one domain could trigger desegregation in other domains by introducing the concept of a “virtuous circle of desegregation”.

The empirical part of this thesis uses Tallinn, the capital of Estonia, and its surrounding urban region as a case study. Tallinn Urban Region has a large Russian ethno-linguistic minority, and segregation in both neighbourhoods and schools is persistently high. Furthermore, a smaller share of the Russian ethno-linguistic minority receive university degrees than the Estonian majority, which may contribute to income inequality and reduced social mobility among Russian-speakers. Therefore, understanding what factors are associated with residential desegregation and tertiary educational achievement among the Russian ethno-linguistic minority in Tallinn Urban Region will shed more light on the relationship between residential segregation, school segregation and family context, and improve comprehension of the “vicious circle of segregation”. Using Tallinn Urban Region also provides an opportunity to study some less researched contexts, such as the rapid transition from a centrally planned to a free market economy, separate language education systems and comparatively low socioeconomic segregation due to Soviet-era housing allocation policies. Hence, the following two empirical research questions are investigated:

1. How is the ethnic composition of neighbourhoods lived in as adults connected to the ethnic composition of schools, ethnic composition of childhood neighbourhoods, and family contexts for the Russian ethno-linguistic minority who grew up in minority-dense neighbourhoods in Tallinn Urban Region? (**Article II**)

2. What is the association between achieving tertiary education and school ethnic composition, childhood neighbourhood ethnic and educational composition, and family context for the Russian ethno-linguistic minority in Tallinn Urban Region? (**Article III**)

To answer these research questions, this thesis utilises data from several sources: Estonian Census data from 2000 and 2011; Estonian Population Register data from 2019 and 2020; and Estonian Educational Register data from 2005 and 2006. The Census, Population Register and Education Register data can be linked, allowing the educational career, neighbourhoods resided in during both childhood and adulthood, and important background characteristics for each individual to be known. Furthermore, a fourth dataset, 2019 Euromod, allows individuals to be connected with their parents, providing parental background characteristics as well. The result is a rich dataset that follows individuals from their childhood neighbourhoods and schools to their adult neighbourhoods and final educational level, allowing the study of the impact of school and childhood neighbourhood composition on adult neighbourhood composition and the attainment of tertiary education.

This thesis is structured as follows. First, the conceptual and empirical basis for the “vicious circle of segregation” framework is described. Second, the context of Tallinn Urban Region is introduced. Third, the data and analysis methods used in the course of the research are detailed. Fourth, the main results of the analyses are presented. Fifth, the main results are discussed. Finally, conclusions from the research are drawn.

2. LITERATURE REVIEW

2.1. Theoretical framework—the “Vicious Circle of Segregation”

The main theoretical framework underpinning this thesis is the “vicious circle of segregation”. The idea of a vicious circle of segregation was first introduced by Tammaru et al. (2017) to describe the production and reproduction of segregation and spatial inequalities across neighbourhoods, schools and the labour market. The concept was elaborated further by van Ham et al. (2018) to become a framework in which segregation in different life domains is connected by feedback loops that operate spatially across a city and temporally over an individual’s life course and across generations. This section of the thesis, alongside **Article I**, will develop the vicious circle of segregation framework to more fully illustrate how connections between different life domains create and reinforce segregation through the spatial sorting of individuals and households with different sociodemographic characteristics and the intergenerational transmission of inequality and segregation.

Segregation is increasingly being understood in terms of different life domains interacting over time (van Ham & Tammaru 2016). Life domains can be thought of as areas of life where different social processes occur, such as neighbourhoods (the ‘residential domain’), schools, universities and other educational institutions (the ‘school’ or ‘education’ domain), workplaces (the ‘workplace domain’) and leisure activities (the ‘leisure domain’). However, as posited by the vicious circle of segregation framework, these domains do not exist in isolation; processes that take place in one domain can affect processes and outcomes in another (van Ham et al. 2018).

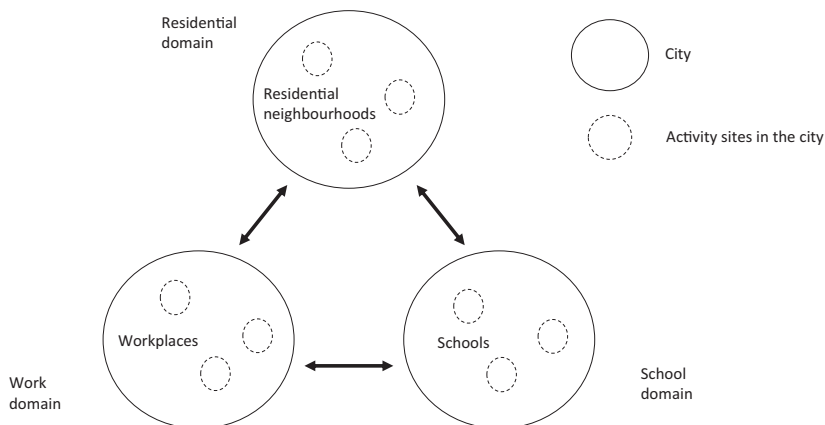


Figure 1: Activity sites in different life domains. Source: **Article I**, Figure 1.

Furthermore, life domains can be thought of as consisting of different “activity sites”. Activity sites are all of the locations in a city that relate to the particular life domain (Figure 1). For example, the residential domain comprises all of the neighbourhoods in a city and the education domain comprises all of the schools, university, kindergartens and other educational institutions in a city. It is at these activity sites where interactions between different people occur and social networks develop, with the sum of an individual’s or household’s activity sites defining their “activity space” (Wong & Shaw 2011; Silm & Ahas 2014). If members of different sociodemographic groups are sorted into different activity sites, then the domain can be considered segregated.

The spatial sorting of different sociodemographic groups into different activity sites is a key component of the vicious circle of segregation. Residential spatial sorting into different neighbourhoods is especially significant (van Ham & Feijten 2008; Hedman et al. 2011). The neighbourhood in which an individual or household chooses to live is constrained by the choice set available to them (Clark & Ledwith 2007; van Ham & Manley 2010). The main factor influencing the size of the neighbourhood choice set is wealth and income. Wealthier and higher-earning individuals and households have a much larger range of neighbourhoods from which to select as they can afford higher housing costs and have greater mobility. They can rent or buy property in the most expensive, desirable neighbourhoods, even if that means a longer, costlier commute. As wealth and income decrease, the choice set available decreases in size too, until the poorest individuals and households, whose small choice set comprises the cheapest, least desirable neighbourhoods.

However, the level of residential segregation varies due to several factors which affect the sorting process and choice sets available, especially for those with the least wealth and lowest incomes (Musterd 2005; Musterd et al. 2017). These factors include: the distribution of different housing sizes, types and tenures across a city; the type of welfare regime present in the country; the presence of discrimination in the housing market; mortgage availability; and the provision and distribution of social housing, where rents are subsidised.

When residential location decisions involve families with children, then residential sorting has an intergenerational impact as well, because the neighbourhood choice made by the parents determines the neighbourhood environment and characteristics in which their children grow up. This intergenerational link in neighbourhood circumstances has additional consequences, since there is also a close relationship between neighbourhood composition and school composition (Denton 1996; Frankenberg 2013). School places are often allocated according to proximity, for example, by using catchment areas, which means that the school composition will reflect the sociodemographic profile of the school-age children living in the surrounding neighbourhoods (Burgess et al. 2005; Boterman 2019; Kauppinen et al. 2022). Where school allocation is less restricted by proximity and greater parental choice is allowed, school segregation frequently exceeds neighbourhood segregation as affluent parents opt out of local schools perceived to be inferior in favour of schools outside the neighbourhood (Saporito 2003;

Coughlan 2018; Boterman 2019). This can potentially have a significant impact on the social development of the children, as both neighbourhoods and schools are important arenas for interacting with other children and adults, establishing friendships and building social networks. If both domains are segregated along the same sociodemographic lines, then children will grow up in homogeneous environments, with few interactions with members of different sociodemographic groups, and little diversity in friendships and social networks.

The link between neighbourhoods and schools does not just travel from the former to the latter—it is a two-way relationship (Gordon & Monastriotis 2007). This is because schools also influence residential choices among households with children at or close to school age. Where catchment areas are used to allocate school places, parents may seek to move into a neighbourhood within the catchment area of a school they consider to be good (Bernelius et al. 2021). Therefore, for households with children at or near to school age, neighbourhood choice can be conceived of as a “joint residential-school choice” (**Article I**), where access to good schooling is as or more significant than other attributes of the neighbourhood and neighbourhood decisions are constrained by the combined neighbourhood-school choice set. The joint residential-school choice has additional consequences. Places in schools that have excellent reputations are highly sought after and, therefore, homes within their catchment areas tend to garner a premium in the housing market (Cheshire & Sheppard 2004; Nguyen-Hoang & Yinger 2011). This means that houses within the catchment areas of the most highly regarded, desirable schools can only be afforded by the most affluent households, and are therefore outside the choice sets of most families. The sorting of children of different sociodemographic backgrounds into different schools through catchment areas has another feedback effect—schools whose students come from more affluent, high socioeconomic status households tend to have better reputations than schools with high shares of students from low socioeconomic status families, of minority ethnicities or from immigrant backgrounds, as parents often use the composition of a school, or the neighbourhood in which it is located, as a proxy for quality (Rangvid 2010; Rowe & Lubienski 2017; Bernelius et al. 2021). Hence, schools in affluent neighbourhoods tend to have better reputations than schools in deprived neighbourhoods, even if there is no difference in school quality. The upshot is that the combination of feedback loops associated with the joint residential-school choice creates an especially potent dynamic which sorts households into segregated neighbourhoods and schools.

Schools, as well as the wider education system, play an important role in the vicious circle of segregation too, as they provide the main pathway into the labour market. Any segregation in schools has the potential to be replicated in workplaces, especially if there is a large difference in academic performance between schools. Education is a key mediator of the connection between an individual’s socioeconomic origins and socioeconomic destinations, as illustrated by the origin-education-destination or OED triangle (see Figure 2; Ganzeboom & Luijkx 2004), and it is a driver of social mobility (Andersen et al. 2021). The “immigrant pessimism” hypothesis posits that children from minority ethnicity or

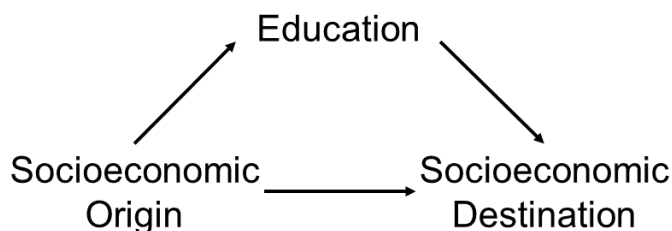


Figure 2: The origin-education-destination or OED triangle. Based on Ganzeboom and Luijkx (2004), Figure 14.4.

immigrant backgrounds may see obtaining academic qualifications as a way of countering anticipated discrimination in the labour market (Louie 2001). However, if there is a strong connection between an individual's socioeconomic origins and their educational attainment, then education ceases to be a mediator and social mobility will decline. In many cities, schools whose students are from affluent households tend to perform better than schools with less affluent student populations due to peer effects on behaviour, aspirations and academic performance (van Ewijk & Slegers 2010; Sykes & Kuyper 2013; Palardy 2015), and the greater resources that parents invest in their children's education (Charles et al. 2007; Guryan et al. 2008). The growing professionalisation of workforces means that high-income jobs increasingly require a university degree (Goldin & Katz 2007). As a result, the intention to attend university and the academic ability to achieve the required entry grades are also increasingly important factors in whether an individual can get a high-income job. The concentration of academic qualifications among individuals from affluent backgrounds resulting from school segregation can, therefore, produce segregation in workplaces and the wider labour market, thus transferring inequality and segregation experienced during childhood into adulthood.

The next stage of the vicious circle of segregation closes the loop. If segregation in schools produces segmented labour markets with segregated workplaces and individuals from affluent backgrounds are sorted into high-income professional occupations, then segregation and inequalities will likely be reproduced at the neighbourhood level. This is because, as discussed earlier, income and wealth determine the size of an individual's or household's neighbourhood choice set. If residential and school segregation mean that individuals or households from affluent backgrounds secure high-income jobs, then they will likely have the financial resources to afford to continue to live in the most expensive, most sought-after neighbourhoods where the most popular schools are located. When such households start families, they then transmit these school and neighbourhood contexts to their children, which enables the vicious circle to continue to operate

intergenerationally. Indeed, studies indicate that such an intergenerational transmission of neighbourhood context does occur (Sharkey 2008; van Ham et al. 2014; Hedman & van Ham 2021). This intergenerational operation of the vicious circle of segregation is illustrated by Figure 3.

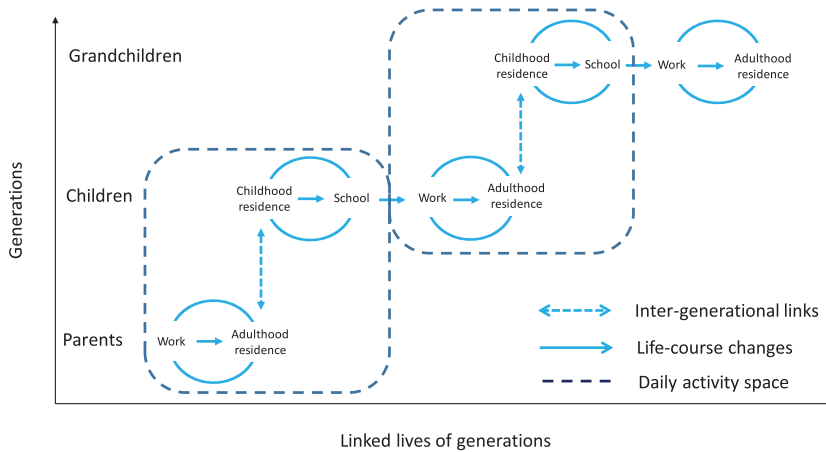


Figure 3: The vicious circle of segregation across three generations. Source: **Article I**, Figure 2.

2.2. Reversing the Vicious Circle of Segregation to create a “Virtuous Circle of Desegregation”

If segregation in one life domain can increase segregation in other life domains, then, in theory, reducing segregation in one can decrease segregation in others. Hence, in contrast to the vicious circle of segregation, we can conceive of a “virtuous circle of desegregation”. However, desegregating or reducing segregation in a domain to trigger such a virtuous circle is not necessarily a simple task, as household wealth and the distribution of housing across a city constrain residential mobility, catchment areas mean school composition reflects neighbourhood composition, and educational inequalities cause segmentation in workplaces. The challenges posed by the vicious circle of segregation are especially relevant to the integration of minority and migrant populations in cities.

2.3. Minority integration: Vicious Circles of Segregation and Virtuous Circles of Desegregation

If the persistence of segregation across life domains and generations is considered to act as a vicious circle, then this may have implications for achieving minority integration in cities. The phenomenon of “eth-class” segregation means that minor-

ity ethnicity households and households with a migrant background tend to have low socioeconomic status and live in segregated, low-income, minority ethnicity neighbourhoods (Gordon 1964). Hence, under a vicious circle of segregation, both ethnic and socioeconomic segregation will be perpetuated across life domains and generations.

The segregation and integration of minority populations has been studied extensively and several theories have been developed to explain the process. *Place stratification* theory posits that minority populations will become increasingly segregated and marginalised as structural constraints and barriers, such as discrimination or poverty, prevent them from becoming integrated spatially in neighbourhoods and schools (Logan 1978; Pais et al. 2012), with subsequent generations being more marginalised than the previous ones. Meanwhile, according to *spatial assimilation* theory, minority and migrant populations will become more integrated and assimilated spatially as the more time spent in the presence of the majority population, the more assimilated into the majority society they become (Massey & Mullan 1984). Later generations would be expected to be more integrated, as they will have spent their entire childhoods and education within the host country, have better host country language skills, and stronger ties with members of the majority population.

However, to account for the differing rates of assimilation among second-generation immigrant populations, spatial assimilation theory has been developed further. The original concept of spatial assimilation as a process whereby subsequent generations of minority and migrant populations become increasingly assimilated spatially into majority society has been named *straight-line assimilation*. Since the degree of assimilation can depend on a range of factors—such as wealth, ability to speak the majority language, and the size of pre-existing co-ethnic communities—the concept of *segmented assimilation* has been introduced, with straight-line assimilation being one such segment (Portes & Zhou 1993; Waters et al. 2010). In the most negative assimilation trajectory in segmented assimilation, which Portes and Rumbaut (2001, p. 59) call *downward assimilation*, minority populations experience downward mobility and become increasingly marginalised, reminiscent of place stratification theory.

One of the factors that influences the extent to which members of a minority or migrant population assimilate into majority society is the opportunity to interact with members of the majority society. *Contact theory* posits that the amount of contact with members of another sociodemographic group can affect an individual's attitude towards members of that group (Allport 1954). Frequent encounters with members of other ethnic groups can reduce prejudice, increase tolerance of inter-ethnic situations and environments, and build mutual trust, respect and acceptance (Holme et al. 2005; Mickelson 2011). These ties can develop into friendships and result in more diverse social networks. However, such an improvement in inter-ethnic relations is predicated on the contact being positive—negative interactions can have the opposite effect (Allport 1954).

Perpetuation theory extends contact theory by considering the consequences of greater inter-ethnic contact in schools or neighbourhoods (Braddock 1980; Pettigrew & Tropp 2006). It hypothesises that the ethnic contexts experienced at school and in the neighbourhood when growing up are perpetuated in the ethnic contexts in neighbourhoods and workplaces experienced as adults. On the one hand, people who experience frequent, positive interactions with members of other ethnic groups at school or in the childhood neighbourhood will have more diverse social networks and be more comfortable living and working in multi-ethnic environments and, therefore, are likely to live and work in diverse neighbourhoods and workplaces later in life. On the other hand, people who have had few or negative interactions with members of other ethnic groups will have less diverse social networks and be less comfortable in multi-ethnic environments and, therefore, be less likely to live and work in diverse neighbourhoods and workplaces. Hence, according to perpetuation theory, living in segregated neighbourhoods and attending segregated schools is likely to result in living in segregated neighbourhoods and working in segregated workplaces later in life, and *vice versa* for integrated neighbourhoods and schools, which agrees with one of the main premises of the vicious circle of segregation.

Enabling opportunities for members of migrant and minority groups to interact with members of the majority population is, therefore, key if a vicious circle of segregation is to be transformed into a virtuous circle of desegregation. Furthermore, the conditions under which contact occurs must maximise the probability that the interactions are positive, as negative interactions could reinforce existing segregation. As a result, many scholars have focused on schools as arenas for inter-ethnic contact (e.g., Vedder et al. 2006; Dinesen 2011), as the opinions and prejudices held as children tend to be less developed and more liable to change, and because schools are regarded as being more neutral settings than neighbourhoods, with teachers available to mediate if conflicts arise. Attending schools alongside members of the majority population may have additional benefits, such as the opportunity to improve proficiency in the majority language, improved academic attainment due to positive peer effects, and adopting majority population norms, expectations and aspirations, including the intention to go to university (van Ewijk & Slegers 2010; Sykes & Kuyper 2013; Palardy 2015). Therefore, desegregating schools may be the most effective way of halting the vicious circle of segregation and initiating a virtuous circle of desegregation.

2.4. The roles of school context, childhood neighbourhood context and family context on adult neighbourhood context and tertiary educational achievement

This thesis furthers understanding of how desegregating schools may desegregate other life domains by studying two important outcomes—the ethnic composition of the neighbourhood lived in during adulthood and the achievement of tertiary education, the latter becoming an increasingly important step in obtaining a high-

income job as a result of the professionalisation of the labour market and the workforce. However, as school context, childhood neighbourhood context and family context are interlinked and all have the ability to influence the choice of adult residential neighbourhood and the completion of a university degree, childhood neighbourhood context and family context must be considered alongside school context.

Several studies in the US have investigated the relationship between school ethnic context and neighbourhood, university and workplace contexts later in life as part of testing perpetuation theory. African-Americans who attended desegregated schools were found to be more likely to attend desegregated universities, work in desegregated workplaces, have desegregated social and professional networks, and work in white-collar and professional employment compared to those who attended segregated schools (Braddock 1980; Braddock & McPartland 1989; Wells & Crain 1994). More recent research by Goldsmith (2010, 2016) and Rowley and McNeill (2017) shows that, for both African-Americans and Latino-Americans, attending desegregated schools is associated with living in more diverse neighbourhoods as adults. Thus, the US experience indicates that desegregation of schools can help to desegregate other life domains.

The relationship between childhood neighbourhood context and the neighbourhood context later in life has been well-documented by research into the “intergenerational transmission” of neighbourhood context (Sharkey 2008; van Ham et al. 2014; Hedman et al. 2015). Adults tend to live in neighbourhoods with similar ethnic and socioeconomic characteristics to those that they grew up in, which were also the neighbourhoods their parents lived in as adults. Hedman and van Ham (2021) even observed a relationship for women in Sweden between the neighbourhood context in which they lived in and that of both their mothers and grandmothers.

The impact of both school and neighbourhood context on tertiary educational achievement has attracted less attention. One of the most comprehensive studies is Owens (2010), which investigated both neighbourhood and school effects. She found that neighbourhood socioeconomic status was more important than school socioeconomic status in achieving a degree and that only absolute, and not relative, school socioeconomic status was significant. She also observed interactions between school ethnic composition and neighbourhood socioeconomic status—students from low socioeconomic status neighbourhoods were less likely to earn a degree if they attended a school with a larger share of European-Americans, while students from high socioeconomic neighbourhoods were more likely to earn a degree if they studied at a school with a higher share of European-Americans. Meanwhile, the results of Brattbakk and Wessel (2013) indicate that living in a neighbourhood with a greater proportion of disadvantaged neighbours reduced the likelihood of obtaining a university or college degree.

Although few studies have specifically examined school and neighbourhood effects on tertiary educational achievement, more have looked at other measures of educational attainment, such as grades, years of schooling or enrolment at university. For example, Chetty et al. (2016) found that children who had moved

to neighbourhoods with lower poverty rates as part of the Moving to Opportunity initiative were more likely to enrol at university. Meanwhile, Howell (2019) observed that children who grew up in neighbourhoods with the lowest poverty rates completed more years of education than those who grew up in neighbourhoods with higher poverty rates and, in a meta-analysis, Nieuwenhuis and Hooimeijer (2016) found neighbourhood poverty, neighbourhood educational climate, the share of ethnic or migrant groups in a neighbourhood and a neighbourhood's level of social disorganisation to be related to educational attainment.

The effect of school composition appears to be more complex. While many studies, especially those undertaken in the US, indicate that higher shares of minority ethnicity students are associated with lower educational achievement (e.g., Southworth 2010; Mickelson et al. 2021; Conway-Turner et al. 2023), others suggest that this is not always the case. Hermansen and Birkelund (2015) found a small increase in the likelihood of completing upper secondary education if a student had more immigrant classmates, with students with migrant backgrounds benefitting more than those with non-migrant backgrounds. Meanwhile, Fekjær and Birkelund (2007) discovered that, once the academic composition of school peers had been accounted for, there were small, but positive, effects of attending a school with more minority students for both majority and minority students. Moreover, peer effects resulting from the socioeconomic status and academic performance of classmates may explain at least some of the apparent effects of school ethnic composition (Rumberger & Palardy 2005; van Ewijk & Slegers 2010; Sykes & Kuyper 2013), which is unsurprising as ethnic and socioeconomic segregation often overlap.

However, as discussed earlier, neighbourhood context and school context are strongly connected. The joint residential-school choice means that the apparent effects of one of the domains may be in fact due to the other. Indeed, studies which use cross-classified multilevel models where individuals are nested in both schools and neighbourhoods at the second level have observed both decreases in the size (Brännström 2008; Kauppinen 2008; Kuyvenhoven & Boterman 2021) and the total disappearance of the neighbourhood effect (Sykes & Musterd 2011). Effects which initially appear to be a consequence of the sorting of households and children into different neighbourhoods in fact are partly due to the sorting of children into schools. This highlights the importance of investigating neighbourhood effects and school effects—and residential segregation and school segregation—in tandem rather than separately.

Finally, it is critical that an individual's parental or family context is not overlooked. Families and households often selectively sort into neighbourhoods and schools where the residents and students have similar characteristics to their own. This introduces a selection bias (Hedman et al. 2011; Hedman & van Ham 2012), as neighbourhood and school characteristics are correlated with household and family characteristics. Therefore, apparent neighbourhood and/or school effects may actually be due to the characteristics of the family or household, rather than the characteristics of either the neighbourhood or the school. In particular, the educational level of parents should be taken into account, as the link between

the educational level achieved by an individual and the educational level achieved by their parents is well-documented (e.g., Bukodi & Goldthorpe 2013; Fleury & Gilles 2018; Galster et al. 2022). As a result, the parental or family background should also be included when studying neighbourhood and school effects.

3. TALLINN CONTEXT

3.1. Ethnic and socioeconomic characteristics of Tallinn Urban Region

Tallinn, the capital city of Estonia, and its surrounding urban region have developed distinct segregation patterns. In particular, Tallinn Urban Region has a large Russian ethno-linguistic minority, which is segregated both in terms of the neighbourhoods in which they live and the schools they attend. This is primarily a consequence of the migration, labour market and education policies implemented during Estonia's 50-year period as part of the Soviet Union. Ethnic Russians were encouraged to migrate to other constituent republics of the Soviet Union, including Estonia, to work in all-Union industrial companies, the Soviet bureaucracy and the Soviet military (Tammaru & Kulu 2003), while few people from outside the Union immigrated to Estonia. Additionally, separate Russian- and Estonian-medium education systems were established. Today, about 31% of Estonia's 1.3 million residents are minority ethnicities, the vast majority of which are ethno-linguistically Russian—either ethnically Russian, Russian-speaking or both. About half of Estonia's minority population lives in Tallinn and its wider urban region.

Although the Russian ethno-linguistic minority in Tallinn Urban Region is homogeneous compared to minority populations in many other cities (Saar et al. 2017), it still contains considerable diversity, especially in terms of the degree of integration into majority Estonian society (Kruusvall et al. 2009; Nimmerfeldt et al. 2011). Particular characteristics are associated with integration. For example, those with good Estonian language skills tend to be more integrated than those without (Küün 2008; Ehala & Zabrodskaia 2014). Citizenship status is also linked to the level of integration, with those holding Estonian citizenship tending to be the most integrated, those with no citizenship the least, and those with Russian citizenship in between (Ehala & Zabrodskaia 2014). Those without citizenship are those residents who, after Estonia's re-independence, have neither obtained Estonian citizenship nor the citizenship of another country and have been issued Estonian alien's passports.

Another interesting aspect of Tallinn's Russian minority is their economic trajectory. In most immigrant societies, minority populations, especially those with a migrant background, tend to have low socioeconomic status initially, entering the labour market near the bottom. Afterwards, some may assimilate and achieve a rise in socioeconomic status, while others may become marginalised. However, the Russian ethno-linguistic minority in Estonia has experienced a decline in labour market outcomes (Leping & Toomet 2008; Saar & Helemäe 2017). During the Soviet era, both in Tallinn and Estonia as a whole, Russian immigrants arrived into a relatively privileged position, with well-paid, secure employment in reputable industries and new housing. However, the break-up of the Soviet Union and Estonia's re-independence in 1991 precipitated a rapid transition from a centrally planned to a market economy, which applied an immense shock to the economy. The resultant decline in economic fortunes for Estonia's Russian ethno-linguistic

minority had three main drivers. First, there was significant return migration to Russia following Estonia's re-independence, especially among those who had worked in the Soviet military and bureaucracy, who, especially in the latter, tended to have higher socioeconomic status (Tammaru & Kulu 2003). Second, the Estonian economy transitioned away from primary and secondary industries, such as mining and manufacturing, towards services or tertiary industries. The Russian-speaking minority was disproportionately negatively affected by this change, as they were overrepresented in such primary and secondary industries (Titma et al. 1998; Tammaru & Kulu 2003). Furthermore, the growing professionalisation of the Estonian economy has increased demand for employees with university degrees, which fewer Russian-speakers have compared to Estonians (Hazans et al. 2008; Lindemann & Saar 2012). Finally, the importance of the Russian language in the Estonian economy has declined greatly since re-independence. This is because Estonia realigned its economy away from serving markets in Russia and the former Soviet Union and towards Europe, as well as the development of a strong domestic market served by Estonian companies and entrepreneurs, during the market transition. As a result, Estonian is now the main language in the labour market, with English becoming increasingly important in international firms and sectors. However, the Estonian language skills of the Russian-speaking minority are often poor or non-existent (Lindemann 2014), as the ubiquity of Russian during the Soviet era meant understanding Estonian was not necessary and, as a result, few Russian immigrants learnt it (Rannut 2008). Since good Estonian language skills are a prerequisite for many well-paid service jobs in Tallinn, many Russian ethno-linguistic minority members are excluded from the higher end of the labour market.

In terms of socioeconomic characteristics, Tallinn is more like other major cities. The post-Soviet transition saw Tallinn transform from a city with relatively little variation in income, wealth and socioeconomic status to one with some of the largest inequalities in Europe (Musterd et al. 2017). Employees with a university education working for private international companies in skilled service industries have seen wages increase at a much faster rate than those with only basic or secondary education working in low-skilled occupations. As discussed in the previous paragraph, ethno-linguistic and socioeconomic inequalities in Tallinn interact, as ethnic Russians and Russian-speakers tend to fare worse in the labour market compared to ethnic Estonians.

3.2. Residential segregation in Tallinn Urban Region

Tallinn Urban Region displays clear residential segregation in terms of both ethno-linguistic identity and socioeconomic status. Regarding ethnic segregation, there are significant differences in the distribution of ethnic Estonians and Russian ethno-linguistic group members across the city and urban region, with some neighbourhoods heavily overrepresented with Estonians and others with Russian ethno-linguistic group members. Similarly, socioeconomic groups are unevenly

spread throughout Tallinn and its environs: there are neighbourhoods where households with higher socioeconomic backgrounds are overrepresented and others where lower socioeconomic households are overrepresented.

The ethno-linguistic segregation patterns found in Tallinn Urban Region result from the large-scale migration of Russian-speakers to Estonia—to work in all-Union industrial companies and the Soviet bureaucracy and military—and housing policies implemented to accommodate them. To house the new residents, large neighbourhoods of prefabricated concrete apartment blocks were constructed on the edges of cities, including Tallinn. Examples of these Soviet-era apartment districts in Tallinn include Lasnamäe and Mustamäe. A result of this is that such districts became overrepresented with ethnic and linguistic Russians, a situation that persists today (Ruoppila & Kährik 2003; Leetmaa et al. 2018). Meanwhile, Estonians tended to remain in older inner-city or lower density outer neighbourhoods, often comprising wooden housing. Similarly, these neighbourhoods are usually overrepresented with Estonian households today.

In contrast, socioeconomic segregation only emerged in Tallinn after the post-Soviet transition. The extensive privatisation of housing during the 1990s meant that household wealth and income became the main drivers of residential mobility. The richer the household, the more choice of residential locations they had. The result is that Tallinn's socioeconomic inequalities are visible spatially, as the most desirable areas have attracted the wealthiest households and only those unable to afford anywhere else living in the least desirable districts (Tammaru et al. 2016). Furthermore, suburbanisation, urban regeneration and gentrification have also contributed to increasing spatial segregation (Kährik & Tammaru 2008; Pastak & Kährik 2021). Renovated wooden housing neighbourhoods, modern inner-city apartments and new-build suburbs comprising large, family houses have become sought-after and, consequently, expensive, while some Soviet-era apartment neighbourhoods have experienced declines in status and condition (Leetmaa et al. 2018). This has led to ethnic Russians and Russian-speakers and low-income households becoming overrepresented in the Soviet apartment block estates and ethnic Estonians and high-income households being overrepresented in more expensive and desirable neighbourhoods.

3.3. School segregation in Tallinn Urban Region

Another legacy of the Soviet era is that the schools in Tallinn Urban Region are significantly segregated along ethno-linguistic lines. During the Soviet period, Russian-medium schools were established for the children of the newly arrived Russian-speaking immigrants in addition to the existing Estonian-medium schools, with practically all students whose mother tongue was Russian attending Russian-medium schools and students whose mother tongue was Estonian attending Estonian-medium schools. These parallel systems largely remain intact, despite ongoing reforms to the education system, in which some Russian-medium schools have switched to Estonian or have implemented immersion models (Masso & Soll 2014). Tallinn's schools remain highly segregated according to ethnicity

and mother tongue, with virtually all ethnic Estonian students attending Estonian-medium schools and a large majority of Russian ethno-linguistic group students attending Russian-medium or former Russian-language schools (Rajangu 2007; Lindemann 2011, 2014).

Socioeconomic segregation has also started to emerge in Tallinn Urban Region, although not to the same extent as many North American or Western European cities (Pöder & Lauri 2014b). Estonia's education system is fairly comprehensive, with no tracking occurring until the completion of Basic Education at age 15, and the private sector is small (Santiago et al. 2016). School allocation is undertaken using a “hybrid” approach comprising both catchment areas—with students guaranteed a place at their local “neighbourhood” school—and the option of attending a school elsewhere in the city if that school has available places (Pöder & Lauri 2014a). Additionally, parents have the option of “intra-city” schools, which do not have catchment areas and enrol students from anywhere in the city. The socioeconomic segregation apparent in Tallinn Urban Region's schools may be a result of the extreme ethno-linguistic segregation, as Russian-speaking students are more likely to come from families with lower socioeconomic status.

3.4. Tertiary educational achievement among the Russian ethno-linguistic minority in Tallinn Urban Region

Members of the Russian ethno-linguistic minority in Tallinn Urban Region are less likely than members of the Estonian majority to achieve a university degree (Hazans et al. 2008; Lindemann & Saar 2012). This may be explained by the fact that Russian-speakers are less likely to make the transition to tertiary education than Estonians (Lindemann & Saar 2012). One potential barrier to Russian-speakers attending university is Estonian language skills, as most courses at Bachelor's level are offered only in Estonian, with a few courses available in English or Russian. Therefore, any student wishing to study towards a university degree in Estonia will likely need very good Estonian language skills, which not all Russian-speaking students have (Täht & Paškov 2013). Despite this, members of the Russian ethno-linguistic minority appear to value education as much as the Estonian majority. However, they are more likely than Estonians to think wealthier families find it easier to access tertiary education, which may be related to the lack of options to study in Russian in Estonia (Täht & Paškov 2013). Even so, many members of the Russian ethno-linguistic minority do still attend university, despite these barriers. Therefore, understanding the factors associated with why some Russian-speakers attain tertiary education and others do not is important for researchers and policymakers.

4. DATA AND METHODOLOGY

4.1. Data

The research detailed in this thesis primarily uses three data sources: Estonian censuses, the Estonian Population Register and the Estonian Education Register (*Eesti Hariduse Infosüsteem*, EHIS). Specifically, I use the 2000 and 2011 censuses, Population Register data for 2019 and 2020 and EHIS data for 2005 and 2006. In addition, to link individuals to their parents, and create parental characteristic variables, 2019 data from Euromod—a European tax and benefit dataset—was used as it contained mother’s and father’s ID code variables, which could be linked to census data. In all of the datasets, individuals were pseudonymised and, therefore, could not be identified. Table 1 summarises which datasets were used for each of the research questions.

Table 1: Summary of datasets used in investigating each research question

Article	Research question	Datasets used			
		Census	Population Register	EHIS	Euromod
II	1	2000, 2011	2019	2005, 2006	2019
III	2	2000, 2011	2020	2005, 2006	2019

Education register data from 2005 and 2006 was used as these were the first years available in EHIS. This allowed the maximum time period for individuals to settle into their adulthood neighbourhoods—for research question 1—and to achieve a university degree—for research question 2—as those who completed either basic or general secondary education in either 2005 or 2006 would be aged 28–32 in 2019 and 29–33 in 2020.

The advantage of using census and register data is that data for the whole country or school year are available, negating the need to generate a sample or panel to survey and account for potential biases within that sample or panel. Another benefit is that census and register data are not subject to attrition, unlike panel surveys, where often a significant proportion of the panel participants drop out of follow-up surveys due to refusal or being uncontactable. However, census data do have a drawback in that long time periods elapse between censuses (11 years in the case of the 2000 and 2011 Estonian censuses). Such long time periods mean that multiple changes in place of residence that occur between censuses are missed, as well as the exact timing of any changes in residence. Therefore, using census data may not fully document the complexity of the residential careers of individuals. Also, any changes in other individual characteristics liable to change over time, such as educational level and household structure, will only be recorded for the census dates.

4.2. Study area and research population

The study area is Tallinn Urban Region, which is defined as the municipalities where at least 30% of the working population commuted daily to Tallinn (based on 2011 data). The area of Tallinn Urban Region in relation to the rest of Estonia is illustrated in Figure 4.



Figure 4: The study area—Tallinn Urban Region. Source: **Article III**, Figure 1.

For research question 1 (**Article II**), the research population consisted of individuals who had completed either basic or general secondary education in 2005/06, whose mother tongue was Russian and who lived in minority-dense neighbourhoods in Tallinn Urban Region in 2000. A minority-dense neighbourhood was defined as a neighbourhood where the Russian-speaking minority was overrepresented, i.e., the share living in the neighbourhood exceeded the share living across Tallinn Urban Region as a whole. The Location Quotient (LQ)—the ratio between the share of a particular group in a particular spatial unit and the share across a larger region—was used to determine whether Russian-speakers were overrepresented in a neighbourhood and, therefore, whether that neighbourhood was minority-dense. An LQ value greater than 1 indicates overrepresentation and, therefore, a minority-dense neighbourhood, and an LQ value less than 1 indicates underrepresentation (Brown & Chung 2006). Hence, only neighbourhoods with LQ values exceeding 1 were included in defining the research population. The reason for restricting the research population to Russian-speakers living in minority-dense neighbourhoods during childhood was that the research question was specifically interested in the effect of school ethno-linguistic composition on

moving out from minority-dense neighbourhoods and living in majority-dense (i.e., Estonian) neighbourhoods later in life, and any resultant implications for desegregation policies. Russian-speakers who grew up in Estonian-majority neighbourhoods as children are likely to be more integrated and, therefore, including them is unlikely to provide additional insight into residential desegregation.

The research population was extended for research question 2 (**Article III**) to include all Russian-speakers who had completed basic or general secondary education in 2005/06 and had lived and attended school in Tallinn Urban Region. This was because research question 2 wanted to consider the effect of growing up in an Estonian neighbourhood on a Russian ethno-linguistic minority member achieving tertiary education alongside other potential factors such as school ethno-linguistic composition. Additionally, a separate dataset in which the research population were members of the Estonian ethno-linguistic majority who had lived and attended school in Tallinn Urban Region was created to enable comparisons between the Estonian majority and Russian ethno-linguistic minority to be made in terms of factors influencing achieving tertiary education.

4.3. Methodology

Binary logistic regression modelling was used to analyse the data for both research questions 1 and 2. Binary logistic regression modelling was considered to be appropriate as the independent variables being examined included binary, categorical and continuous variables, and the dependent variables for both research questions—whether or not an individual lived in a majority-dense neighbourhood in 2019 (research question 1) and whether or not an individual achieved tertiary education (research question 2)—were binary.

In both cases, the nature of the data is such that individuals may be nested in schools and/or neighbourhoods. Therefore, it may be necessary to undertake multilevel binary logistic regression modelling to account for any nesting of individuals. To determine if multilevel modelling was required, separate intercept-only models with schools and neighbourhoods as the second level were analysed. For both research questions, the intraclass correlation coefficient values of the models indicated that individuals were nested in schools, but not neighbourhoods, and that multilevel modelling with schools at the second level was appropriate. This also indicates that, for research question 1, some of the variation in moving decisions can be explained by school characteristics and, for research question 2, some of the variation in achieving tertiary education can also be explained by the school.

Although the main independent variable of interest is the ethno-linguistic composition of schools (mainly Estonian or mainly Russian ethno-linguistic composition), information regarding the ethno-linguistic composition of schools is not available for the cohorts who completed basic and general secondary education in 2005 and 2006. However, since the vast majority of students attending Estonian-language schools are Estonian and Russian-language schools are Russian ethno-linguistic minority members, respectively, school language of instruction

can be used as a proxy for school ethno-linguistic composition. A dummy variable indicating whether someone had completed basic or secondary education in 2005 or 2006 was also included. Both of these variables were obtained from the 2005/06 EHIS data.

Other variables that might influence the dependent variables were also incorporated into the studies' models. These comprised individual characteristic variables, integration variables, parental characteristic variables and neighbourhood characteristic variables. Each set of variables was added stepwise into the binary logistic regression models.

In terms of individual characteristic variables, both studies included an individual's sex, while the study in **Article II** also included an individual's highest completed level of education in 2019 and occupation status in 2019, and the study in **Article III** considered ethnicity. All of these individual characteristic variables were obtained from the Population Register—2019 for **Article II** and 2020 for **Article III**.

Variables which corresponded to an individual's degree of integration into majority society consisted of citizenship, immigrant generation and Estonian language skills for both studies. **Article II** also included partner ethnicity. Citizenship, immigrant generation and partner ethnicity were derived from the Population Register, while Estonian language skills were obtained from the 2011 census, since the Population Register does not contain language data beyond mother tongue.

Parental characteristic variables were taken from the 2000 census. Both studies incorporated parental education and mother tongue variables, and **Article III** also included parental citizenship and occupational status variables.

Also derived from the 2000 census were childhood neighbourhood characteristic variables. The percentage of Russian-speaking residents in the childhood neighbourhood was included in both articles, while **Article III** also considered the percentage of residents with tertiary education in the childhood neighbourhood and whether a Russian-medium school was located in the childhood neighbourhood.

Since there could be self-selection of tertiary-educated parents into neighbourhoods with a higher share of tertiary-educated residents, two interaction variables were included in **Article III**: one for a potential interaction between mother's level of education and the share of residents with tertiary education in the childhood neighbourhood and another for a potential interaction between father's level of education and the share of residents with tertiary education in the childhood neighbourhood.

5. RESULTS

5.1. School ethnic composition and family context are associated with residential desegregation for the Russian ethno-linguistic minority living in minority-dense neighbourhoods in Tallinn Urban Region

This section describes the results of research question 1 and **Article II**, which considered the connection between the ethnic composition of neighbourhoods lived in as adults and the ethnic composition of schools, ethnic composition of childhood neighbourhoods, and family contexts for the Russian ethno-linguistic minority who grew up in minority-dense neighbourhoods in Tallinn Urban Region.

As demonstrated in Table 1 in **Article II**, most of the research population (94%) attended Russian-language schools, which is a strong indicator of the segregation between the Estonian majority and Russian ethno-linguistic minority in schools due to the dual language school infrastructure. Furthermore, a much higher proportion of those who studied in Estonian-language schools had moved from a minority-dense neighbourhood to a majority-dense neighbourhood by 2019 (28% compared to 13%). While this suggests that the language of instruction is indeed associated with whether a member of the Russian ethno-linguistic minority moves from a minority-dense to a majority-dense neighbourhood, it is also apparent from Table 1 (**Article II**) that the characteristics of those attending Estonian-language and Russian-language schools in the research population are not the same. Those who attended Estonian-language schools are more likely than those who attended Russian-language schools to have higher education in 2019, more likely to be an Estonian citizen and less likely to have Russian citizenship or hold an Estonian alien's passport, more likely to have an Estonian partner, more likely to have parents with higher education, and more likely to have at least one parent whose mother tongue was Estonian. One or more of these variables may instead be associated with moving from a minority-dense to a majority-dense neighbourhood and, therefore, binary logistic regression modelling is required to ensure that a confounder variable does not explain the apparent relationship between school language of instruction and a member of the Russian ethno-linguistic minority moving out from a minority-dense neighbourhood and into a majority-dense one.

Table 2 of **Article II** shows how the number and percentage of individuals who moved to a majority-dense neighbourhood, moved to a minority-dense neighbourhood or stayed in the same neighbourhood varies between the whole research population, those who studied in Estonian-medium schools and those who studied in Russian-medium schools. Although the intergenerational transmission of residential segregation has been documented in Estonia (Mägi et al. 2016) and elsewhere (Wells & Crain 1994), the extent to which it is evident in the research population is still startling. Over half (56%) still live in the same neighbourhood in which they grew up. A further 30% moved into another minority-dense neighbourhood, while only 14% moved into a majority-dense—i.e., strongly Estonian—neighbourhood. When the school language of instruction for the research population is considered,

it is observed that a lower share of individuals who studied in Estonian remain in the same neighbourhood in which they grew up compared to those who studied in Russian (44% vs. 57%) and that a much larger proportion of those studying in Estonian-medium schools moved into majority-dense neighbourhoods as adults (28% vs. 13%). When only those who moved into a different neighbourhood to the childhood one are examined, the difference is also striking. Almost half (49%) of those who studied in Estonian and changed neighbourhoods moved into a majority-dense neighbourhood, whereas only 30% of those who studied in Russian and changed neighbourhoods did so. This indicates that Russian ethno-linguistic minority members who studied in Estonian-medium schools have greater residential mobility and are more open to living in majority-dense neighbourhoods in adulthood.

Moving onto the multilevel binary logistic regression analyses (Table 3, **Article II**), it is clear that the proxy for school composition—school language of instruction—is associated with whether a member of the Russian ethno-linguistic minority who grew up in a minority-dense neighbourhood in Tallinn Urban Region lives in a majority-dense neighbourhood in 2019. Even when individual and parental socioeconomic characteristics, integration variables and neighbourhood ethno-linguistic composition are included in the models, someone who attended an Estonian-medium school—i.e., majority Estonian composition—has over twice the odds of living in a majority-dense neighbourhood in 2019 than someone who attended a Russian-medium, Russian majority composition school. Furthermore, the relationship is significant at the 0.1% level. As expected, individual socioeconomic and integration characteristics also exhibit significant associations with living in a majority-dense neighbourhood in 2019, although only partnership status appears have a larger impact than school composition / language of instruction—compared to someone with a Russian partner, an individual with an Estonian partner has over 2.5-times the odds of moving into a majority-dense neighbourhood, while being single nearly halves the odds of moving into a majority-dense neighbourhood. The percentage of Russian-speaking residents in the childhood neighbourhood has a significant relationship with living in a majority-dense neighbourhood in 2019, with a standard deviation increase in the percentage resulting in 1.01-times lower odds of moving into one. Interestingly, none of the parental background characteristic variables (educational level and mother tongue) have a significant link to whether someone moves into a majority-dense neighbourhood.

5.2. Tertiary educational achievement among the Russian ethno-linguistic minority in Tallinn Urban Region is associated with school ethnic composition, neighbourhood composition and family context

The results of research question 2 and **Article III**, which investigated whether tertiary educational achievement among the Russian ethno-linguistic minority in Tallinn Urban Region is linked to the ethnic composition of schools, the ethnic and educational composition of childhood neighbourhoods, and family context, are detailed in this section.

The educational level in 2020 of the Estonian population as a whole and the cohorts who completed basic or secondary education in 2005 and 2006 is documented in Table 1, **Article III**. Both among the population as a whole and the 2005 and 2006 cohorts, the share of those whose mother tongue was Russian who had achieved tertiary education was lower compared to the wider population, while a slightly higher share of those with Estonian as their mother tongue had achieved it. The expansion of tertiary education in Estonia is illustrated by the fact that a much higher proportion of the 2005 and 2006 cohorts had tertiary education than the population as a whole (over 40% compared with 20–25%). While both Russian-speakers and Estonian-speakers have benefited from the expansion, the gap between them in terms of achieving a university degree has also increased: from 2.6 percentage points among the wider population to 5.9 percentage points among the 2005 and 2006 cohorts in favour of Estonian-speakers. Despite the increase in university education among the Russian ethno-linguistic minority, the tertiary educational achievement gap between them and the Estonian majority has grown. This is especially interesting as it does not align with other studies in Europe that show the convergence of educational outcomes among immigrant populations over generations (e.g., Hermansen 2016).

Descriptive statistics for both the Russian-speaking and Estonian-speaking research populations for research question 2 are presented in Table 2, **Article III**. A slight majority of the Russian ethno-linguistic minority (55%) had not achieved tertiary education by 2020, while a similar proportion of the Estonian majority had. Perhaps unsurprisingly, a vast majority of both Russian-speakers (92%) and Estonians (>99%) were studying in schools that corresponded to their ethno-linguistic identity when they completed basic or secondary education. The share for Estonians is particularly striking, as it shows that almost no Estonians studied in Russian-language schools at the completion of basic or secondary education in 2005 and 2006. Table 2 also shows differences between the Estonian and Russian ethno-linguistic research populations in terms of ethnicity, citizenship, immigrant generation and parental characteristics. Regarding the latter, the Estonian group has a slightly higher share of individuals with parents who have a university degree. Also, a higher proportion of both mothers and fathers of those in the Russian-speaking group work in lower status occupations, while the reverse is the case for the Estonian group.

The results of the binary logistic regression analyses indicate that school, neighbourhood and family characteristics are associated with the likelihood that a Russian ethno-linguistic minority member will achieve tertiary education (Table 3, **Article III**). School composition—represented by the proxy variable school language of instruction—is indeed significantly related to achievement of a university degree, with Russian-speakers who attended Estonian-medium schools (i.e., majority Estonian composition) more likely to do so than those attending Russian-medium schools. Several factors that correspond to the degree to which an individual is integrated into majority Estonian society also demonstrate a significant association with tertiary educational achievement. Citizenship and Estonian language skills are both associated, with those holding Russian citizenship and especially those without citizenship—i.e., holding Estonian alien’s passports—much less likely to obtain tertiary education, while those able to speak Estonian were much more likely to get a university degree. Interestingly, no statistically significant differences were observed among different immigrant generations. Concerning parental variables, socioeconomic characteristics appear more important than indicators of integration, as mother’s occupational status and both mother’s and father’s educational level are significantly associated with achieving tertiary education. The only parental integration variable to demonstrate a significant relationship with tertiary educational achievement is father’s mother tongue, but, interestingly, those with a father whose mother tongue is Estonian were less likely to obtain a university degree than those who did not, the opposite of what would be expected. It is not immediately clear why this is the case; it may simply be a spurious result. In terms of neighbourhood characteristics, a higher percentage of residents with tertiary education in the childhood neighbourhood was associated with tertiary educational achievement, but the percentage of Russian-speakers was not connected. Finally, for the variables concerning the possible interaction between parents’ educational level and the percentage of residents with tertiary education in the childhood neighbourhood, no significant relationship with achievement of tertiary education was observed.

6. DISCUSSION

6.1. The role of schools, neighbourhoods and families in the Vicious Circle of Segregation

The residential and school contexts experienced when growing up can have significant effects on outcomes in adulthood. This is especially the case in cities with high levels of ethnic and socioeconomic segregation, as the difference in experiences and outcomes can be very profound (e.g., Reardon & Owens 2014; Galster & Sharkey 2017). The results of this thesis indicate that the ethnic composition of neighbourhoods lived in during adulthood and tertiary educational achievement are two such outcomes. Minority population members who attended schools with mainly majority students are more likely to experience residential desegregation and live in majority composition neighbourhoods (**Article II**) and achieve tertiary education (**Article III**) than those who attended schools with mostly minority students.

The results also illustrate how a “vicious circle of segregation” can develop as segregation in one life domain reinforces segregation in others. Individuals whose childhood is spent in low-income neighbourhoods with large proportions of minority ethnicity and immigrant background residents tend to achieve a lower level of education, occupy a lower position in the labour market, have a lower income, have poorer health and continue to live in low-income, minority-dense neighbourhoods during adulthood (Friedrichs et al. 2003; Sharkey 2008; Brattbakk & Wessel 2013; Jivraj et al. 2019). For individuals fortunate enough to grow up in affluent neighbourhoods, they are more likely to occupy a high labour market position with a high income, and to continue to live in affluent neighbourhoods as adults (Howell 2019). Meanwhile, attending a school where most students are from low-income, minority ethnicity and immigrant backgrounds often means a lower standard of teaching, fewer resources available to support learning, negative peer effects and lower aspirations in terms of academic success, which can translate into lower academic attainment. Attending a school with affluent peers, however, usually results in a higher standard of teaching, more resources available inside and outside the classroom, positive peer effects and greater academic aspirations, which tends to lead to higher educational attainment (Charles et al. 2007; Sykes & Kuyper 2013; Palardy 2015). Since there is a strong connection between residential segregation and school segregation—schools often draw their students from the surrounding neighbourhoods using catchment areas—experiences in neighbourhoods tend to be repeated in schools (Frankenberg 2013). Individuals living in affluent neighbourhoods generally attend schools where students are mainly from affluent households, while individuals living in low-income, minority-dense neighbourhoods generally attend schools whose students are from low-income, minority ethnicity households. Hence, the benefits of growing up in an affluent neighbourhood and disadvantages of growing up in a poor neighbourhood are compounded by attending a high-performing school and attending a low-performing school, respectively, producing a vicious circle of segregation.

The findings of **Article III**, however, suggest that the relationship between childhood neighbourhood context and outcomes later in life may be more nuanced than first thought. While minority population members who attended schools whose students are mainly from the majority population are more likely to receive a university degree than those attending schools with mostly minority students, the ethno-linguistic composition of neighbourhoods seems to have no significant impact. Instead, the educational level of a neighbourhood's residents is associated with tertiary educational achievement. These findings support previous studies which have found a positive impact on educational achievement from growing up in a higher socioeconomic status neighbourhood but contradict research showing a negative impact due to living in a neighbourhood with a higher share of minority ethnicity and immigrant background residents (Brattbakk & Wessel 2013; Nieuwenhuis & Hooimeijer 2016). However, it should be noted that peer effects due to the socioeconomic status and academic performance of classmates at school are not accounted for in the binary logistic regression models in **Article III**, due to a lack of data. It may be that some, or possibly even all, of the association between achieving tertiary education and attending a majority composition school may be in fact due to peer effects.

Family context also has an important role. Families provide the immediate environment in which children learn and develop, and the norms, values, attitudes, aspirations and expectations present in the family home are often inherited as children grow up (Archer et al. 2014). The educational level of parents is associated with residential desegregation and achieving a university degree, with having those having at least one parent with tertiary education more likely to live in a majority-dense neighbourhood later in life and complete tertiary education (**Articles II and III**). This indicates that more educated parents place greater importance on education, including attending university and obtaining a degree, which is transferred onto their children. Furthermore, more educated, higher socioeconomic status families are likely to possess greater resources, whether financial or educational, which can be used to support their children's learning (Charles et al. 2007; Guryan et al. 2008). It is the case that children from well-educated, high socioeconomic status families are still likely to attain a high level of education, including completing university, regardless of whether they live in an affluent or a deprived neighbourhood or attend a high-quality or a low-quality school. Similarly, children from less-educated, low socioeconomic status families are less likely to obtain tertiary education, even if they live in an affluent neighbourhood or attend a high-quality school. Moreover, as more affluent, more educated, higher socioeconomic status families sort into wealthier neighbourhoods—and their children sort into schools with higher academic performance—neighbourhood, school and family effects tend to act in combination, so children from higher socioeconomic status backgrounds usually receive the benefit of positive neighbourhood and school effects in addition to the benefit of their advantaged family background (Howell 2019). In the same way, children from lower socioeconomic status families receive all the disadvantages associated with their school, neighbourhood and family contexts. As socioeconomic status frequently intersects with ethnicity and

migrant status, advantages tend to accrue to children from the majority population, while disadvantages accumulate for minority ethnicity children and children from immigrant backgrounds. This is the case in Tallinn Urban Region, with Estonian children generally receiving beneficial effects from their neighbourhood, school and family contexts, while children from the Russian ethno-linguistic minority generally experience detrimental effects.

For individuals from an ethnic minority or immigrant background, the degree of integration into majority society is strongly linked to residential, educational and labour market outcomes later in life. For example, being able to speak the majority language and holding host country citizenship—indicators of the level of integration of someone into majority society—are associated with achieving tertiary education (**Article III**). Similarly, someone with host country citizenship is more likely to move out of a minority-dense and into a majority-dense neighbourhood later in life than someone without (**Article II**). However, not all indicators of integration into majority society are associated with moving from minority-dense to majority-dense neighbourhoods or achieving tertiary education. It would be anticipated that an individual who was a second- or third-generation immigrant would be more integrated into majority society, as posited by the straight-line theory of assimilation, because of the increased interactions and contacts with majority society experienced by later immigrant generations in schools, neighbourhoods and other life domains (Massey & Mullan 1984). Instead, there is no apparent association between immigrant generation and whether a minority population member achieves residential assimilation or obtains a university degree. However, this lack of association between immigrant generation and residential and educational outcomes in later life may be specific to the context of Tallinn Urban Region. The region has high levels of both neighbourhood and school segregation. Members of the Russian ethno-linguistic minority tend to live in Soviet-era apartment neighbourhoods where Russian-speakers are overrepresented (Ruoppila & Kährik 2003; Leetmaa et al. 2018). These neighbourhoods have well-developed Russian ethno-linguistic minority social networks and a wide variety of services and businesses available run by Russian-speakers. Russian-speaking parents have the option to send their children to Russian-medium schools or schools where most of the students have Russian as their mother tongue. Therefore, the combination of residential and school segregation reduces the number and frequency of inter-ethnic contacts between minority Russian-speakers and majority Estonians in Tallinn Urban Region, while at the same time facilitating own-culture maintenance. Furthermore, the segregated environment may foster attitudes which are resistant to residential assimilation or attending university. This suggests that the Russian ethno-linguistic minority in Tallinn Urban Region is experiencing segmented assimilation rather than straight-line assimilation, with different individuals experiencing different levels of assimilation into majority society depending on their neighbourhood, school and family context (Portes & Zhou 1993; Waters et al. 2010). Those members of the Russian ethno-linguistic minority who grow up in minority-dense neighbourhoods, attend Russian-medium schools, and have parents who cannot speak Estonian and are not integrated or assimilated into majority

Estonian society in other ways are likely to achieve a low degree of assimilation. In contrast, those who grow up in majority-dense neighbourhoods, attend Estonian composition schools, and have parents who have very good Estonian language skills and are well-integrated or assimilated into majority Estonian society are themselves likely to reach a high level of assimilation.

However, not all parents conform and send their children to schools whose students have the same ethno-linguistic identity. Although practically no Estonian students attend Russian-medium schools (i.e., Russian ethno-linguistic composition schools), a minority of Russian-speaking students attend Estonian-medium schools, whose composition is primarily Estonian (**Article III**). This indicates that a minority of minority background parents are actively choosing majority composition schools over minority composition schools. This is an interesting finding, suggesting that some minority parents value the characteristics of majority composition schools over the own-culture and language maintenance offered by minority composition schools. One reason for this may be that these parents consider such schools to be of a higher quality: for example, they may select schools with mostly majority population students if the local minority composition school has a poor reputation. Also, parents may value the stronger connections and expanded social networks with members of the majority population that may develop in majority composition schools, which may improve majority language skills and access to information about labour market opportunities.

That the quality, or perceived quality or reputation, of schools may be a factor in minority parents' decision to send their children to schools where most students are from the majority population is no surprise. As illustrated by the OED triangle, education can be an important driver of social mobility (Ganzeboom & Luijkx 2004; Andersen et al. 2021), and the increasing professionalisation of high-income jobs and importance of academic credentials mean that achieving a high level of education is now usually a prerequisite to earning a higher wage (Goldin & Katz 2007). As a result, achieving a university degree has become a key step towards employment in a high-income job. Schools are influential in this regard as high academic attainment at school is needed to enrol at a university and teachers and classmates at school help shape the attitudes, norms, expectations and aspirations of students, including the intention to pursue tertiary education (Palardy 2015). Therefore, attending a school with high academic performance and a record of leavers attending university can have a profound effect on their labour market prospects. Therefore, parents may prioritise the academic performance or reputation of a school when selecting a school for their children to attend (Kosunen 2014; Burgess et al. 2015), which they may judge based on the ethnic or socioeconomic composition of the school (Rangvid 2010; Rowe & Lubinski 2017; Bernelius et al. 2021).

As a result, access to quality schools—or schools perceived to offer a high-quality education—also plays an important role in the vicious circle of segregation, as it is a key criterion in neighbourhood residential choice for families with young children. Since many schools allocate places using catchment areas, parents with children at or approaching school age often choose to live in neighbourhoods

within the catchment areas of good schools to ensure their children can attend their preferred school (Bernelius et al. 2021). Hence, the choice of school and neighbourhood usually go hand-in-hand in a “joint residential-school choice” (**Article I**). This joint residential-school choice acts as a sorting mechanism for families with school-age children, as homes in neighbourhoods with good schools tend to command a higher cost to buy or rent (Cheshire & Sheppard 2004; Nguyen-Hoang & Yinger 2011). Only affluent households can afford to live in neighbourhoods with good schools, which displaces poorer households into cheaper neighbourhoods with worse schools (van Ham & Feijten 2008; Hedman et al. 2011; Burgess et al. 2015). Positive peer effects, such as greater academic ambitions or better behaviour, due to the socioeconomic status of classmates, can widen the differences in pupil achievement between schools in the most and least affluent neighbourhoods. Also, since many parents use the ethnic and socioeconomic composition of a school as a proxy for quality (Rangvid 2010; Rowe & Lubinski 2017; Bernelius et al. 2021), and because ethnicity and socioeconomic status generally overlap, majority ethnicity parents avoid schools with high shares of minority ethnicity and/or low-income students, further reinforcing school segregation. Therefore, this joint sorting of households with children into neighbourhoods and schools according to their sociodemographic characteristics perpetuates both the vicious circle of segregation and the inequalities between different neighbourhoods and schools.

6.2. School desegregation as a mechanism for desegregating other life domains

However, in the same way that the vicious circle of segregation replicates segregation in one life domain across other life domains, desegregation in one life domain could trigger the desegregation of others, creating a “virtuous circle of desegregation”. For example, desegregating schools can weaken the link between neighbourhood characteristics during childhood and income in adulthood, potentially reducing segregation in workplaces and industry sectors and decreasing income inequality between different sociodemographic groups. Reduced segregation in the labour market and lower income inequality can then help to desegregate neighbourhoods as more individuals and households who grew up in deprived neighbourhoods have sufficient wealth to move into affluent, desirable neighbourhoods.

The significant role of schools in the vicious circle of segregation alongside the findings of **Article II** and **Article III** suggest that desegregating schools may be an effective way of transforming a vicious circle of segregation into a virtuous circle of desegregation. In both articles, attending a majority composition school is significantly associated with residential integration (moving from a minority-dense into a majority-dense neighbourhood) and achieving a university degree for a member of the Russian ethno-linguistic minority in Tallinn Urban Region. In addition to their primary role of educating students and supporting academic achievement, schools also act as key sites of interactions with both classmates and teachers. Alongside

the neighbourhood and family home, schools are key arenas where norms, values, expectations and aspirations can be instilled. Attending a school where peers intend to get a university education or a school with a culture of futility can influence whether an individual chooses to pursue a university degree themselves (Palardy 2015; Vandell & Demaret 2021). Where neighbourhoods are ethnically segregated, schools may provide the only location where inter-ethnic interactions and contacts can occur, and where social networks can be diversified beyond the ethnic composition of the neighbourhood (Vedder et al. 2006; Dinesen 2011). The findings of this thesis support both “contact theory”—which posits that greater contact with members of other ethnic and socioeconomic groups can reduce prejudice and increase trust and respect (Allport 1954)—and “perpetuation theory”—which proposes that greater inter-ethnic contact in schools or neighbourhoods can be perpetuated in other life domains in later life (Braddock 1980; Pettigrew & Tropp 2006). However, as schools often reflect their immediate neighbourhoods, schools tend to be segregated along similar sociodemographic lines (Denton 1996; Frankenberg 2013). Therefore, desegregating schools is an important step in severing the links between neighbourhood composition and school composition and between neighbourhood composition and educational level, breaking the vicious circle of segregation and establishing a virtuous circle of desegregation. Desegregating schools may be particularly effective as neighbourhood effects tend to be mediated through schools (Sykes & Musterd 2011).

Desegregating schools, though, is not a simple task. Most school allocation methods—such as catchment areas or parental choice—tend to transfer neighbourhood segregation into schools or produce segregation in schools which exceeds that within the neighbourhood (Burgess et al. 2005; Boterman 2019; Kauppinen et al. 2022). Lotteries have been used to allocate students to schools in a small number of places as a way of ensuring neighbourhood segregation does not translate into school segregation (e.g., Allen et al. 2013; Glazerman & Dotter 2017). However, these cases have not been without controversy, especially among some parents. Furthermore, many parents place importance on attending a school close to the home and, where parental choice is much less constrained, parents value the opportunity to exercise choice. Therefore, introducing a fairer, lottery-based school allocation method may be politically unpalatable. Alternatively, a parental choice school allocation system could be adopted that includes measures to eliminate the advantage middle-class parents have courtesy of their strategies to maximise the chances that their children are allocated to their preferred school. Such measures could include targeted efforts to engage with minority ethnicity parents and parents from other sociodemographic groups less likely to exercise school choice optimally to ensure that they have a full understanding of the process. However, this assumes that parents from different sociodemographic groups have the same or similar criteria for selecting and ranking schools. In some cases, minority ethnicity parents may deliberately choose schools with high shares of minority ethnicity students because of concerns about discrimination at majority composition schools

or because the school is attended by a high number of co-ethnic students (Lewis & Danzig 2010). In these circumstances, changes to school allocation methods may have little impact.

Where proximity-based school allocation methods are used, such as catchment areas, then the simplest way to desegregate schools may be to desegregate neighbourhoods, as school composition would reflect the desegregated composition of the surrounding neighbourhoods. Since greater income and wealth facilitate greater choice in the housing market, any policies aimed at desegregating neighbourhoods must eliminate this wealth-based inequality in choice. Therefore, policies which ensure a wide variety of home sizes, types (e.g., apartments, small and large houses) and tenures are available in each neighbourhood should be implemented, enabling households of different incomes and wealth to live in the same neighbourhood. This includes the availability of social housing (i.e., subsidised rent). However, the strong two-way connection between neighbourhood composition and school composition, underpinned by the joint residential-school choice that many households make when relocating, complicates the desegregation process. Neighbourhood and school choice often go hand-in-hand and, where parental choice is incorporated into the school allocation process, middle-class parents can opt to avoid local schools (Saporito 2003), maintaining school segregation even when neighbourhoods have started to desegregate. Hence, policies that promote desegregation in neighbourhoods and in schools, such as diversifying housing types and tenures in neighbourhoods and introducing fairer school allocation methods, must be pursued together, so that desegregation in one of the domains is reinforced by desegregation in the other.

6.3. Creating a Virtuous Circle of Desegregation in Tallinn Urban Region

The case of Tallinn Urban Region illustrates the challenges of reversing the vicious circle of segregation to become a virtuous circle of desegregation. It has high levels of ethno-linguistic segregation in its neighbourhoods. Furthermore, this segregation appears entrenched, as most Russian-speakers who grow up in neighbourhoods overrepresented with Russian-speakers also live as adults in neighbourhoods overrepresented with Russian-speakers (**Article II**). More than a half continue to live in the same neighbourhood. This ethno-linguistic residential segregation was originally the result of Soviet-era housing allocation policies, where many of the newly built apartments were allocated to Russian-speaking immigrants from other Soviet republics. However, it has persisted because of a combination of the free market housing allocation system established after re-independence in 1991 and the different neighbourhood preferences of the Estonian majority and the Russian ethno-linguistic minority: Estonians tend to prefer the wooden housing neighbourhoods and suburbs and Russian-speakers the Soviet-era apartment districts (Ruoppila & Kährik 2003; Leetmaa et al. 2018). Furthermore, the different neighbourhoods have developed separate Estonian- and Russian-language social networks, infrastructure and services, which act as additional attractors to

remaining in these types of neighbourhood. Since re-independence and the free market reforms that followed, income and wealth also play a role in neighbourhood choice. Estonians have disproportionately benefitted from both the change from a centrally-planned economy to one based on free markets and Estonia's re-orientation away from Russia and towards Europe. As a result, they now tend to be more affluent and have higher incomes than Russian-speakers—a reversal of the Soviet situation (Leping & Toomet 2008; Saar & Helemäe 2017). Greater wealth and higher incomes provide greater residential mobility, which means that Estonian households usually have more choice in terms of the neighbourhoods in which they could settle compared to Russian-speaking households. At the same time, the free housing market has allowed capital to be invested in new suburban homes on the edge of Tallinn Urban Region, new apartments in the inner-city neighbourhoods and renovating some of the older wooden housing districts. Affluent Estonian households have taken advantage of these new housing options, becoming both suburbanisers and returning to inner-city neighbourhoods close to professional employment locations in the city centre (Kährrik & Tammaru 2008). The arrival of wealthier, middle-class households to these inner-city districts has precipitated the social upgrading of these neighbourhoods and, increasingly, their gentrification (Pastak & Kährrik 2021). Meanwhile, the Soviet-era apartment neighbourhoods are generally unattractive to wealthier Estonian households. Their appeal lies in that they tend to be where the most affordable housing in Tallinn Urban Region is located and, for Russian ethno-linguistic minority members, have well-developed Russian-language social networks and services and a familiar cultural environment. The upshot of this is that, while the inner-city districts of Tallinn have tended to become more attractive places to live, the Soviet-era apartment neighbourhoods, especially those in the poorest condition, have begun to decline in status and desirability (Leetmaa et al. 2018). Hence, the free market reforms to housing allocation in Estonia have helped maintain the ethno-linguistic segregation that formed in Tallinn Urban Region's neighbourhoods during the Soviet period.

Schools are even more strongly segregated, mainly as a result of the separate Estonian- and Russian-medium education systems established during the Soviet period. This segregation has persisted after Estonia's re-independence, despite an ongoing transition to fully Estonian-language teaching. Virtually all students at Russian-medium schools have Russian as their mother tongue, while most students at Estonian-medium schools have Estonian as their mother tongue (**Article III**). This indicates that language of instruction—and the ethno-linguistic compositions that result—are important factors in the school choice decisions of parents in Tallinn Urban Region, possibly from a desire for own-culture and mother tongue maintenance. Hence, most children growing up in Tallinn Urban Region experience similar ethno-linguistic environments in both their neighbourhood and their school.

Desegregating schools in Tallinn Urban Region, therefore, represents a significant challenge. There are clear preferences among Estonian and Russian-speaking parents for a school whose language of instruction corresponds to their mother tongue and whose students share their ethno-linguistic identity, which may mean that any attempts to desegregate schools are met with resistance. This may be an

issue particularly with Estonian parents, as virtually no students with Estonian as their mother tongue attend Russian-medium schools (**Article III**). Therefore, it is questionable whether simply switching the language of instruction at schools will spur desegregation in Tallinn Urban Region's schools. The current school allocation system, which allows a large degree of parental choice (Pöder & Lauri 2014a), means that measures to desegregate neighbourhoods are unlikely to reduce school segregation, as parents are able to select a school outside the neighbourhood if the local school does not match their criteria in terms of language of instruction or ethno-linguistic composition. Moreover, Estonia's free market system for housing allocation, with only a small proportion of social housing, makes desegregating neighbourhoods very challenging indeed (Kährik 2002).

Despite these challenges, it is still important to try to desegregate both schools and neighbourhoods in Tallinn Urban Region. In particular, policies to desegregate schools may have to be implemented slowly and in such a way that builds and maintains broad support. Increasing the size of the social housing sector in Tallinn Urban Region's housing market, and providing social housing in neighbourhoods that lack it, would help to reduce residential segregation. Efforts to desegregate or integrate schools could be pursued slowly, possibly by starting with kindergartens and pre-primary schools, when second language acquisition is easier and inter-ethnic contacts may be more influential. Integration of later school years could then be implemented as cohorts who have attended integrated kindergartens and pre-primary schools move up through the education system. However, housing markets and school allocation methods are inherently political subjects and, therefore, may become subjects of political debate and opposition. For example, changing the school allocation system so that parents miss out on the preferred school for their children may be unpopular and, therefore, politically unpalatable. Hence, the benefits of measures to tackle desegregation must be communicated well and any attempt to implement desegregation policies must consider the potential political perspectives and discourses they may provoke, otherwise they may risk failure. Perhaps the most challenging aspect in school desegregation in Tallinn Urban Region is to develop a compelling political narrative that generates broad support for desegregation policies, overcoming parents' current preferences for schools with students who have the same ethno-linguistic identity as their children and for own-culture and language maintenance.

6.4. Study limitations

It is important to recognise that there are limitations to the research undertaken in this thesis. First, only associations between studying at an Estonian composition school and moving from a minority-dense to a majority-dense neighbourhood in adulthood and between attending an Estonian composition school and achieving tertiary education are demonstrated for members of the Russian ethno-linguistic minority in Tallinn Urban Region and not causation. It may be that there are one or more confounding factors which were not accounted for in the logistic regression models that explain the connection. Second, the research does not shed

any light on the decision-making process undertaken by households when choosing where to live and to which schools to send their children. Although the language of instruction and the ethno-linguistic composition of schools appear to be key factors in school choice, it is vital to understand parents' rationales for preferring particular schools over others and how these decisions are framed, as these can inform how policies are developed and presented. For example, if parents avoid schools whose students primarily have Russian as their mother tongue because they perceive these schools to be less academically successful, then measures to counteract this perception can be implemented. However, it must be acknowledged that school choice often goes hand-in-hand with neighbourhood choice, and that it is necessary to also understand the trade-offs involved in the joint residential-school choice. A third limitation is that the studies in **Articles II and III** use only a single point in time in defining the childhood neighbourhood—the 2000 census. The characteristics of the neighbourhood recorded in the 2000 census may not be representative of the neighbourhood(s) someone lived in during the rest of their childhood. However, the residential mobility of the Russian-speaking minority in Tallinn Urban Region is low, and the characteristics of the neighbourhoods lived in at the time of the 2000 census are likely to be representative of the childhood neighbourhood. Another issue with using a dataset from a single point in time is that the length of exposure to different neighbourhood contexts is not available. Research suggests that the length of time lived in a deprived or affluent neighbourhood affects the size of any neighbourhood effects (Hedman et al. 2015). A further limitation of the research is that school academic performance is not included in the models. This is especially relevant for **Article III**, as school grades are important for being able to enrol at a university. It is conceivable that some of the factors found to be associated with Russian ethno-linguistic minority members achieving tertiary education may become weaker or insignificant when school grades are considered. Finally, neither empirical study accounts for the socioeconomic status of classmates—some of the association between school ethno-linguistic composition and both residential context in adulthood and tertiary educational achievement may be due to school socioeconomic composition. This cannot be ruled out, especially as the Russian ethno-linguistic minority in Tallinn Urban Region tends to have lower socioeconomic status compared to ethnic Estonians (Saar & Helemäe 2017).

6.5. Future research

The findings of this thesis also point towards directions for future research. It is vital to understand the decision-making process carried out by households when choosing neighbourhoods in which to live and schools to which to send their children. Since these decisions are often combined in a joint residential-school choice, a greater comprehension of how different criteria for prospective schools and neighbourhoods are assessed and what trade-offs are considered can provide a much deeper insight into how the neighbourhood and school sorting mechanisms create and reinforce segregation in both neighbourhoods and schools. This can

be achieved by undertaking qualitative research, through interviews and focus groups involving households—especially those with children at or approaching school age—who have recently moved home, are in the process of moving or are considering moving. Another future research avenue is to extend the scope of existing studies to include other life domains beyond the residential and education domains. It would be worthwhile investigating the effect of neighbourhood, school and family contexts on incomes and workplace ethno-linguistic composition, further testing the theories of “segregation across multiple domains” and the “vicious circle of segregation”. Also, the role of the transition from education to employment in reinforcing or disrupting inequalities and segregation has received comparatively little attention in studies. Finally, the socioeconomic dimension of segregation across different life domains in Tallinn Urban Region should be examined, especially within schools. Tallinn Urban Region has experienced significant increases in income inequality and socioeconomic segregation in recent years, in addition to ethno-linguistic segregation. Although there is some overlap between ethno-linguistic and socioeconomic segregation, as Russian-speakers usually have lower socioeconomic status compared to Estonians, the inclusion of the socioeconomic contexts of schools and neighbourhoods will contribute to a more complete picture of segregation in Tallinn Urban Region.

7. CONCLUSIONS

Neighbourhood segregation, school segregation and family context each play an important role in influencing the opportunities and outcomes individuals have during their lives. However, they are also interlinked, as neighbourhood segregation and school segregation tend to occur together as a result of the joint residential-school choice made by families and households with similar sociodemographic characteristics. The combination of residential and school segregation means that young people from different ethnic and socioeconomic groups have few opportunities to meet and interact with each other, especially in neutral settings, such as schools. This lack of inter-ethnic contact can help perpetuate ethnic segregation, as young people do not become comfortable in multi-ethnic environments and retain a perception of ethnic threat.

This thesis furthers the understanding of the interrelationship between neighbourhood segregation, school segregation and family context by focusing on the connections between school ethno-linguistic composition and the residential desegregation and tertiary educational achievement of minority students. The findings suggest that persistent ethno-linguistic segregation in neighbourhoods, schools and other life domains is not inevitable. First, minority students who grew up in minority-dense neighbourhoods and attended majority composition schools were significantly more likely to live in a majority-dense neighbourhood later in life compared to minority students who also grew up in minority-dense neighbourhoods but attended minority composition schools. This association remained significant after accounting for adult occupational status, indicators of integration into majority society (e.g., citizenship, having an majority ethnicity partner) and parental background. This indicates that attending a school with classmates from the majority population can help minority population members become more comfortable in diverse environments and integrate into majority society such that they choose to live in majority-dense neighbourhoods as adults. Second, minority students who attend majority composition schools are significantly more likely to achieve tertiary education than minority students who attend minority composition schools. This relationship stayed significant even when citizenship, majority language skills, parental background characteristics and other variables were added to the models. Meanwhile, the educational level of neighbourhood residents, but not their ethno-linguistic identity, was also found to be significant. Studying at school alongside majority population members may instil the aspiration and expectation of pursuing a university degree among minority students, or improve academic attainment, which may help them to reach a higher position in the labour market and earn a higher income than otherwise would be the case. Therefore, the close links between neighbourhood, school and family contexts, which so often produce and reproduce segregation in a “vicious circle”, could mean that desegregating schools initiates a “virtuous circle of desegregation”, as desegregated schools improve inter-ethnic contacts and reduce educational, labour market and income

inequalities between different sociodemographic groups, enabling minority households to access high income jobs and homes in affluent neighbourhoods, thus reducing segregation in neighbourhoods and workplaces.

However, desegregating schools is a complicated process, due to the two-way relationship between school context and neighbourhood context and the fact that more affluent households, who tend to belong to the majority population, usually have much larger school and neighbourhood choice sets. School catchment areas mean that neighbourhood segregation is transferred to schools, and the joint residential-school choice results in households being sorted into neighbourhoods and schools based on their wealth and income. Even in cities with relatively low levels of segregation, schools can become segregated if a high degree of parental choice is permitted in the school allocation system, as affluent families opt out of local schools perceived to be of lower quality. Therefore, desegregating schools and neighbourhoods is most likely to succeed when measures for each are implemented together. The initial desegregation in each domain can trigger further desegregation in the other, reversing the vicious circle of segregation into a virtuous circle of desegregation.

Desegregating neighbourhoods and schools in cities and urban regions with entrenched segregation, such as Tallinn Urban Region, is extremely challenging. Improving the diversity of housing sizes, types and tenures, including building new social housing, would help address neighbourhood segregation, while changing the school allocation process—e.g., by using a lottery system—would help prevent neighbourhood segregation being replicated in schools. However, to maximise the chances of success, policies targeting neighbourhood and school segregation should be implemented concurrently, otherwise the persistent segregation in one domain will reduce the efficacy of any intervention in the other. Even so, implementing such policies, especially any aimed at desegregating schools, may be unpopular and controversial. Hence, policies intending to desegregate schools and neighbourhoods must be designed carefully such that they gain broad support.

This thesis has revealed much about about the relationship between neighbourhood segregation, school segregation and family context using the case of Tallinn Urban Region. The region's neighbourhoods and, in particular, schools are heavily segregated along ethno-linguistic lines. Desegregating schools, however, could help to desegregate neighbourhoods and reduce the gap in tertiary educational achievement between majority and minority population members. The current “vicious circle of segregation” could be reversed to become a “virtuous circle of desegregation”. However, the strong link between neighbourhood composition and school composition and the joint residential-school choice made by households with young children mean that neighbourhood segregation could hinder the progress of any school desegregation policies. Hence, policies designed to reduce both school and neighbourhood segregation should be pursued together, as they are likely to reinforce each other. With the right mix of policies, decreasing segregation in schools, neighbourhoods and other areas of life is a realistic prospect.

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SUMMARY IN ESTONIAN

Elukohasegregatsiooni, koolisegregatsiooni ja perekondliku konteksti seosed

Erinevast rahvusest ja erineva sissetulekuga inimesed kipuvad koonduma elama teatud linna asumitesse. Nii tekib ruumiline eraldatus ehk segregatsioon. Kui varasemad uurimistööd keskenduvad peamiselt ruumilise eraldatusele elukohtades, siis nüüd on suurenenud huvi selle vastu, kuidas ruumiline erinevates eluvaldkondades on seotud. Käesolev uurimus käsitleb ruumilise eraldatuse seoste asumites ja koolides. See, et erinevast rahvusest inimesed kipuvad koonduma erinevatesse asumitesse ja koolidesse, on sageli seotud sellega, et lapsed asuvad õppima oma kodupiirkonna koolides. Kui erinevast rahvusest laste vanemad elavad erinevates linna asumites, kandub ruumiline eraldatus ka koolidesse, sealt tööturule ning tööturul tekkivad sissetulekute erinevused mõjutavad inimeste elukohavalikuid. Nii tekib nähtus, mida nimetatakse „ruumilise eraldatuse nõiaringi” kus ruumiline eraldatus taastoodab ennast, kandudes vanemate põlvkonnast edasi laste põlvkonda. Samas ei mõista me neid ülekandemehhanisme täna veel piisavalt hästi ning käesolev doktoritöö aitab seda lünka täita.

Doktoritöö eesmärk on nii teoreetilise kui ka empiirilisel parandada arusaamist elukohasegregatsiooni, koolisegregatsiooni ja perekondliku konteksti vahelistest suhetest. Teoreetiline osa (**artikkel I**) laiendab arusaamist „ruumilise segregatsiooni nõiaringi” (vicious circle of segregation) kontseptsioonist, mis selgitab, kuidas segregatsioon kandub ühest eluvaldkonnast teise, jaotades nii inimesi elama erinevatesse asumitesse, õppima erinevatesse koolidesse, tööle erinevatesse töökohtadesse ja eraldi tegutsema muudesse tegevuskohtadesse, näiteks huviringidesse ja teistesse vaba aja veetmise kohtadesse. Doktoritöö empiiriline osa koosneb kahest Tallinna linnaregioonis läbi viidud uuringust, mis põhinevad järgmistel uurimisküsimustel:

1. Kuidas seonduvad lapsepõlve asumite rahvuslik koosseis, laste perekondlik taust ja koolide rahvuslik koosseis nende vene noorte elukohavalikutega täiskasvanuna, kes kasvasid lapsena üles peamiselt venekeelsetes asumites (**artikkel II**).
2. Kuidas mõjutavad lapsepõlve asumi rahvuslik ja hariduslik koosseis, laste perekondlik taust ja koolide rahvuslik koosseis kolmanda taseme ehk gümnaasiumi järgse hariduse omandamise tõenäosust vene emakeelega noorte seas (**artikkel III**).

Tallinna linnaregiooni kontekst on huvitav, sest eesti ja vene emakeelega inimeste osakaal linnas tervikuna on sarnane, kuid erineb märkimisväärselt erinevates asumites. Nii on linnas asumeid, kus vene emakeelega inimesed on oluliselt ülesindatud ning asumeid, kus eesti emakeelega inimesed on oluliselt ülesindatud. Teaduslikus mõttes on huvipakkuv ka hariduskorraldus, mis on jaotanud noored enam kui pool sajandit eesti ja vene õppekeelega koolidesse. Nii õpivad eesti õppekeelega koolides peamiselt (kuid mitte ainult) eestlased ning vene õppekeele-

ga koolides peamiselt kõikide teiste rahvusrühmade esindajad, mis on tekitanud venekeelse elanikkonna Eestis kitsamalt ning eesti ja vene keeles toimivad paralleelühiskonnad laiemalt. Kuna osa teiste rahvuste lastest õpib siiski ja eestikeelses koolis koos eestlastega ja nende osakaal kasvab, siis ongi käesoleva doktoritöö keskmes küsimus, kas eestlaste koos õppimine aitab vene noortel väljuda ruumilise eraldatuse nõiaringist.

Erinevast rahvusest inimeste koonduvad elama teatud linnaosadesse ja asumitesse nii rahvusrühmade sissetulekuerinevuste ja eelistuste tõttu. Väiksema sissetulekuga leibkondadel on vähem valikuvõimalusi ja kõige vähem jõukad leibkonnad saavad valida ainult kõige vähem soovitavaid naabruskondi. Sageli on sisserändajate ja teistesse rahvusrühmadesse kuuluvate inimeste sissetulekud madalamad kui põhirahvusel. Tallinna mõjutas erinevast rahvusest inimeste jaotumist erinevatesse asumitesse ka nõukogude ajal olnud seosed uuselamuehituse ja sisserände vahel. Sisserändajatele jaotati kortereid eelisjärjekorras just valminud elamupiirkondadesse ehk ruumiline eraldatus teket nii elukohtades kui koolides juhtis ja orkestreeris riik.

Erinevatesse asumitesse elama asumine ja erinevatesse koolidesse õppima asumine on omavahel tihedalt seotud. Ühelt poolt võtavad koolid lapsi õppima lähimast ümbruskonnast. Teiselt poolt valivad vanemad sageli elukohta selle alusel, milline on piirkonna kool. Seetõttu peegeldavad asumite ja koolide rahvuskoosseisud vastastikku teineteist. Siia lisandub perede sissetulekute mõte. Hinnatumate koolide ümbruses on üldjuhul eluasemed kallimad, mis tähendab, et parimate koolide piirkondades on üleesindatud jõukad pered. Seega mõjutab laste elukoha ja kooli seoseid omakorda vanemate tööturu positsioon. Nii tekib keerukas seoste võrgustik (a) asumite elanike koosseisude, (b) koolide õpilaste koosseisude ja akadeemilise edukuse ning (c) laste perekondliku tausta ehk vanemate sotsiaalset seisundi, tööturu edukuse vahel.

Ruumilise eraldatuse nõiaringi muudab eriti püsivaks asjaolu, et lastega perede jaoks on elukoha ja kooli valikud omavahel seotud, mille tulemusena jaotuvad koolieas lastega pered jõukuse ja sissetuleku järgi nii koolidesse kui ka naabruskondadesse, mis muudab kooli ja naabruskonna vahelise segregatsiooni eriti tugevaks. Ning just selle tugeva seose lõhkumine aitab väljuda ruumilise eraldatuse nõiaringist. Lapsed omandavad uusi teadmisi kiiresti ja nii areneb keeleoskus. Koolid on olulised kohad ka väärtuste, normide, püüdluste ja ootuste kujundamiseks, mis mõjutavad noorte edasist eluteed, näiteks kavatsust minna edasi õppima ülikooli. Väga oluline on see, et koolides tekivad suhtlusvõrgustikud. Näiteks on tänaseks üldteada, et lapseas teise riiki elama asunud ja koos kohalike lastega õppinud noored lõimuvad asukohamaal kiiremini kui nende täiskasvanueas saabunud vanemad. Koolide kaudu tekivad suhtlusvõrgustikud ka vanemate vahel. Seetõttu keskendubki käesolev uurimistöo nende vene noorte uurimisele, kes elavad lapsepõlves valdavalt venekeelses asumis, kuid õpivad kas vene või eesti õppekeelega koolis selitamaks selle valiku pikemaajalisi mõjusid kõrghariduse omandamisele ja elukohavalikule juba täiskasvanueas.

Kahe empiirilise **artikli II ja III** andmeanalüüsid toetuvad Eesti rahvaloenduste, rahvastikuregistrist, haridusregistrist (EHIS) ja Euroopa maksude andmekogu Euromod andmetele. **II artikli** fookuses on lapsepõlvea ja täiskasvanuea elukoha-sumi keeleline keskkond. Täpsemalt mõõdab sõltuv muutuja seda, kes peamiselt venekeelses asumis üles kasvanud vene noortest elab täiskasvanueas peamiselt eestikeelses asumis (1) või mitte (0). **III artikli** fookuses on kõrghariduse omandamine. Täpsemalt mõõdab sõltuv muutuja seda, millised vene noored jõuavad kõrghariduse omandamiseni (1) ja millised mitte (0). Sõltuvad muutujad on binaarsed, mistõttu on peamiseks analüüsi meetodiks mõlemas artiklis binaarne logistiline regressioon. Mudelid on mitmetasandilised ehk koole uuritavad noored moodustavad esimese ja koolid teise tasandi. Sellise analüüsistrateegia valik on tingitud sellest, et samas koolis õppinud noored on omavahel rohkem seotud ehk nad on saanud sarnaseid „koolimõjutusi”. Kooli rahvusliku koosseisu mõõdetakse kaudselt ehk õppekeele alusel. Mõlemad uuringud hõlmavad erinevaid teoreetiliselt olulisi tunnuseid nagu õpilaste demograafilised näitajad nagu sugu, lõimumise näitajad nagu kodakondsus, perekondlikku tausta iseloomustavad tunnused nagu vanemate haridus muutujaid ja lapsepõlve elukohaasumi tunnused nagu täpne vene emakeelega inimeste osakaal asumis. **III artikkel** sisaldab ka tunnuste vahelisi vastasmõjusid (interaktsioone).

II artikli põhitlemusena selgus oluline seos eesti õppekeelega koolis käimise ja täiskasvanuea asumi keelekeskkonna vahel. Need noored, kes elasid lapsepõlves Tallinna venekeelses asumis ja õppisid vene õppekeelega koolis elasid suure tõenäosusega ka täiskasvanueas Tallinna venekeelses asumis. Tallinnas. Need noored, kes elasid lapsepõlves Tallinna venekeelses asumis ja õppisid eesti õppekeelega koolis elasid suure tõenäosusega aga täiskasvanueas Tallinna eestikeelses asumis. See seos jäi oluliseks ka pärast kõigi teiste muutujate, sh vanematega seotud perekondliku tausta, lisamist. Individuaalsete tunnuste osas seostus täiskasvanueas eestikeelses asumis elamine kõrghariduse omandamise ja parmini tasustatud ametialal töötamisega. Ka teised lõimumise tunnused nagu näiteks Eesti kodakondsuse olemasolu või eestlasest elukaaslasega kooselamine seonduvad täiskasvanueas eestikeelses asumis elamisega. Perekondliku tausta täiskasvanuea elukohavalikutega aga olulist rolli ei mängu ehk vanemate mõju avaldub just selles, kas laps suunatakse õppima eestikeelses või venekeelses kooli.

III artiklis põhitlemusena selgus, et Tallinna linnaregioonis üles kasvanud vene noorte kõrghariduse omandamine on seotud kooli õppekeelega. Eesti õppekeelega koolis õppinud vene noortel on suurem tõenäosus omandada kõrgharidus kui vene õppekeelega koolis õppinud vene noortel. See seos jäi oluliseks ka pärast seda teiste tunnuste lisamist regressioonimudelisse. Individuaalsetest tunnustest selgus, et naiste puhul on kõrghariduse omandamise tõenäosus oluliselt suurem kui meeste puhul. Lõimumist mõõtvate muutujate osas selgus, et Eesti kodakondsusega vene noored omandavad oluliselt suurema tõenäosusega kõrghariduse kui Venemaa kodakondsusega noored. Välismaalase passi omanike seas on kõrghariduse omandamine aga kõige vähem tõenäoline. Eesti keelt kõnelevad vene noored omandavad kõrghariduse palju tõenäolisemalt kui need, kes eesti keelt ei oska. Nii

nagu kooli õpikeele valikul on ema ja isa roll oluline ka kõrghariduse omandamisel. Need vene noored, kellel emal või isal on kõrgharidusega on ka endal suurem tõenäosus omandada kõrgharidus.

Kahe uuringu tulemused näitavad seega, et eesti õppekeelega koolis õppimine suurendab tõenäosust Eesti ühiskonda lõimuda, toetades nii kõrghariduse omandamist kui vähendades elukohapõhist segregatsiooni täiskasvanueas nendel noortel, kes elasid peamiselt venekeelsetes asumites lapsepõlves. See tõendab, et kaotades laste jaotamise koolidesse õppekeele alusel koolide segregatsiooni kaotamine aitab kaas rahvuspõhiste erinevuste vähenemise ühiskonnas. Tulemused viitavad ka sellele, et „ruumilise eraldatuse nõiaringi” võib potentsiaalselt ümber pöörata ja muuta „lõimumise hoorattaks” (virtuous circle of integration).

Siiski ei ole segregatsiooni kaotamine koolides lihtne ülesanne. Õpilaste koosseis koolide peegeldab laste koosseisu kooli ümbritsevas asumis. Kuna elukohtade põhine segregatsioon on kasvanud suureks nii Tallinnas kui paljudes teistes maailma linnades, mistõttu kooli õppekeele muutmine üksi ei pruugi lõimumis piisavalt toetada ning võib isegi kaasa tuua soovimatuid tulemusi kui kohalikud põhirahvusest lapsed jäävad koolis vähemusse. Nii on oluline mõista, et elukoha valik ja kooli valik moodustavad ühtes terviku ning vaid ühe elemendiga (näiteks koolid) tegelemine ei anna veel soovitud tulemusi. Elukoha- ja koolisegregatsiooniga tuleb tegeleda üheaegselt ning nende omavahelisi koosmõjusid ning samuti vanemate valikuid arvestavalt, sest käesolevast uuringust selgus, et vanematel laste kooli- ja haridusvalikutes oluline roll.

Kokkuvõttes aitas doktoritöö paremini mõista lõimumisprotsesside ruumilist iseloomu ehk kuidas on omavahel seotud elukoha- ja koolisegregatsioon ning laste perekondlik taust. Uurimistöö näitas, millised on võimalused ruumilise eraldatuse nõiaringi lõhkumiseks, aga nendest probleemides, mis sellega võivad omakorda kaasneda.

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I leave Tartu with good thoughts and incredible memories.

PUBLICATIONS

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