RESEARCH REPORT
STUDY PAPER 257
SEPTEMBER 2025

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THE ROCKWOOL FOUNDATION
RESEARCH

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Published by:
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Address:
The ROCKWOOL Foundation Research Unit
Ny Kongensgade 6
1472 Copenhagen, Denmark

Telephone +45 33 34 48 00
E-mail: kontakt@rff.dk
en.rockwoolfonden.dk/research/

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Co-Ethnic Neighbours and Integration of Migrant Children[1]

Anna Piil Damm[2], Ahmad Hassani[3], Camilla Hvidtfeldt[4],

Trine Skriver Høholt Jensen[5], Marie Louise Schultz-Nielsen[6]

Abstract: We investigate the effects of co-ethnic residential networks on migrant children; how the size and quality of that network impact an individual's academic achievement, potential criminality, and human capital accumulation. We exploit a natural experiment in Denmark between 1999 and 2021, when refugee immigrants were assigned to neighbourhoods quasi-randomly. We find strong evidence that the size as measured by the assigned share of co-ethnic neighbours reduces the student's grade point average (GPA) rank within the cohort at the 9th grade exit exams as well as the GPA rank in Danish and Math. We define co-ethnicity either by shared language or shared country of origin. The effects of the assigned share of co-ethnic neighbours are stronger when using shared minority language rather than shared country of origin, when defining neighbours at a granular level, and when controlling for fixed differences in school resources and neighbourhood amenities. The employment rate among assigned co-ethnic neighbours in their working ages (quality) is found to reduce the risk of grade repetition. Turning to long-term effects, the size and quality of the co-ethnic network has little effect on educational attainment, but their short-term effects on academic achievement appear to in turn affect later criminal behaviour among males. We find strong evidence that both the assigned share of co-language neighbours and the assigned share of young people convicted for crimes in the neighbourhood increase conviction rates for male students later in life, and suggestive evidence that the share of young people convicted among co-ethnic neighbours additionally explain conviction probabilities. Our results are consistent with the views that co-language neighbours reduce minority members' incentive to speak in the majority language or trigger prejudice, producing short-term negative effects on academic achievement and in turn increasing the risk of juvenile delinquency, and that established ethnic enclaves facilitate progression through compulsory school through knowledge sharing about host-country institutions.

Keywords: Immigrants, Refugees, Neighbourhoods, Human Capital Investment, Education, Educational Production Function, Crime, School, Wellbeing, Shared Language, Shared Culture.

JEL codes: I21, I24, J15, R23

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[1] Acknowledgement: We acknowledge financial support from the ROCKWOOL Foundation and Aarhus University. We are grateful for research assistance on an earlier draft from Camilla Hedegaard Hansen and Eloise Madison Plesser. The authors have no relevant or material financial interests that relate to the research in this paper. We apricate the helpful comments from Nabanita Datta Gupta, Matti Sarvimäki, Panu Poutvaara.

[2] Department of Economics and Business, Aarhus University, Fuglesangs Allé 4, DK-8210 Aarhus V. Email: apd@econ.au.dk

[3] Department of Economics and Business, Aarhus University, Fuglesangs Allé 4, DK-8210 Aarhus V. Email: ahass@econ.au.dk

[4] ROCKWOOL Foundation Research Unit, Ny Kongensgade 6, 1472 København K. Email: ch@rff.dk

[5] Department of Economics and Business, Aarhus University, Fuglesangs Allé 4, DK-8210 Aarhus V. Email: tshj@econ.au.dk

[6] ROCKWOOL Foundation Research Unit, Ny Kongensgade 6, 1472 København K. Email: mls@rff.dk

1 INTRODUCTION

Immigrants from low-income countries and their descendants make up an increasing share of Western countries' populations. For instance, in Denmark since 1988, the population share has increased from 2% to 14%—and the share is expected to grow further in the future. While the share of natives living in low-income households in Denmark remained constant at around 5% from 1988 until 2016, the share of low-income migrants with origin from low-income countries increased from 18% to 28% in this period (Damm et al., 2019). In short, the share of migrants is increasing, and among them more are poor.

A childhood in poverty negatively influences later life-chances. In accordance with the high prevalence of poverty among migrant children, previous studies demonstrate a substantial educational gap between natives and migrant children from low-income countries (Bratsberg et al., 2012; Dustmann et al., 2012; e.g., Schnepf, 2007). The existing literature shows that parental socioeconomic status partly explain the migrant-native gap in upper-secondary education and, in some countries, entirely explain exam marks gap in primary school (Ansala et al., 2020; Fallesen, 2017; Støren & Helland, 2010). In Denmark, the gap is only significant for migrant children who arrived after school starting age. The results indicate that something unrelated to parental characteristics happens during the primary schooling ages. As migrants from low-income countries are highly segregated across schools and neighbourhoods in Denmark, an explanation of the educational gap can be caused by differences in school inputs and peer effects. Some migrant children may be lucky to grow up in "areas of opportunity" that are better at promoting educational attainment among migrant children. To a large degree, it is still a black box which neighbourhood characteristics promote educational attainment and school wellbeing for migrant children. The present paper aims at eliciting the content of this black box.

One important reason for neighbours to affect school outcomes is social interaction between individuals, which is the mechanism we aim to isolate in this paper. Contact to neighbours may further provide information about the present values of particular actions, as in informational role models (see Chung 2000), or create conformity behaviour, as in moral role models. Manski (1993, 2000) distinguishes between two types of social interaction: endogenous interaction, where the propensity of an individual to engage in school activities varies with the behaviour of her peer group, and contextual interaction, where the propensity of an individual to engage in school activities varies with the "exogenous" or "contextual" characteristics of residents, such as their economic and social status or their attitudes toward education. Another reason may be that individuals in the same municipality share the same institutional environments, such as the quality of educational institutions, which in turn affect schooling. These "correlated" effects (Manski 1993) are not social effects, and they are not created by social interactions

Observed associations between school outcomes and neighbourhood characteristics are likely biased and cannot be interpreted as causal effects. This is because families tend to self-select into neighbourhoods based on unobserved preferences for local amenities (Tiebout, 1956), which confounds simple comparisons of, for example, educational attainment or school wellbeing across areas. To overcome the selection challenge, we utilise the Danish Spatial

Dispersal Policy on Refugees 1999–2021. The Policy enables us to identify area characteristics that causally affect migrant children's educational outcomes, in both the short, medium and long run. Refugee household heads in our sample were assigned to 93 of 98 municipalities in Denmark, and 1,109 of the 1,961 macro-neighbourhoods (57%). We show that household heads were randomly distributed across municipalities, conditional on a few observable individual demographic characteristics and assigned municipality fixed effects. Similarly, we show household heads were also randomly distributed across small-scale neighbourhoods, conditional on a few observable individual demographic characteristics and assigned municipality fixed effects.

We focus on the population of children of refugees who arrived together with or shortly after the first-arrived parent. In Denmark, each home address belongs to a school district with one school, which is the default school and school of enrolment of the majority of children. The quasi-random neighbourhood assignment of children in our estimation sample translates into quasi-random assignment to school districts. We can distinguish more forcefully than previous work between social effects, induced by social interaction, and correlated effects, as the large number of municipalities and macro-neighbourhoods and the extended period of the spatial dispersal policy allows us to estimate models with municipality, school district or neighbourhood fixed effects to eliminate all time-invariant area characteristics. We thereby add substantially to the knowledge regarding characteristics of areas of opportunity.

Building on existing theory and evidence on neighbourhood effects, we consider two types of neighbourhood characteristics. First, neighbourhood characteristics that that are common to all neighbours such as the employment rate (Case and Katz, 1991; Chetty et al. 2020) and the youth crime conviction rate (Damm and Dustmann, 2014). Second, neighbourhood characteristics that take into account that residential networks are likely to be stratified by ethnic origin (e.g. Åslund et al. 2011; Damm 2014; Damm and Dustmann, 2014) according to two prominent theories. First, common culture and language decrease the cost of interaction as argued in the seminal paper by Lazear (1999). Second, modern versions of "realistic group conflict theories" (RGTC) (Campbell, 1965) posit that competition between groups engenders the belief in a "group threat", which in turn leads to prejudice and negative stereotyping by members of one group against the other, simultaneously bolstering within-group cohesion (Sidanius and Pratto, 1999) under particular circumstances. According to contact theory (Allport, 1954) interaction between ethnic groups can lead to more understanding and reduction of prejudice under four conditions: equal group status, common goals, intergroup cooperation, and authority support. An additional RGCT prediction is that "resource stress" (Esses et al., 2001) or "economic vulnerability" (Citrin et al., 1997) will enhance perceptions of the threat posed by competing groups. Thus, these RGTC theories suggest that the allocation of individuals of different backgrounds in one's immediate neighbourhood may trigger prejudice, by generating a sense of collective threat, unless such interaction is taking place under particular conditions, as suggested by contact theory, and a hypothesis that finds support in empirical research by, e.g., Brooks (1975) and Bradburn et al. (1971).

Our quasi-experimental design implies that by chance some refugee children are initially assigned to neighbourhoods with higher shares of co-ethnic neighbours which may slow down

their progression in the host-country language due to lower incentive to invest in the host-country language (Lazear, 1999) and expose them to more prejudice and negative stereotyping in the assigned neighbourhood depending on the extent to which the four conditions given by Allport (1954) are met.

Co-ethnic peers may also impose social norms to each other that could slow down cultural integration (Koopmans 2016). Even second-generation immigrants – for whom language skills should be less of an issue than for their parents – appear to be heavily influenced by their parent's origin country cultures (Guiso, Sapienza, and Zingales 2006; Alesina, Giuliano, and Nunn 2013).

We find that the size and quality of the co-ethnic residential network affects academic achievement in the short and medium run. First, defining co-ethnics as language fellows, we see that a one percentage point higher share of co-ethnics in the assigned neighbourhood at arrival reduces the overall grade point average (GPA) rank at the 9th grade exit exam by between 0.69 and 0.86 percentage points, corresponding to 2 percent. The share of language fellows in the assigned neighbourhood at arrival also reduces the GPA rank in Danish and Math. The effects of the share of the co-ethnics in the assigned neighbourhood on GPA tend to be stronger when ethnicity is defined as shared minority language rather than shared country of origin, when defining neighbours at the level of smaller-scale neighbourhoods instead of municipalities, and when accounting for fixed differences in school resources and neighbourhood amenities. The result is consistent with the view that exposure to more language fellow neighbours reduce minority members' incentive to speak the majority language or increase prejudice towards minorities with short-term negative effects on academic achievement.

Second, we use the employment rate among the co-ethnic residential network as a proxy for the quality of the adult co-ethnic network. Here, we find that a one percentage point higher employment rate among language fellows in the assigned neighbourhood at arrival reduces the probability of being too old for the grade at the 9th grade exit exam (our measure signifying grade repetition) by between 0.17 and 0.21 percent, or 0.2 percent. This result lends support to the view that exposure to more resourceful adult co-ethnics in the neighbourhood assigned at arrival facilitate progression through compulsory school, likely through knowledge sharing about host-country institutions and role model effects.

Finally, focusing on the longer-term outcomes — attained years of education at ages, 18, 19, 20 and 21, and the risk of being inactive (defined as neither being in education nor employment), we find no effects of the quality of the adult co-ethnic residential network on educational attainment of migrant children.

In the long run, the general employment rate in the municipality at assignment plays a role. Regarding attained years of education at age 21, a one percentage point increase in the municipality employment rate reduces the attained years of education by 0.17, corresponding to 2%. As to the risk of being inactive, the municipality employment rate at assignment increases the risk of being inactive for age groups 18–19 and 18–20, but has no affect on the risk of being inactive for age group 21. A one percentage point increase in the employment rate

increases the probability of being inactive by 0.024 to 0.04 percentage points, depending on specification. Hence, a higher municipality employment rate at assignment leads to both fewer years of education at age 21 and a temporary increase in the risk inactiveness. This indicates that even though a high employment rate in the assignment area can increase the employment rate of immigrants moving into this area (Azlor et al., 2020), a high employment rate can also crowd out children's incentives to invest in upper secondary education. Corresponding to the effects of the municipality employment rate on inactivity, we find that the youth crime conviction rate, in contrast, increases the probability of being inactive.

Finally, we examine whether effects of the size and quality of co-ethnic residential networks found on education in turn affect the risk of criminal behaviour. Consistent with such a mechanism, we find that the share of language fellows in the assigned neighbourhood increases the risk of a conviction later in life for young males. Moreover, in line with Damm & Dustmann (2014) we find that a higher youth crime conviction rate in the assigned municipality enhances the risk of convictions later in life for young males and suggestive evidence that the share of young people convicted among co-ethnic neighbours additionally explain conviction probabilities. A one percentage point higher youth crime conviction rate in the neighbourhood at arrival enhances the conviction probability among young male refugees by 5.4 percentage point for the age group 15–21, corresponding to 25 percent.

Our paper is not the first to explore neighbourhood effects. Beyond an extensive literature exploring associations between neighbourhood characteristics and different outcomes for children and adolescents from low-income families (see reviews by e.g., Leventhal & Brooks-Gunn, 2000; Mayer & Jencks, 1989; Sampson et al., 2002; Sharkey & Faber, 2014), there is a smaller, but growing literature exploiting social and pseudo-natural experiments. This literature can be divided into groups according to what provides the exogenous variation supporting causal interpretation.

First, several studies use as exogenous variation; randomized house choice voucher programs in which households from poor areas are randomly chosen to be offered a voucher for the chance to move to more affluent areas—the Moving to Opportunity (MTO) operated in Baltimore, Boston, Chicago, Los Angeles, and New York is probably the most well-known of these programs (see e.g., Chetty & Hendren, 2018; Kling et al., 2007; Leventhal & Brooks-Gunn, 2004). Different from our setting the MTO literature investigates a move to better neighbourhoods, due to the neighbourhood assignment procedure in our setting we investigate effect of staying in some of Denmark's less well-off neigbourhoods. The short-term results from the MTO show that moving to a better neighbourhood increase dwellers' subjective wellbeing (and female physical health), had positive effects on younger children's educational outcomes, and led to less behavioural problems among boys; however, the studies find no significant effect on adult employment and earnings (Katz et al., 2001; Kling et al., 2007; Leventhal & Brooks-Gunn, 2004). Later studies also identify positive medium- and long-term results for children who moved before age 13, inter alia in terms of increased college attendance, lower rates of teenage births, and improved earnings (Chetty et al., 2016; Chetty & Hendren, 2018). For children moving during adolescence, Chetty et al. (2016) find negative, but statistically insignificant effects which they interpret as potential disruption effects. Yet not

all studies of voucher programs find neighbourhood effects. Jacob et al. (2015), for instance, find that change of neighbourhood due to vouchers had very little if any impact on education, crime, and health outcomes for children in households moving from unsubsidized private housing into public housing.

Second, another group of studies use public housing demolition as exogenous variation. Contrary to programs where households are offered vouchers and some voluntarily chose to move, those who were exposed to housing demolition are forced to move. Jacob (2004) studies the short-term impact of public housing demolition in Chicago during the mid-1990s; he finds no effect on the achievement of children in households affected by demolition and attributes this to small differences between the emitting and the receiving neighbourhoods. Chyn (2018) exploits the same housing demolitions in Chicago, but analyses long-term impacts on children. He demonstrates notably better labour market outcomes for the displaced children—both in terms of employment rates and earnings—and lower rates of arrests for violent crimes. In line with the MTO-studies, he also shows that children who were displaced at younger ages have lower high school drop-out rates. However, like the results based on voucher programs, not all studies using housing demolition to obtain causal estimates get results consistent with Chyn (2018). Haltiwanger et al. (2020), e.g., use a larger and more nationally representative group of housing demolitions and find significant improvements in labour market outcomes at age 26, but attributes this effect to increased job opportunities in the new neighbourhood rather than childhood human capital growth.

Demolition limits the supply of public housing—another way of doing so, is putting a cap on the construction costs of public housing. In Denmark, a reform in 2004 introduced such a cap and led to a major drop in supply of public housing units. Hassani (2024) employs this reform and shows that for children for whom living in public housing was an important option, the pre-reform 2002-cohort lived around 13 months longer than the post-reform 2006-cohort in public housing. The reform created exogenous variation: growing up in public housing significantly reduces the risk of dropping out from national tests in grade 6. Each additional month in public housing also lowers the likelihood of high school absenteeism and improves self-reported social wellbeing at school.

A third group of studies uses the variation in neighbourhood assignments created by waiting lists for public housing. Oreopoulos (2003), e.g., argues that in Toronto, the assignment of families to housing units was quasi-random as it was mainly based on household size and families could not specify housing project preferences. Oreopoulos cannot detect any effect of living in low-poverty neighbourhoods on children's long-run labour market outcomes. Relatedly, Weinhardt (2014) argues that long waiting lists for public houses in high-demand areas of England made the timing of moving into public housing exogenous. Exploiting the exogenous variation in the timing of moving and a difference-in-differences approach he finds that living in deprived neighbourhoods—characterized by high concentration of public housing—did not affect teenagers' test scores in the short-run.

Yet another group of studies use natural catastrophes for identification of neighbour effects. Sacerdote (2012) studies how students' test scores were affected when Hurricanes Katrina and Rita forced them to switch neighbourhoods and schools. Despite relatively large declines in

test scores among the evacuees in the first year after the hurricanes, there were positive longer-term effects on children's test scores. The results are not unambiguous, as he also finds a modest negative effect in the college attendance rate. Deryugina et al. (2018) instead base their results from Katrina on tax return data. The evacuees' income surpasses that of the control households. Nakamura et al. (2022) use as exogenous variation a 1973 volcanic eruption on the Westman Islands (Iceland), covering houses with lava and thereby forcing households to move. By comparing the households with those whose houses were not destroyed by lava (and therefore stayed on the islands), they show positive effects on education and long-run labour earnings for the children that were part of households forced to move, while there were signs of negative effects for the children's parents.

Finally, a group of studies use refugee dispersal and settlement policies as a source of exogenous variation. Edin et al. (2003), use a reform of the Swedish immigrant reception system implemented during 1985–1991 which limited where refugees could resettle. Living in ethnic enclaves improves labour market outcomes for those in the lower end of the skill distribution. Åslund et al. (2011) exploit the same reform to study the effects of neighbourhoods on refugee immigrant children's school performance (9^{th} grade exit exam, GPA) and longer run educational effects. The number of highly educated fellow countrymen positively influence immigrant children's compulsory school grades. The disadvantaged students gain more than other students by having many fellow countrymen, and the effect on GPA likely leads to improved educational attainment for boys and children from less-educated families. In a U.S. context, Beaman (2012) exploits variation in the size and structure of refugee social networks and detect heterogenous labour market effects: an increase in the number of refugees arriving the year before lowers the employment probabilities, while an increase in the number of tenured network members improves labour market outcomes for recently arrived refugees.

Denmark—like Sweden— has had a refugee dispersal policy. Damm (2005, 2009a) establishes that the Danish refugee dispersal policies during 1986-1998 led to quasi-random neighbourhood assignment for newly arrived refugees, while Azlor et al. (2020) do the same for the later period 1999–2016. Results from the first period strongly supports that living in an ethnic enclave increases refugees' annual earnings: one standard deviation rise in the share of co-ethnics increases the annual earnings by 18%. Results from the second period show that a one percentage point higher employment rate in the assigned municipality increases refugees' employment probability by 0.5–0.6 percentage point two to four years after resettlement. Both studies provide quasi-experimental evidence that immigrant labour market outcomes are affected by the labour market conditions in the assigned resettlement neighbourhood. Lastly, Damm and Dustmann (2014), also exploiting the refugee dispersal policy during 1986–1998, find strong evidence of the infectious nature of crime: for male refugees, the risk of being convicted increases with a high share of young people convicted for violent crimes in the assigned neighbourhood.[7]

[7] Using child gender as another kind of natural experiment, Dustmann and Landersø (2021) also show spillover effects of crime. Very young men fathering a son instead of a daughter are less criminal in the first years after

We contribute to the existing literature in several ways. First, our study is the first focusing on causal effects of neighbourhood characteristics on a variety of school outcomes across compulsory school grades using the exogenous variation in neighbourhood characteristics which arises from a Spatial Dispersal Policy – the study by Åslund et al. (2011) described above is the most closely related in terms of study design and aim. Second, to our knowledge, with exception of the studies by Åslund et al. (2011), Oreopolous (2003), Weinhardt (2014) and Hassani (2024), other studies on this topic investigate the effects of moving out of (rather than living in) disadvantaged areas on children's educational outcomes. Therefore, factors of disadvantaged neighbourhoods that *causally* affect the schooling outcomes of children (e.g., the youth crime conviction rate) have not been studied. Third, in contrast to most existing studies on neighbourhood effects, our study also investigates effects of neighbourhoods, allowing for ethnically stratified networks within the neighbourhood and thus heterogenous effects of a particular neighbourhood by ethnicity. Fourth, in contrast to most previous studies on the effects of ethnic enclaves on immigrant outcomes, our study distinguishes between the effects of the size and the quality of the ethnic network (following, e.g., Åslund et al. 2011; Damm 2014). Finally, in the absence of co-nationals in the assigned neighbourhoods, immigrants and their children might interact with neighbours with whom they share a common language. In this regard, we consider size and quality of residence-based co-ethnic networks using two different definitions of ethnic enclaves: co-nationals (strong ties) and language fellows (weak ties). Only one previous study also considers co-language fellows, and for other outcomes (Damm et al., 2024). Hence, this will be the first study that uses alternative definitions of ethnicity to identify the effect of size and quality of residence-based co-ethnic networks on a wide range of child, adolescent, and young adult outcomes.

2 BACKGROUND

2.1 Distribution of immigrants in Denmark

In 1986, the population in Denmark totalled 5.1 million. By 2021, the population had reached 5.9 million. The population increase is almost entirely due to immigration, primarily from non-Western countries. Over that period, the population share of immigrants has increased from around 3% to 11% (www.statbank.dk/FOLK2) — and the share is expected to continue growing. Since the mid-1980s, a significant share of non-Western immigrants has received a residence permit for reasons of asylum. In our observation period from 1999 until 2021, refugees primarily arrive from Syria, Afghanistan, Iraq, Iran, and Eritrea. The largest inflow of refugees in our study period was in 2015, in which 10,783 permits of residence for reasons of asylum were granted (www.statbank.dk/VAN66). Immigrants in Denmark settle to a large degree around the major cities, Copenhagen, Aarhus, Odense, and Aalborg.

2.2 Being an asylum seeker in Denmark

With the exception of UN quota refugees (of which Denmark invited 500 annually until 2016), applicants for asylum apply after arrival in Denmark and live in a refugee reception center until their asylum application has been processed.

birth, thereby quasi-randomly lowering the neighbourhood crime rate. The study shows that this reduces criminal convictions among other young men in the neighbourhood.

When an individual seeking asylum spontaneously arrives at the border to Denmark, the individual will have to go to the nearest police station to invoke the call for asylum. The police will bring the asylum seeker to a reception centre and report the individual to the Danish Immigration Service (DIS), as illustrated in Figure 1. A caseworker at DIS will meet the asylum seeker to confirm the identity of the applicant, and record the reason(s) for asylum, the home country of the refugee, etc. In this meeting, the applicant can express a wish to settle in a particular municipality at the time of receipt of asylum, just one wish, not a prioritized list of municipalities. At this early stage of the asylum process, neither the asylum seeker nor DIS know whether or when the applicant will receive asylum and which settlement municipalities will have vacant slots at the time of receipt of asylum, so the chance of realizing a location wish, if any, is meagre, as argued below.

After meeting with the caseworker, the caseworker refers the asylum seeker to an asylum centre. The asylum seeker lives at the asylum centre throughout the processing time of their case. The waiting period varies between individuals and the year in which the application is processed, but during 2005 and 2010 it lasted on average 376 days (Hvidtfeldt and Schultz-Nielsen 2018). The applicant has no way of influencing the time it takes to process the case. If the applicant gets asylum in Denmark, a caseworker from DIS assigns the refugee to a municipality with a non-filled refugee quota for the present year, as described in the next subsection. The municipality of assignment bears the responsibility for finding suitable housing and conducting an integration program for the refugee. The integration program is an official three-years program offered by the municipality of residence.

[Insert Figures 1 and 2 around here]

The refugee is only eligible for social assistance during the first three years if the refugee resides in the municipality of assignment and participates in the integration program. The requirement results in a large share of refugees staying the three years and even longer in the municipality of assignment, as seen in Figure 2. The figure illustrates the geographical stability of settlement in the assigned municipality among refugee household heads who got asylum between 1999 and 2020. Around 85% still lived in the assigned municipality after four years. The relocation rate peaks three and a half years after assignment at a rate of 3.6% but declines fast thereafter. Eight years after assignment, 75% of refugee household heads still live in the municipality that they were assigned to by DIS upon receipt of asylum.

2.3 The Danish Spatial Dispersal Policy on Refugees 1999–2021

Quasi-random municipality assignment — To ensure an equitable distribution of refugees across municipalities equipped with suitable facilities for integration, such as institutions for qualifying education and relatively low percentages of immigrants, Denmark implemented its first policy of geographical dispersal of refugees in 1986 (Damm, 2005). The 'Integration Act,' enacted by the Danish Parliament on January 1, 1999, marked a significant reform of this policy, which remains in effect. Hereafter, we will refer to the reform as the Danish Spatial Dispersal Policy on Refugees 1999–2021. In this study, we exploit natural variation in neighbourhood characteristics of newly arrived refugee children created by the reform because micro data on grades received in the 9th grade exit exam only exist from 2002 and micro data

on national test scores received in primary school only exists from 2010, which enable us to investigate neighbourhood effects in the short and medium term. Knowledge of such effects are key to understanding long-term effects of growing up in a particular neighbourhood. Below, we describe the reform in 1999 in detail and its implications for the settlement pattern of the 1999–2021 cohorts.

The reform aimed to achieve an even more balanced distribution of refugees in proportion to the local population size across municipalities and reduce subsequent migration from the assigned municipality of residence. The former goal is obtained by allocating the annual influx of refugees across municipalities according to a quota system that settles refugees in municipalities with a positive quota; municipalities with a lower immigrant concentration receive a higher quota. The formula for calculating annual municipal quotas is outlined in the third chapter of the Integration Act. In this regard, it is important to note that the method for calculating quotas did not change during 1999–2021.[8] At the beginning of each year, it is possible to assign refugees to all municipalities with a positive quota. However, as months pass and more refugees are assigned to municipalities, municipal quotas are filled. This means that a potential individual wish to settle in a particular municipality registered during the interview by the caseworker at DIS at the start of the asylum process may be satisfied at the beginning of each year. However, in the next months, it gradually becomes more difficult to meet location wishes. If a refugee would like to go to a municipality that has fulfilled the annual quota, she cannot settle there and will be assigned to another municipality with vacant slots. Only under very special conditions will a refugee be settled in a municipality with a full quota (DIS-interview[9]). The important point is that the date at which an asylum seeker is granted a residence permit is not under the control of the asylum seeker. Therefore, despite a potential wish for a specific municipality, asylum seekers who receive residence permits in later months are less likely to realize a potential location wish. Later arrivals during a calendar year are assigned to other municipalities with vacant slots. Importantly, this aspect of the refugee settlement policy is a novel finding of our interview with the DIS and has not been discussed in public and was not noted in the literature until the publication of Azlor, Damm, and Schultz-Nielsen (2020). In addition, the date on which a refugee is assigned to a municipality can be considered outside the control of the refugee, given that the month in which asylum is granted can be regarded as nonstrategic and since municipal assignment takes place shortly after receiving asylum.[10] Furthermore, asylum seekers' waiting period to obtain a Danish residence permit can last months (or even years) (Hvidtfeldt, Schultz-Nielsen, Tekin and Fosgerau 2018).

Using this formula to predict annual municipal refugee quotas, Azlor, Damm, and Schultz-Nielsen (2020) found a high correlation of 0.96 between predicted and actual refugee quotas across municipalities. Notably, socioeconomic characteristics of the municipality, such as job and rental housing vacancies, do not factor into the formula for calculating municipal quotas.

[8] For more detailed information about the calculation of annual quota, see Appendix A in Azlor et al. (2020).
[9] Two of the authors (Damm and Schultz-Nielsen) conducted an interview that addressed the administration of the Danish Spatial Dispersal Policy with Bente Herbst Bendiksen and Janne Lindblad at the DIS on January 18th, 2017.
[10] It takes 40 days on average from refugees' date of residence permit until they are registered in the municipality population register in the period 2005–2010 (Hvidtfeldt and Schultz-Nielsen, 2018).

The Danish Immigration Service does not consider educational qualifications obtained prior to asylum in municipal assignments. This is because educational qualifications from refugees' home countries are typically not easily transferable to the Danish labour market, and municipalities' demand for specific educational groups is modest (Azlor, Damm, and Schultz-Nielsen, 2020). Additionally, the primary consideration for placement is given to close family members already residing in Denmark, with spouses and children always settled in the same municipality as the first arrived family member.

Quasi-random neighbourhood allocation — The municipality of assignment is responsible for providing assigned refugees with affordable rental housing of an appropriate size based on household size shortly after receiving the residence permit. To address acute housing problems among individuals requiring social assistance, the municipality can exercise the right to assign such individuals to every fourth vacant unit in public housing[11] and private rental houses that have received public subsidies for building renovation within the last five years. Applicants are assigned based on a waiting list, ensuring a diverse mix of residents in each public housing section (Ministry for Children, Equality, Integration, and Social Affairs, 2015). Additionally, to address housing problems, the municipality can negotiate the right to assign individuals to vacant private rental housing with compensation to the owner and purchase of apartments from cooperative housing associations for resale or rental (Ministry for Children, Equality, Integration, and Social Affairs, 2015). This helps achieve a better mix of residents in certain apartment blocks. However, the municipality is prohibited from letting housing units at a rental rate below the market rent. Refugees can obtain a means-tested loan from the municipality for residential deposits and a means-tested rent subsidy. Due to the shortage of affordable rental housing, queues of individuals with the same characteristics waiting for housing were common. Consequently, whenever the municipality received a vacant housing unit in a block with relatively few immigrants, it was offered to the next refugee in line whose household characteristics matched the housing. This prevented the municipality from selectively placing refugees with the same household characteristics.[12] As anticipated, refugees are initially settled in municipalities with a relatively low share of non-Western immigrants (Damm et al., 2022). Within these municipalities, refugees are provided housing in neighbourhoods with relatively high proportions of public housing, co-nationals, and individuals of low socioeconomic status (Damm et al., 2022).[13] In this context, investigating the effects of area characteristics for the subsample of refugees assigned to a municipality in the later months of the year resembles a field experiment.

2.4 Refugee children in Danish Schools

In Denmark, all children are entitled to receive education (in school or at home) from Aug. in the year in which they turn six until completion of national exit exams in grade 9.[14] An average Danish child will enrol in pre-school (grade 0) in the year of turning six, enrol in grade one in

[11] The municipality can negotiate a higher share than every fourth vacant unit in public housing (Ministry for Children, Equality, Integration and Social Affairs 2015).
[12] For a similar argument related to refugees' settlement during the first Danish Spatial Dispersal Policy (1986-1998), see Hasager and Jørgensen (2021).
[13] Since 2010, municipalities are not allowed to offer housing to newly recognized refugees in socially deprived neighborhoods (public housing areas listed as "Ghettos" on the annual list from the Ministry of Housing).
[14] LBK nr. 34 af 14/12/2017.

the year of turning seven and enrol in grade 9, the final grade, in the year of turning 16. Figure 3 illustrates a refugee child's progression through the Danish educational system. The pupil has to, on average, pass the national exit exams at the end of grade 9 to enrol in secondary education. Secondary education can consist of vocational training, high school or a combination of the two. Turning to tertiary education in Denmark, the university requires a high school diploma to access. We study the cohorts that graduate between 1999 and 2021.[15] To make sure a change of the grading system in 2006 does not affect our results, we transform observed grade point averages at the exit exams in grade 9 into percentile ranks within the cohort.

[Insert Figure 3 around here]

Especially important to our research design is that each Danish home address belongs to a school district with one school. Therefore, the parental home address mainly determines the school in which a child is enrolled.[16] Consequently, quasi-random assignment of refugees (and their children) to neighbourhoods can be translated to quasi-random assignment of children to school districts and schools.

An arriving refugee child will, if arriving before the age of school, start following the Danish school system as the average Danish child. They will start in preschool (grade 0) in Aug. of the year they turn six and progress to the next grade each year until grade 9, which ends with national exit exams in most subjects. Before Aug. 2009, only grades 1-9 were compulsory, but most pupils took the pre-school offer. Since then, ten years of schooling has been compulsory. If a child has difficulties academically or socially, the child can repeat a class. The child repeats a class to give the child a possibility to mature and learn more before ending compulsory schooling. The possibility of extending compulsory schooling with an extra year can also be used if the child's Danish skills are not sufficient to complete the exam.[17] This is likely to be the case for refugee children who immigrate several years after school start. To include observations on the national exit exams in grade 9, in the case that the child has postponed the final exam, we measure the individual's academic performance by the age of 18.

The Danish compulsory schooling ends with a national exam at the end of grade 9. A pupil can attend the full exam or only the exams in certain subjects. The exam consists of two tests in Danish (oral and written), a test in Math (written), an test in English (oral) and a combined test in physics and chemistry (oral). The exam also tests the student in two of three subjects: religion, history or geography, decided by an official draw by the Ministry of Education.[18] The written exam in Danish consists of a test in reading, a test in spelling, a test in grammar and a

[15] In 2006, the Danish grade system was reformed from being a 00-13 system with thirteen "Given for the exceptionally independent and excellent performance (very rare)" to a system ranging from -3 to 12, where the grade twelve is now given "For an excellent performance displaying a high level of command of all aspects of the relevant material, with no or only a few minor weaknesses" (https://ufm.dk/en/education/the-danish-education-system/grading-system.) Both grade systems are based on absolute grading, where the grade should be based on the students' performance alone, and not taking other pupils' performance into account.

[16] Additionally, due to existence of a few slots for students outside of each school district, the likelihood of registration of students in other school districts is low. Finally, as refugee families are often low-income families, their possibility of enrolling children in private schools for which they have to pay enrolment fee is also low.

[17] LBK nr. 595 af 15/05/2019, LBK nr. 1510 af 14/12/2017.

[18] LBK nr. 1510 af 14/12/2017, BEK nr. 262 af 20/03/2007

test in style. The test in Math is split into two, one written exam with the use of aid and one without.

A child with academic or social difficulties can partake in only the non-drawn exams or take part in the exams in 9th grade and then complete the exams at the end of a voluntary grade 10 a year later.[19] Students completing grade 10 attend the grade 10 final exam in one or more subjects corresponding to the final exam in grade 9.[20]

Ideally, we would also have liked to use as an outcome a binary indicator for having completed upper secondary education. However, individuals in our sample are too young, given that they on average complete compulsory school later than native children. Instead, we measure effects on years of completed education by a given age between age 16 until age 21.

3 Conceptual framework: Human Capital production Theory

According to theory of human capital, inaugurated by Becker (1964), education is an investment that will produce earnings in the future. Ben-Porath (1967), Heckman (1976), and Weiss (1986) have documented that the theory of human capital explains the difference in observed earnings-profile across skill groups and extended the basic model. The theory predicts that human capital investments during a particular period of the lifecycle will depend on individual incentives, e.g. a higher return to human capital investment early in the life and individual differences in the return to human capital investment due to differences in innate skills, both cognitive and non-cognitive abilities (e.g. Cunha et al. 2006). Following Becker (1964), Hanushek (1973) introduced the human capital production function as an alternative way to model the human capital process. According to this view, human capital is produced from various inputs, most importantly innate skills, individual characteristics, investments by the family, (pre-) school and neighbours. Becker and Tomes (1979) suggest that the role of family background in human capital production reflects both intergenerational transmission of human capital and the investment decision of parents.

According to empirical studies, school inputs that promote human capital production include school spending, the teacher/pupil ratio, the expenditure per pupil and the wages of teachers (e.g. Card and Krueger 1992; Altonji and Dunn 1996; Holmlund, McNally and Viarengo 2010; Hægeland, Raaum and Salvanes 2012; Jackson, Johnson and Persico 2016; Johnson and Jackson 2017; Hyman 2017), class size (Krueger 1999; Angrist and Lavy 1999; Fredriksson et al. 2013), school quality, and teacher quality (Hanushek and Rivkin 2012).[21] Borjas argues that differences in academic achievement by migrant children not only depends on parental capital, but also the cultural and social norms in their ethnic environment, referred to as ethnic capital (e.g., Borjas 1992, 1995).

There is general consensus in the literature that the human capital production function is given as

$$A_{it} = f(F_i(t), I_i, S_i(t), P_i(t)) \quad (1)$$

[19] §14 stk. 07 §13 stk. 05 LBK nr. 1887 af 01/10/2021, LBK nr. 1510 af 14/12/2017.
[20] https://ufm.dk/en/education/the-danish-education-system/grading-system/old-grading-scale.
[21] For a recent review of the literature on whether school spending matters, see Jackson (2020).

according to which the accumulated human capital of individual i at time t, A_{it}, is a function of individual and family characteristics, $F_i(t)$, innate abilities, I_i, school inputs, $S_i(t)$, and peer group inputs, $P_i(t)$ (see e.g. Bowles 1970, Hanushek 1973, Todd and Wolpin 2003, Robertson and Symons 2003, and Harris 2010).

Our study estimates the effects of peer group inputs on human capital by estimating a model similar to Eq. (1) for a sample of children of refugees who were quasi-randomly assigned to the initial neighbourhood of residence in the host-country, such that school and peer group inputs are independent of innate abilities, I_i and controlling for fixed differences in school inputs and municipality resources by conditioning on school district and municipality fixed effects. For a similar quasi-experimental strategy, see Åslund, Edin, Fredriksson and Grönqvist (2011). Since school and peer group inputs may affect human capital acquisition directly or indirectly via well-being in school, our study will further include estimation of the effects of peer group inputs on well-being in school, thus shedding light on the potential mechanism.

Immigrants who expect to return to their origin country may invest less in human capital production in the host-country, since human capital is only partly transferable between countries (Dustmann 2003, Adda et al. 2022). Since refugees arrive due to push factors (Hatton 2016), they tend to stay permanently in the host-country. Across arrival cohorts (1997-2016), refugees in Denmark have very low out-migration rates, ranging from 5-8% five years after arrival (Schultz-Nielsen, 2019). In view of the refugees' poor prospects of returning to their origin country, our study concerns an immigrant group which have relatively strong incentives to invest in human capital in the host-country.

4 DATA

4.1 Data sources

Our micro data stems from three sources: national longitudinal administrative registers from Statistics Denmark (1997-2021), national longitudinal education data collected by public schools, and the full population dataset with annual information on the individual's neighbourhood of residence constructed by Damm, Hassani, and Schultz-Nielsen (2021), available from 1986 until 2021. We link the three data sources using a unique person identifier.

The population register provides detailed information on individual demographic characteristics of children and their parents (e.g., age, country of origin, immigrant status, date of immigration, and marital and residence status), the municipality and school district of residence, educational attainment and employment status. The residence permit register includes detailed information on granted residence permits from 1997 onwards and enables us to perfectly identify refugees for the period of interest.

Damm et al. (2021) have divided 459,497 inhabited hectare cells of Denmark into 1,961 macro-neighbourhoods, which consist of at least 600 housing units (median of 1,173 and standard deviation of 394). The macro-neighbourhoods are clusters of adjacent housing units, delineated by physical barriers, homogenous in terms of housing type and house ownership, compact, and have unchanged boundaries over 34 years (1986-2019). The clustering criteria are similar to

the statistical criteria used to delineate the US census block groups. Using housing and population registers, they construct a dataset with annual information about the individual's neighbourhood of residence over this period. To find the neighbourhood of residence, we use the unique identifier of housing addresses from the population register and link the dataset to the neighbourhood clusters constructed by Damm et al. (2021). We treat the first registered municipality and macro-neighbourhood as the initial municipality and neighbourhood of assignment. By linking the national administrative registers with the neighbourhood dataset constructed by Damm, Hassani, and Schultz-Nielsen (2021) using a unique person identifier, we construct variables to describe the neighbourhood composition at two aggregate levels of analysis, municipalities and macro-neighbourhoods.

Finally, we extend our database with information about the languages that a refugee can speak, constructed by Damm, Hassani, Jensen, and Schultz-Nielsen (2024). That study has used a document from the United Nations (2017) stating the name of countries and the official languages (national official) of those countries. Accordingly, we assume that refugees can speak the official language(s) of their origin countries. Identifying the official languages spoken in each country allows us to find the number of people (in addition to co-nationals) in the municipality and macro-neighbourhood of residence with whom a refugee can speak by a common language(s). See Damm et al. (2024) for detailed information on identifying the official language(s) of each refugee-sending country.

4.2 Sample selection and summary statistics

We extract two samples for our analysis. First, the sample of refugee household heads who had children prior to their arrival to Denmark. Second, the sample of children of refugee household heads.

The sample of refugee household heads with children is extracted using the following selection criteria. First, considering only the first residence permit for each person in the residence permit register during 1997–2021, we drop persons without a unique identifier and persons with an admission category imputed by Statistics Denmark from our sample. Second, we restrict our sample to individuals with refugee status who were granted residency during 1999–2021, observed in the population register at least once during 1999–2022, and who were at least 18 years old on the date of arrival to Denmark. Third, we drop persons who were not observed in the population register in the same year or the year after receiving their residence permit. Fourth, we drop persons without an identified macro-neighbourhood or for whom the initial macro-neighbourhood of residence was different from the first registered municipality of residence. Fifth, we limit the sample to the first-arrived person from each family (i.e., household head) because the first-arrived person is the main subject of the dispersal policy, and the settlement of other members of the family depends on the household head's settlement. In the case of married couples who are granted asylum at the same time, we consider the husband to be the head of household. Finally, we limit the sample to households who either arrive together with children (N=4,996) or have children who arrive within 12 months after the household head (N=298). We restrict to children born before arriving to Denmark, to avoid endogenous sample selection in case that the fertility decision is affected by the neighbourhood

characteristics. The sample of refugee household heads with children has observations on 5,211 individuals. 69% of household heads are men, typically low-skilled married men from the Middle East, in particular Syria, who are on average aged 36. See Table A1 in the Appendix for variable definitions and Table A2 for descriptive statistics of background characteristics.

The sample of refugee children is extracted by linking individuals in the sample of refugee household heads with children with the population register using the identifiers of an individual's father and mother. The sample of refugee children has observations for 9,960 children, 9,468 of which have arrived on the same date as the household head. 53% of children are boys. To ensure a homogenous group of children we restrict to children with both parents. Children were on average 6 years old at arrival, and the large majority are born between 1996 and 2010. See Table 1, Panel A for details on the background characteristics of individuals in the sample of refugee children. We observe around half of the sample at age 18, which allows us to measure whether individuals have taken the 9th grade exit exams by age 18, allowing for up to two years of delay in taking the 9th grade exit exams compared to the regular age of taking the 9th grade exit exams among natives. 52% of children of refugees took the 9th grade exit exams at the regular age (the year of turning 16), while 42% took it one year later, and 6% two years later. A minor fraction were three years delayed. Among those who had taken the 9th grade exit exams by age 18, 48% were thus too old for grade when taking the exams. Being too old for a grade is a sign of needing extra time to achieve the goal of graduating compared to the average student. A high share of refugee children being too old for their grade can be seen as an indicator of lower academic performance.

[Insert Table 1 around here]

The estimation samples of refugee children vary across outcomes since the outcomes observed for an individual vary across birth cohorts and by whether the individual attends a public or private school. We consistently limit the estimation samples to children who arrive before age 16, to measure effects of assigned neighbourhood characteristics on academic achievement by age 18. Moreover, to avoid confounding effects from periods of COVID-19 lockdowns of schools in Denmark during 2020 and 2021, we only measure effects on outcomes in school until 2019.

4.3 Outcomes

In Table 1, panel B, we report descriptive statistics for all outcomes considered in our empirical analysis: the percentile rank in the grade 9 exam GPA score (overall rank and subject-specific ranks), percentile rank in the national tests (across grades and subjects), school absentee rates (in grades 6 and 9), and wellbeing survey factors (in grades 4-9), binary indicators for having ever been charged and/or convicted for a violation of the penal code (during different age ranges from age 10 and 21), years of education attained by different ages between age 16 and 21, binary indicator for ever inactive, i.e. neither enrolled in education nor in employment (during different age ranges between 18 and 21).

The Danish National Tests Register (2010-2021) provides national standardized test scores (low stake) in reading and math. The National Tests are designed to estimate the student's ability across three cognitive areas. For reading, the areas are language comprehension, decoding, and reading comprehension. For math, the cognitive areas are algebra, geometry,

and applied math. The National Tests are IT-based, adaptive, and self-scoring tests.[22] The tests are compulsory for public schools, but the school principal may exempt a student from tests. Due to systematic non-response in the national tests in lower grades and because we wish to estimate effects on national tests in Danish (reading) and Math (both conducted in grade 6), we focus on effects on national test in grade 6. To avoid selection in test-taking among private schools, we focus on pupils in public schools. Among public school pupils in our sample, 14% have not taken the national test in Danish in grade 6, while 11% have not taken the national test in Math in grade 6. The test-takers in our sample obtain a low percentile rank of the test scores in both Danish and Math, respectively, 30% and 34%.

The School Grade Register (2002-2021) includes all grades obtained in the national exit exams in grade 9 (high stake). Grade points are registered across subjects by skill being assessed, e.g., spelling in the subject Danish. For each student, we calculate the grade point average (GPA) across the five mandatory exams: oral exam in Danish, written exam in Danish, written exam in Math, oral exam in English, and oral exam in natural sciences (physics, chemistry, biology, and geography). In Table 1, panel B, we show that by age 18, 74% of individuals in our sample have taken all mandatory exit exams in grade 9, the percentile rank in the grade 9 mandatory exam GPA score is on average 44%. By age 18, 96% of individuals in our sample have taken all exit exams in Danish in grade 9 and on average obtained a percentile rank in Danish of 47%, while 98% have taken all exit exams in Math in grade 9 and on average obtained a percentile rank in Math of 50%.

The Education Register (2008-2021) contains individual information on the date of enrolment and completion of an education, the type of education, and current education affiliation status. We use the register to construct binary indicators for years of completed education by each age between 16 and 21. "By age 16" should be interpreted as "the year of turning 16" and so forth. Since enrolment in grade 0 was voluntary until Aug. 2009, we disregard completion of grade 0 in our calculation of years of completed education. A typical pupil has completed nine years of compulsory schooling in the year of turning 16. Individuals in our sample have on average completed 8.5 years by age 16 and have on average completed 9 years by age 17 and 10.8 years by age 21.

[Insert Table 2 around here]

The Central Police Register (2007-2021) records individual charges (date of charge, date of committing the offense, and type of offense) and convictions (date of conviction, verdict, and sentence) for the full Danish population. The Danish National Police record all contacts with individuals, including official charges and convictions. Charges are usually a predecessor of a conviction, i.e., a court ruling that the individual is guilty as charged.[23] If an individual below

[22] See Beuchert & Nandrup (2018) for a description.

[23] For a random 10 percent sample of Danes born in 1980 who were followed until age 21, 28 percent of charges led to a conviction (Damm and Dustmann, 2014). US studies on crime tend to measure individual crime by arrests, but arrests are uncommon in Denmark. According to the Danish "Law on Administration of Justice" (Retsplejeloven. Article 755, part 1), the police can arrest a person whom they have reason to suspect is guilty of a criminal offense subject to public prosecution, but only if an arrest is regarded as necessary in order to prevent further criminal offenses, ensure the subject's presence for the time being, or to prevent his communication with

the age of criminal responsibility commits a crime, the police will record the offense as an "as-if charge" in the register on contacts with the police, which means that the person would have been charged with the offense had the person been above the age of criminal responsibility. As described in Damm et al. (2025), the Danish Police are required by law to register offenders below the minimum age of criminal responsibility in the Central Police Register if they violate the Penal Code Act, Weapons Act or Drugs Act.[24] During our observation period, the minimum age of criminal responsibility is age 15.[25] Since the official reports of offenses against the Traffic, Drugs, and Weapons Acts may be sensitive to police efforts, and the Danish Police are not required to report traffic offenses by children below the minimum age of criminal responsibility, we restrict the outcome to "as-if" charges for violation of the Penal Code Act. The unique feature of the register allows us to analyse crimes as measured by an (as-if) charge from age ten. On average, 5% of individuals in our sample have at least one registration for an "as-if" charge for a violation of the Penal Code during age range 10-14, and 10% have been charged for (at least one) violation of the Penal Code during age 15-17. By age 21, 20% have been charged for a violation of the Penal Code during age range 15-21, with substantially higher charge rates among males (28%) than females (9%), consistent with previous studies of criminal behaviour, e.g., Damm and Dustmann (2014). The ever conviction-rates for a violation of the Penal Code during age ranges 15-17 and 15-21 are around 2/3 to 3/4 of the ever charged-rate during the same age range, respectively: 7% during age range 15-17 and 15% during age range 15-21.

The Employment Register (2008-2021) contains all job spells in the Danish labour market with exact start and end dates. We combine individual information on enrolment in an education from the Education Register with individual information on employment status in the Employment Register to construct a binary indicator for neither being enrolled in education nor employed in a given year; we refer to it as being inactive. Next, we use the annual indicators to construct indicators for being inactive during the entire age ranges 18-19, 18-20, and 18-21. For individuals in our sample, that share drops from 10% during age range 18-19 to 6% during age range 18-21.

4.4 Characteristics of the Assigned Neighbourhoods

We define the size of the residence-based co-ethnic network as the number of co-ethnic neighbours relative to the number of inhabitants in the neighbourhood at the beginning of the year of asylum (see, e.g., Damm 2014). Since our narrowly defined neighbourhoods have been constructed to be homogeneous in size, our results are robust to using the alternative definition of size, which is the number of co-ethnic neighbours, as used in Edin et al. (2003) and Damm (2009a). Like previous studies on the effects of ethnic enclaves on labour market outcomes (e.g., Munshi 2003; Edin et al. 2003; Damm, 2009a, 2014), we measure the quality of co-ethnic

other people. Further, an arrest should not be made if imprisonment would be a disproportionate measure in regard to the nature of the offense or other circumstances.

[24] See the relevant law (in Danish): BEK no. 881 of 04/07/2014.

[25] In 2010, a Danish policy reform lowered the minimum age of criminal responsibility from 15 to 14 years for a 20-month period. Damm et al. (2017) find that neither the reform nor the repeal of the reform affected crime rates of 13—15-year-olds. For individuals aged 14 during the reform period, the binary indicator for an "as-if" charge has been constructed by combining records of "as-if" charges during age range 10-13 with records of charges at age 14.

neighbours as their employment rate because it measures how established the ethnic enclave is and how useful it is for informal job referral.

Refugee household heads in our sample were assigned to 93 of 98 municipalities in Denmark, and 1,109 of the 1,961 macro-neighbourhoods (57%). Table A3 in the Appendix reports descriptive statistics of the assigned municipality of refugee household heads, while Table A4 reports descriptive statistics of the assigned macro-neighbourhoods. Notice that all neighbourhood characteristics are population shares (i.e., take values between 0 and 1). However, the interpretation of a one percentage point change differs by characteristic — for instance, a one percentage point increase in the share of language fellows (e.g., from 0.8% to 1.8%) represents a substantial relative change, while the same change in the employment rate is relatively modest. On average, refugee household heads were assigned to a municipality with 7.2% immigrants and descendants. The average shares of co-nationals and language fellows in the assigned municipality are low, respectively 0.2% (176 individuals) and 0.8% (755 individuals), which is as expected in view of spatial dispersal of refugees in Denmark since 1986 and low rates of subsequent relocation (Damm, 2009b; Azlor et al., 2020) and the large number of refugee-sending countries during our observation period. Comparison of the average characteristics of the assigned macro-neighbourhood with the average characteristics of the assigned municipality shows that refugee household heads were overrepresented in macro-neighbourhoods with higher shares of immigrants and descendants (of non-Western origin), language fellows, co-nationals, rental housing, and lower shares of high-skilled and employment rates among all demographic groups. The likely reason is that refugees were assigned to affordable housing and such housing, in particular public housing, is highly concentrated in certain neighbourhoods (Damm, Hassani and Schultz-Nielsen, 2019). According to Table A4 the average share of co-nationals in the assigned macro-neighbourhood is 0.4% (18 individuals), while the share of language fellows is 1.4% (36 individuals).

5 METHODOLOGICAL CONSIDERATIONS AND EMPIRICAL MODEL

5.1 Methodological considerations

Well-off neighbourhoods can be characterised by low poverty rates, or a large fraction of higher educated inhabitants. Additionally, higher employment rates (Case and Katz 1991; Chetty et al. 2020b), a low share of single-parent households (Chetty et al., 2020; Sampson et al., 1997), and a low youth crime conviction rate in neighbourhoods wherein children grew up are all beneficial factors (Damm and Dustmann, 2014; Damm, 2014), Finally, it is important to consider that networks are stratified by ethnicity and socioeconomic status of co-ethnic neighbours (Damm and Dustmann, 2014; Damm, 2014). Therefore, our neighbourhood characteristics include share of co-ethnics, using alternative measures (shares of co-nationals and language fellows), as well as socioeconomic characteristics of co-nationals and language fellows, such as the employment rate and the youth crime conviction rate.[26]

Due to methodological challenges in identification of the housing, demographic and socioeconomic characteristics of neighbourhoods that affect children's educational outcomes

[26] We prefer to measure the socioeconomic status of adult neighbours by their employment rate instead of their highest attained education because the Danish administrative registers lack information of the latter for a considerable share of immigrants.

caused by the reflection problem and location sorting (Manski, 1993; Tiebout, 1956), few empirical studies provide rigorous evidence on neighbourhood effects (Angrist, 2014). To deal with these issues, a researcher should find exogenous variation, which not only significantly affects the likelihood of living in a neighbourhood but is also uncorrelated with other observable and unobservable factors that affect the children's outcomes such as parental characteristics or innate abilities. The Danish Spatial Dispersal Policy on Refugees 1999-2021 provides us with exogenous variation in the neighbourhood characteristics that we can exploit to identify the effect of characteristics of neighbourhoods on academic achievement of refugee children—who arrived with their parent(s) to Denmark during 1999-2021.

Evaluation of the effect of neighbourhood characteristics common to all individuals such as the youth crime conviction rate in the neighbourhood requires the strong assumption that we control for all correlated neighbourhood characteristics. We also aim to identify effects of neighbourhood characteristics that are ethnically stratified. Identification of such neighbourhood effects relies on the weaker assumption that the effect of unobserved correlated neighbourhood characteristics is the same across individuals of the same ethnicity (as measured by e.g. source country or official language). Our empirical strategy builds on the approach proposed by Edin et al. (2003) and Åslund et al. (2011) to identify effects of socioeconomic characteristics of co-ethnic neighbours. In particular, we exploit exogenous variation from spatial dispersal of refugees across neighbourhoods by controlling for individual characteristics that were observed by the placement officer and controlling for correlated unobserved neighbourhood characteristics using school district or neighbourhood fixed effects.

In the Danish Spatial Dispersal Policy on Refugees 1999-2021 the calculation of municipal refugee quotas takes into account the share of Danish population living in the municipality, as well as the shares of immigrants from low-income countries and co-nationals within the municipality. Therefore, we expect that after controlling for these characteristics as well as information asked by the case worker from Danish Immigration Service during the interview with refugee (i.e., country of origin, age at arrival, marital status, number of children), other demographic and socioeconomic characteristics of the assigned neighbourhoods do not correlate with personal characteristics of refugees like their levels of education. Empirically, we will estimate intent-to-treat (ITT) effects of neighbourhood characteristics on academic achievement (the likelihood of taking the exit exam in the 9^{th} grade and the percentile rank of the grade point average obtained at the exit exam in 9^{th} grade conditional on exam take-up) for all refugee children, irrespective of whether they attend public or private school.

The ITT estimates are relevant for local policy makers who can use our findings to assign refugees to neighbourhoods upon receipt of asylum or re-settle immigrants after public housing demolition. Alternatively, one could have estimated instrumental variable (IV) estimates by instrumenting current location characteristics by the assigned location characteristics. The ITT estimate differs from the IV estimate in case of selective relocation out of the assigned school district. The settlement policy that we exploit for effect estimation gave assigned refugees a strong financial incentive to stay in the assigned municipality for at least three years. Consistent with this, Azlor, Damm and Schultz-Nielsen (2020) find for the 1999-2010 arrivals that 89% of refugees were still living in the assigned municipality three years after assignment.

Consequently, characteristics of the assigned location will be a strong predictor of characteristics of the current location of residence, say, 5 years after assignment. To test the prediction power of characteristics of the assigned neighbourhood for characteristics of the current neighbourhood of residence, we have regressed the demographic, socioeconomic, and housing characteristics (shares of public housing and private rental housing) of the neighbourhoods wherein the first-arrived parent (and hence their children) lived during 1-5 years since arrival on the same characteristics of the initially assigned neighbourhood (and controlled for the characteristics that are considered in calculation of quota, and observable characteristics of the refugee that are known by the case worker). In these first stage regressions, we find that the characteristics of the assigned neighbourhood are positively and significantly ($p<0.001$) correlated with the current neighbourhood characteristics, allowing for potential long-term effects of initially assigned neighbourhood characteristics.

Therefore, our ITT estimates will be close to the IV-estimates. Under the assumption of homogenous treatment effects, the IV estimate is the Average Treatment Effect, which is another relevant estimate for local policy makers.[27]

A concern regarding our ITT estimates on school outcomes could be the influence of white flight on the quality of peers in the classroom. Our estimation strategy, which includes area fixed effects, year of arrival fixed effects and country of origin fixed effects, is designed to account for area-specific factors, national time trends and ethnic-group specific factors. This allows us to compare individuals arriving in the same municipality at the same time but with different ethnicities. In addition to our estimation strategy addressing this concern, earlier studies using Danish data have found little evidence of native flight. Damm et al. (2021) finds no evidence of native flight from a policy that increased the share of dual language learners in first grade to around 20 percent. Hassan et al. (2025) found no effects on classmates' academic performance from having a refugee as a classmate. Both findings support the idea that the Danish model of compensating resources to schools with higher needs mitigates native flight from schools (Damm et al. 2021).

5.2 Empirical Methodology and Interpretation

The main question we ask is whether children assigned to certain types of neighbourhoods fare better. Our basic specification represents the academic achievement:

$$y_{icjt} = \alpha_1 S_{cjt} + \alpha_2 Q_{cjt} + \alpha_3 LER_{jt} + \alpha_4 C_{ijt} + \boldsymbol{X}_{it}\boldsymbol{\beta} + \boldsymbol{\delta}_j + \boldsymbol{\delta}_t + \varepsilon_{icjt} \quad (1)$$

where the variable y_{icjt} is the grade point average percentile rank at the 9th grade exit exam of individual i from country c assigned to neighbourhood j in assignment year t. Alternatively, y_{ijt} is a binary indicator for having taken the 9th grade exit exams. The key explanatory variables in Equation (1) are the four neighbourhood characteristics; S_{cjt} which measures the size of the assigned residence-based co-ethnic network, Q_{cjt} which measures the quality of the assigned residence-based co-ethnic network, LER_{jt} which measures the employment rate in the

[27] Under the alternative assumption of heterogeneous treatment effects, the IV estimate is the average treatment of the treated or the local average treatment effect.

assigned neighbourhood (municipality) and C_{ijt} which measures the share of individuals aged 15-25 who were convicted for a crime committed in year t and who lived in the assigned neighbourhood (municipality) in year t. We measure S_{cjt} by the co-ethnic share in neighbourhood j in year t, and Q_{cjt} by the employment rate of the co-ethnic group in neighbourhood j in year t, where co-ethnics are defined either on the basis of shared country of origin c or shared language in the origin country. To account for differences between individual's pre-assignment characteristics, including those that DIS may have used in the assignment process (i.e., household size, country of origin, parental age, marital status), the vector $\boldsymbol{X}_{it}$ contains individual background characteristics in the year of assignment, as well as age at assignment dummies and two municipality characteristics that enter the formula for calculation of the annual refugee quota of each municipality. The municipal share of the population in the country and the share of residents in the municipality who are non-Western immigrants. The coefficient estimates of these two variables should not be given a causal interpretation. Further, the vectors $\boldsymbol{\delta}_j$ and $\boldsymbol{\delta}_t$, respectively, contain neighbourhood of assignment dummies and year of assignment dummies, and ε is an error term.

Since we do not know the scale at which neighbourhood effects between co-ethnic neighbours operate among migrant children, we investigate effects of the size and quality of the residence-based co-ethnic network at two levels: the assigned municipality and the more granular level of the assigned macro-neighbourhood. When we estimate such effects at the level of the assigned municipality the vector $\boldsymbol{\delta}_j$ denotes dummies for the assigned municipality of residence, specification (1), or alternatively dummies for the assigned school district of residence, specification (2). When we estimate such effects at the level of the assigned macro-neighbourhood of residence, the vector $\boldsymbol{\delta}_j$ denotes one of the following three sets of dummies: (i) dummies for the assigned municipality of residence, specification (3), (ii) dummies for the assigned school district of residence, specification (4), or (iii) dummies for the assigned macro-neighbourhood of residence, specification (5).

To identify effects of S_{cjt} and Q_{cjt}, we make two assumptions. First, the individuals in our estimation sample were randomly assigned to neighbourhoods, conditional on a few demographic characteristics of the household head observed by the DIS. For reasons of efficiency, we also condition on parental educational attainment. Second, there are no correlated neighbourhood characteristics that vary by ethnic origin. If household heads' initial assignment to neighbourhoods was completely random, personal characteristics would be uncorrelated with characteristics of the assigned neighbourhoods. In other words, if such correlations exist, it raises the concern that more able individuals have realised more favorable settlement conditions. In this regard, we examine whether the household head's educational attainment at arrival (i.e., less than 11 years of education, 11 to 13 years of education, and more than 13 years of education) is correlated with the observed demographic and socioeconomic characteristics of the assigned neighbourhood after conditioning on the individual's age, gender, marital status, having children in different age groups, country of origin, and year of asylum. Based on the results of this balancing test, we find that an individual's educational attainment at arrival is not correlated with the observed characteristics of the assigned neighbourhood (municipality level in Table 3 and macro-neighbourhood level in Table 4),

when the control set includes dummies for the assigned municipality of residence. We have conducted robustness checks by narrowing the sample to individuals arriving after zero to twenty municipalities have filled their quotas. Our findings remain robust to this variation in sample selection. To ensure that our sample is not influenced by the recalculation of quotas in years when more refugees than initially expected arrive, we have also conducted estimates excluding refugees who arrive after all initial municipalities are filled. Our results remain robust even under this variation.

[Insert Table 3 and Table 4 around here]

We cluster the standard errors in all estimations at the municipality level to take account of the possibility of the error terms being correlated within the municipalities (i.e. heteroscedasticity). Otherwise, the standard errors could have been underestimated, resulting in too high t-statistics and too low p-values, making an effect statistically significant even though it is not (Cameron and Miller 2015).

Our estimations, utilizing area fixed effects, mean that we account for both between-neighborhood and within-neighborhood variation. In estimations where we control for municipality fixed effects or macro-neighborhood fixed effects, the primary variation arises within geographic areas but spans across years and ethnicities. As illustrated in Table A5, the variation in the size of the ethnic network, measured by the share of co-nationals or language fellows, comes from both within and between municipalities. While there is higher variation between municipalities in the general employment rate, the variation in the ethnic network's employment rate appears to be just as substantial within municipalities, spanning across years and ethnic origins. This pattern persists at the macro-neighborhood level, as shown in Table A6. Therefore, our municipal-level estimation results reflect a combination of the estimated effects from comparison of (i) two refugees assigned to the same municipality in the same year but with different country of origin, (ii) two refugees from the same country of origin assigned to the same municipality in different years, and (iii) two refugees from the same country of origin assigned in the same year to different municipalities.

6 RESULTS

6.1 Main Estimation Results

Effects of Neighbourhood Characteristics on 9th Grade Exit Exam Outcomes. Table 4 reports estimates for the coefficients of the four assigned neighbourhood characteristics on three outcomes observed by age 18 (defined as the year of turning 18): A binary indicator for being too old for grade when taking the 9th grade exit exam (the regular age is the year of turning 16), an indicator for having taken all mandatory 9th grade exams, and GPA rank (calculated using the scores across all subjects), for our preferred definition of co-ethnics as language fellows (Panel A) and for our alternative definition of co-ethnics as co-nationals (Panel B). Specification (1) delimits the co-ethnic group to co-ethnics living in the assigned municipality at arrival (our large scale neighbourhood definition) and conditions on gender, demographic characteristics of the household head (gender, country of origin, and year of assignment), family background characteristics (marital status of household head, number of children aged 0-2 and 3-17, education category of father and mother), municipal population share, municipal

non-Western immigrant share and municipality fixed effects, all measured at the time of assignment. Specification (2) is identical to specification (1) except that it conditions on school district fixed effects instead of municipality fixed effects.

On the one hand municipalities could be too large to capture social interactions and could result in less precise estimates. On the other hand, defining neighbourhoods too narrowly may lead to the omission of a considerable number of interactions. To investigate the concern, in specifications (3)-(5) the co-ethnic group is instead delimited to co-ethnics living in the assigned macro-neighbourhood at arrival (our small-scale neighbourhood definition). Specification (3) uses the same control set as specification (1), while specification (4) uses the same control set as specification (2). Finally, specification (5) is identical to specifications (3) and (4), except that it conditions on macro-neighbourhood fixed effects instead of municipality and school district fixed effects, respectively. The standard errors take into account the clustering of the observations by municipality of assignment.

[Insert Table 4 around here]

The results using our preferred definition of co-ethnics as language fellows in panel A, Table 4, point to a negative effect of the employment rate of language fellows on being too old for grade when taking the 9th grade exit exam (our measure of grade repetition), across specifications. Delimiting language fellows to language fellows in the assigned municipality, the probability of being too old for grade when taking the 9th grade exit exam is about 0.097 percentage points lower in an area with a one percentage point higher employment rate among language fellows at arrival. Delimiting instead language fellows to language fellows in the assigned macro-neighbourhood, the estimate is between -0.081 and -0.1 percentage points using specifications (4) and (5). Since 47.9% of individuals in our sample are too old for grade when taking the 9th grade exit exams, the coefficient estimates of the employment rate of language fellows at arrival of -0.081 and -0.1 using specifications (4) and (5) translate into 0.17 and 0.21 percentages, respectively. The results in panel A point to little or a positive effect of the share of language fellows on being too old for grade when taking the 9th grade exit exams. The overall employment rate and the youth crime conviction rate in the assigned municipality at arrival have little effect on 9th grade exit exam outcomes.

Neither of the four neighbourhood characteristics at arrival affect the probability of having taken all mandatory 9th grade exams by age 18. The estimated effects of neighbourhood characteristics at arrival on the overall GPA rank can, therefore, be given a causal interpretation. The results using our preferred definition of co-ethnics as language fellows in panel A, Table 4, point to little effect using specifications (1)-(3) and a negative effect of the share of language fellows, using specifications (4) and (5). According to the latter specifications, a one percentage point higher share of language fellows in the assigned macro-neighbourhood at arrival reduces the GPA rank by between 0.69 and 0.86 percentage point, corresponding to 2 percent.

Defining instead co-ethnics as co-nationals in panel B also points to a negative effect of the employment rate of language fellows on being too old for grade when taking the 9th grade exit exam, and little effect of the co-national share on that outcome. As in panel A, neither of the

four neighbourhood characteristics at arrival affect the probability of having taken all 9th grade exams by age 18, allowing for a causal interpretation of their coefficient on the overall GPA rank. Similar to panel A, the coefficient of the co-national share points to little effect using specifications (1)-(4) and a negative effect of the share of language fellows, using specification (5).

Overall, these findings provide solid evidence that a higher employment rate among co-ethnics in the assigned area at arrival reduces the probability of being too old for grade when taking the 9th grade exit exams, while a higher share of co-ethnics in the assigned area at arrival reduces the overall GPA rank. Translating out estimated effects into percentage effects, our estimates using specifications (4) and (5) show the following. First, a one percentage point higher employment rate of language fellows in the assigned macro-neighbourhood at arrival reduces the probability by between 0.17 and 0.21 percentage points or 0.2 percent. Second, a percentage point higher share of language fellows in the assigned macro-neighbourhood at arrival decreases the overall GPA rank by between 0.69 and 0.86 percentage points, corresponding to 2 percent.

[Insert Tables 5-6 around here]

Effects of Neighbourhood Characteristics on 9th Grade Exit Exam in Danish (reading) and Math. Tables 5 and 6 report coefficient estimates of four assigned neighbourhood characteristics on subject-specific GPA ranks, respectively, Danish and Math, as well as a binary indicator for having taken the 9th grade exams in that subject. While the coefficient on the share of language fellows in the assigned municipality at arrival in panel A point to a negative effect on the probability of having taken the 9th grade exit exams in that subject, that probability is unaffected by the share of language fellows in the assigned macro-neighbourhood at arrival. The latter finding allows for causal interpretation of the coefficient of the share of language fellows in the assigned macro-neighbourhood at arrival on the GPA rank in Danish and Math. Using specifications 4 and 5, the share of language fellows in the assigned area at arrival reduces the GPA rank in both subjects. A one percentage point higher share of language fellows in the assigned macro-neighbourhood at arrival reduces the GPA rank in Danish by between 0.32 and 0.38 percentage points and in Math by between 0.30 and 0.43 percentage points. Defining instead co-ethnics as co-nationals in panel B, the results point in the same direction, but are imprecisely estimated, with two exceptions.

Next, we test whether the negative effects of the assigned share of language fellows on achievement at the 9th grade exit exams are due to potential negative effects on academic achievement in lower grades, making use of national test scores.

Effects of Neighbourhood Characteristics on National Test Scores in Grade 6. In Table 7, columns (1)-(5), we report test taking rates among potential test takers in our sample for Danish (panel A) and Math (panel B). We see that 87% and 89% of public-school pupils in our sample take the tests in reading and math, respectively, which is in line with the share of test-takers among immigrants in Aarhus (Damm et al., 2021). We also see from Table 7, panel A, columns (1)-(5), that neither the assigned share of language fellows nor their employment rate affected the probability of test-taking in reading Danish. This finding allows for causal interpretation of

the effects of these variables on the test scores in Danish reading. The estimates of the coefficient on the assigned share of language fellows are consistently negative across the five specifications, but insignificant. The estimates of the coefficient on the employment rate of language fellows are close to zero and insignificant. The estimates of the coefficient on the assigned share of language fellows on math test scores should be interpreted with caution using specifications (3) and (4); only the estimates using specifications (1), (2) and (4) allow for causal interpretation since the share of language fellows did not affect the probability of math test-taking according to these specifications. The sign of the estimate changes from positive using specification (1) to negative using specifications (2) and (4), i.e., controlling for time-invariant school characteristics.

Next, we compare our preferred estimates of the assigned language group share at arrival on the GPA rank in the 9th grade exit exams in Tables 4-6 (i.e., estimates obtained from specifications 2, 4 or 5) with the estimates in Table 7 obtained from the same specifications. They all point in the same direction of negative effects of the assigned share of language fellows on academic achievement. The negative effects of the assigned share of language fellows on achievement at the 9th grade exit exams may therefore be due to potential negative effects on academic achievement in lower grades.

[Insert Table 7 around here]

Our results suggest that it is unlikely that local differences in institutions (e.g., school and police) or neighbourhood culture, correlated with the share and quality of co-language neighbours and individual academic achievement in compulsory school, drive our results. We argue that the share of co-language neighbours may lower academic achievement in compulsory school through one of following types of social interactions: First, increased minority group interaction which slows progression in the host-country language due to lower incentive to invest in the host-country language (Lazear, 1999); second, increased prejudice because the allocation of refugee families in one's immediate neighbourhood may trigger a sense of collective threat, unless such interaction is taking place under particular conditions, as suggested by contact theory.

The potential mechanisms for the positive effect of the employment rate among co-language neighbours are endogenous effects mediated through exchange of information about the host-country school system or the present vales of particular actions, as in information role models (see Chung, 2000) or conformity behaviour, as in moral role models.

6.2 Neighbourhood Characteristics and Longer-Term Outcomes

We now turn to investigation of neighbourhood effects on longer term outcomes, in particular years of education completed by years 18-21, a binary indicator for being inactive (neither in education nor employment) during an entire age range, and criminal engagement by years 15-21. Several studies provide empirical evidence that education affects crime (see e.g., Jacob and Lefgren, 2003; Lochner and Moretti, 2004; Machin, Marie, and Vujić, 2011). Neighbourhood effects on education may thus affect crime. However, neighbourhood effects on crime could also affect education, e.g. due to incapacitation (Hjalmarsson 2008; Bell, Costa and Machin, 2022) or through role model effects (see Chung, 2000).

Effects of Neighbourhood Characteristics on years of completed education by age 18, 19, 20, and 21. Table 8 reports the estimates of the coefficient on each of the four neighbourhood characteristics on the number of years of completed education by age 18, 19, 20, and 21, defining ethnicity as shared language. The estimates of the coefficient on the assigned share of language fellows changes sign across specifications and is never significant. The estimates of the coefficient on the assigned employment rate of language fellows are positive across most specifications, albeit insignificant. The positive sign of the employment rate of the co-ethnic group on years of completed education by age 18 squares up with its negative effect on being too old for grade. The coefficient estimates of the general employment rate in the assigned neighbourhood is consistently negative, but only significant by age 21 and only in specifications (2), (4) and (5). By age 21, individuals in our sample have on average completed 11 years of education. According to these estimates, a percentage point increase in the general employment rate reduces the number of years of attained education by between 0.17 and 0.19 or 2%.

[Insert Tables 8 and 9 around here]

Effects of Neighbourhood Characteristics on inactivity during the entire age ranges 18-19, 18-20, and 18-21. Table 9 reports the estimates of the coefficient on each of the four neighbourhood characteristics on binary indicators for being inactive during the entire age ranges 18-19, 18-20, and 18-21, defining ethnicity based on shared language. The estimated coefficients of the assigned share of language fellows changes sign across specifications and years and is always insignificant. The same is the case for the estimated coefficients on the assigned employment rate of language fellows. By contrast, the estimated coefficients on the general employment rate at assignment is positive and significant across most specifications for age ranges 18-19 and 18-20, but insignificant for age range 18-21, possibly due to lack of statistical power to detect significant effects. Recalling that the general employment rate has a negative effect on attained years of education by age 21, the latter result suggests that by age 21 the general employment rate at arrival has opposite effects on completion of education and employment status. The assignment to an area with more favourable employment opportunities increases the individual's employment chances and crowds out the individual's investments into upper secondary education, consistent with Damm et al. (2024). The assigned youth crime conviction rate has a positive effect on the probability of being inactive during all age ranges; the coefficient estimate is always positive and significant across most specifications. According to specifications (2) and (4) a one percentage point increase in the assigned youth crime conviction rate at arrival increases the probability of being inactive during each age range by around 7.3 percentage points corresponding to 75 percent during age range 18-19. Using specification (5) the estimated effect becomes imprecise, however, the magnitude of the estimate is not significantly different. Our finding of a positive effect of the assigned youth crime conviction rate at arrival on the probability of being inactive during the entire age ranges 18-19, 18-20 and 18-21 is in line with the finding by Damm and Dustmann (2014) that the assigned youth violent crime conviction rate reduces the probability of being active during age range 23-25.

Effects of Neighbourhood Characteristics on Criminal Behaviour. Table 10 reports our estimates for the coefficients of the four assigned neighbourhood characteristics on a binary indicator for having been convicted of a crime committed in two age ranges: 15-17 and 15-21, for each of the specifications (1)-(5). Our results using specification (1) confirm the main findings by Damm and Dustmann (2014)[28]; the youth crime conviction rate in the assigned municipality at arrival increases the probability of having been convicted in age range 15-21 among males, while area crime has little effect among females. Using specification (1) a one percentage point increase in the youth crime conviction rate in the assigned municipality at arrival increases the conviction probability in age range 15-21 among males by 5.4 percentage points, and given the average male conviction rate of 21.3 percent, it corresponds to 25 percent. We add the following to the study by Damm and Dustmann (2014): First, both estimates are robust to further conditioning on time-invariant school district characteristics or time-invariant neighbourhood as well as the share and employment rate of co-language neighbours and youth crime conviction rate of co-language neighbours. Second, the share of language fellows in the municipality additionally explains conviction probabilities among males. Using specification (2), a one percentage point increase in the share of language fellows increases their conviction probability by 8.6 percentage points, or 40 percent.

[Insert Tables 10 and 11 around here]

We further investigate whether the overall youth crime conviction rate in the assigned macro-neighbourhood as well as the youth crime conviction rate of the co-ethnic group in the assigned macro-neighbourhood affects the probability of having been convicted of a crime committed during age range 15-17 and 15-21. We report the findings in Table 11 for specifications 3-5. Across specifications, for males the estimates of the coefficient of the youth crime conviction rate of co-nationals on having been convicted during age range 15-17 is positive and significant at a ten percent significance level, while the estimates of the coefficient of the youth crime conviction rate of the language group is positive but insignificant and the estimates of the coefficient of the youth crime conviction rate is always insignificant. By contrast, irrespective of gender, the youth crime conviction rate (overall and of the co-ethnic group) in the assigned micro-neighbourhood at arrival does not affect the individual probability of being convicted during age range 15-21. Viewed in combination he results in Tables 10 and 11 provide evidence of criminal contagion effects among men, that primarily operate in small scale neighbourhoods and through smaller networks as co-national peers until around age 17, and thereafter in larger scale neighbourhoods and across ethnic groups. A possible explanation is that the individual's network is extended around age 17 when pupils tend to leave the local school to enrol in upper secondary education further away.

7 DISCUSSION AND CONCLUSION

This paper investigates which neighbourhood characteristics promote educational attainment of migrant children in the short, medium and long run. We exploit the fact that the first-arriving,

[28] Specification (1) is similar to specification (5) in Damm and Dustmann (2014) that have exploited the first Danish spatial dispersal policy on refugees for investigation of whether area crime is contagious.

adult, refugee, family member who resettled in Denmark during the 1999–2021 was quasi-randomly assigned to municipalities; and within these municipalities to neighbourhoods, thus their children were quasi-randomly assigned to school districts. The resettlement/assignment policy gives us a unique possibility of uncovering mechanisms that causally affect educational outcomes.

We find strong evidence that a larger share of co-ethnic neighbours in the area of assignment (at the time of settlement) reduces the children's GPA rank at primary school (9^{th} grade) exit exam (around age 16), as well as the ranks in Danish and Math. These effects are largest when we define co-ethnics as language fellows rather than co-nationals, when we define neighbourhoods as smaller units delimited by natural borders such as larger roads rather than the larger municipality units, and when we account for time-invariant school resources and neighbourhood amenities. Our results also suggest that a higher share of language fellows lowers the national test scores in primary school grade 6 (around age 13). Taken together, these findings strongly support the view that a higher share of co-language neighbours reduce minority members' incentive to speak the majority language or increase prejudice against them, leading to negative effects on academic achievements in the short- and medium run.

We measure the quality of the co-ethnic network by the employment rate among co-ethnic neighbours—defined as either language fellows or co-nationals. We find that a higher quality of co-ethnic neighbours lowers the risk of grade repetition. This finding lends support of the idea that established enclaves facilitate progression through compulsory primary school through knowledge sharing about host-country institutions or role model effects.

Furthermore, we investigate long-term effects of neighbourhood characteristics on completed years of education by age 21, the risk of being inactive (without education or employment) across different ages spans. Since several previous studies have found that education affects crime, we also investigate long-term effects of neighbourhood characteristics on the risk of being convicted of a crime. The share of co-ethnic neighbours and the quality of the co-ethnic network in the area of assignment (at the time of settlement) have no long-term effects on education and the risk of being inactive in age spans 18–19, 18–20 and 18–21. We also do not find effects of the quality of the co-ethnic residential network (measured by co-ethnic employment rate at assignment) on the risk of a conviction by age 21. By contrast, we find evidence that the share of language fellows in the assigned municipality increases the risk of a conviction later in life for young males, effects that may run through the adverse effects of the share of language fellows on academic achievement in compulsory school.

In the long run, the general employment rate in the municipality at assignment also plays a role. Regarding attained years of education at age 21, a one percentage point increase in the municipality employment rate reduces the attained years of education by 0.17, corresponding to 2%. As to the risk of being inactive, the municipality employment rate at assignment increases the risk of being inactive for age spans 18–19 and 18–20. A one percentage point increase in the employment rate increases the probability of being inactive by 0.024 to 0.04 percentage points across these age spans, depending on specification, but has no effect on the risk of being inactive across age spans 18–21. Hence, a higher municipality employment rate at assignment leads to both fewer years of education at age 21 and a temporary higher risk of

inactiveness. This indicates that even though a high employment rate in the assignment area can increase the employment rate of immigrants moving into this area (Azlor et al., 2020), a high employment rate can also crowd out children's incentives to invest in upper secondary education.

Corresponding to the effects of the municipality employment rate on inactivity, we find strong evidence that the youth crime conviction rate, in contrast, increases the probability of being inactive, in line with Damm and Dustmann (2014). Similar to Damm and Dustmann, we also find strong evidence that assignment to a municipality characterized by a higher youth crime conviction rate enhances the risk of convictions later in life for young males (for age spans 15–17 and 15–21). We complement these municipal-level findings by Damm and Dustmann (2014) by providing strong evidence such effects also operate at the more granular level of macro-neighbourhoods. Yet, the municipal youth crime conviction rate at assignment does not affect the probability of taking the primary school exit exam before age 18, the risk of grade repetition, or the attained years of education at ages 18, 19, 20 or 21. The results suggest that the youth crime conviction rate especially affects the life chances of the most vulnerable young individuals—those at the edge of society—through an increased risk of inactiveness and of ending up in crime.

Taken together, our results suggest that neighbourhood affect outcomes of migrant children, both in the short, medium and long run due to general neighbourhood effects, but that growing up in a particular neighbourhood can affect outcomes of migrant children differently, because their residential networks are to some extent ethnically stratified. Their academic achievement during compulsory school is, therefore, influenced by the size and quality of their co-ethnic residential network with long-lasting effects on the risk of criminal behaviour and inactivity, thus affecting long-term labour market integration of migrant children. There is still plenty of room for future research to uncover mechanisms explaining how local area youth crime may shed long shadows on future generations of children. Understanding such mechanisms reaches far beyond migrants.

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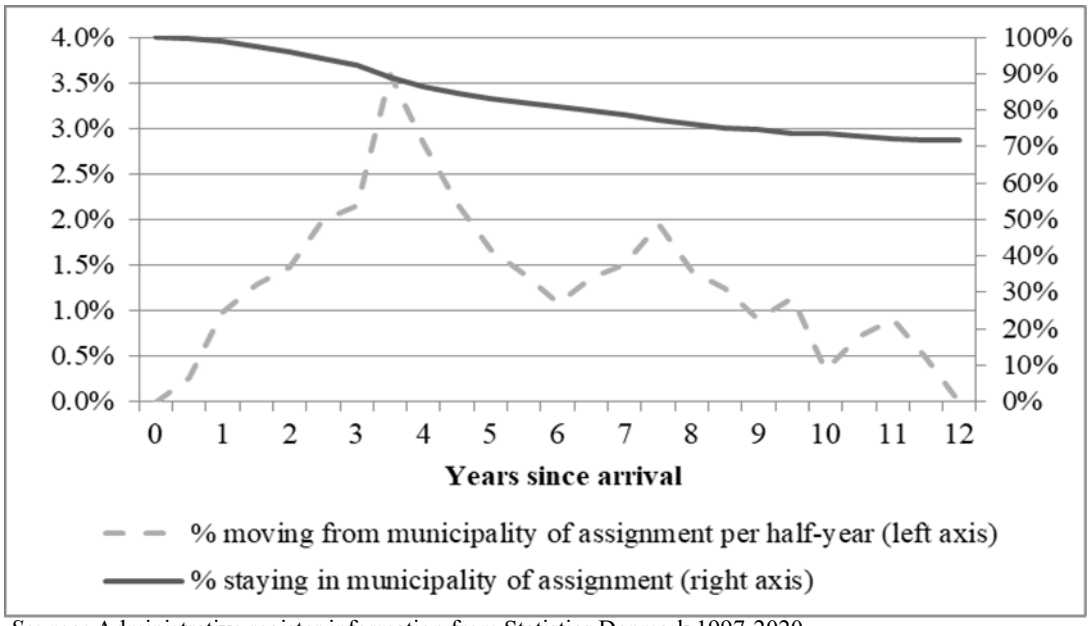
Figure 1 Asylum seekers' way through the Danish system

Source: Authors' construction.

Notes: Figure shows the theoretical progress as a (spontaneous) asylum seeker in Denmark for someone who obeys the rule and progresses through the system without any delays. The horizontal lines show time from arrival to Denmark and forward. The time line is not to scale.

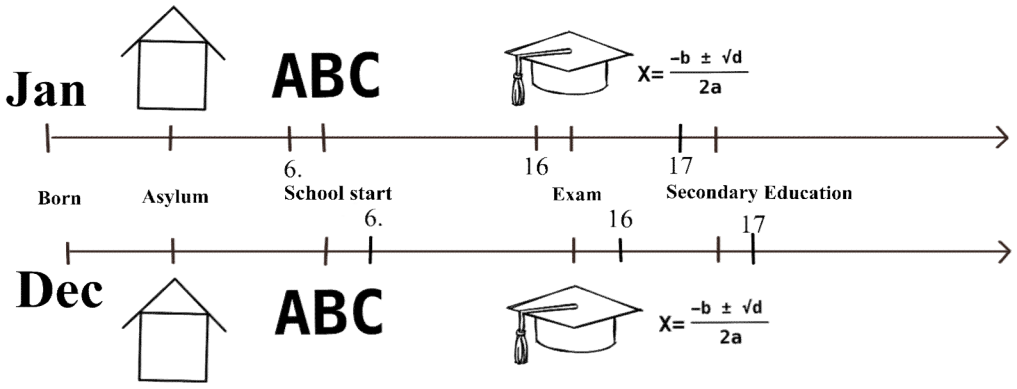
Figure 2 Geographical stability of settlement in assigned municipality among refugee household heads arriving 1999-2020



Source : Administrative register information from Statistics Denmark 1997-2020.

Note : Calculation is based on a gross sample of refugees including all adult refugees arriving to Denmark from 2004-2015. The out-migration rate from the municipality of assignment is calculated as Kaplan-Meier empirical hazard rates. The rate of staying in the municipality of assignment is calculated as Kaplan-Meier empirical survivor rates.

Figure 3 Progression through the Danish educational system



Source: Authors' construction.

Notes: The figure shows the theoretical timing of the educational cycle based on relative age for grade. Figure shows the theoretical educational cycle for someone who obeys the rule and progresses through the educational cycle without any delays. The horizontal lines show time from birth and forward progression in age.

Table 1 Refugee children's characteristics at arrival and outcomes

	Refugee children			Observations		
	All	Men	Women	All	Men	Women
Panel A: Individual and parental characteristics						
Male (0/1)	0.531	1.000	0.000	9960	5290	4670
	(0.499)	(0.000)	(0.000)			
Age	6.246	6.355	6.122	9960	5290	4670
	(4.658)	(4.701)	(4.606)			
Single parent	0.271	0.276	0.265	9960	5290	4670
	(0.444)	(0.447)	(0.441)			
Single parent mother	0.236	0.235	0.238	9960	5290	4670
	(0.425)	(0.424)	(0.426)			
Birth date 1981-1990 (0/1)	0.010	0.010	0.009	9960	5290	4670
	(0.099)	(0.101)	(0.095)			
Birth date 1991-1995 (0/1)	0.125	0.128	0.122	9960	5290	4670
	(0.331)	(0.334)	(0.327)			
Birth date 1996-2000 (0/1)	0.244	0.253	0.235	9960	5290	4670
	(0.430)	(0.435)	(0.424)			
Birth date 2001-2005 (0/1)	0.213	0.209	0.217	9960	5290	4670
	(0.409)	(0.407)	(0.412)			
Birth date 2006-2010 (0/1)	0.218	0.215	0.221	9960	5290	4670
	(0.413)	(0.411)	(0.415)			
Birth date 2011-2015 (0/1)	0.164	0.161	0.168	9960	5290	4670
	(0.371)	(0.368)	(0.374)			
Birth date 2016-2021 (0/1)	0.026	0.023	0.028	9960	5290	4670
	(0.158)	(0.150)	(0.166)			
Panel B: Individual outcomes						
National Tests[1] in grade 6:						
Danish test						
Drop out in grade 6 Danish test	0.137	0.151	0.121	3161	1647	1514
	(0.343)	(0.358)	(0.327)			
Age at test date in grade 6	12.760	12.783	12.735	2729	1399	1330
	(0.730)	(0.721)	(0.739)			
Test score in grade 6 (ranked)	0.298	0.280	0.317	2729	1399	1330
	(0.263)	(0.259)	(0.266)			
Math test						
Drop out in grade 6 Math test	0.111	0.126	0.095	3154	1646	1508
	(0.314)	(0.332)	(0.293)			
Age at test date in grade 6	12.771	12.793	12.749	2804	1439	1365
	(0.729)	(0.734)	(0.723)			
Test score in grade 6 (ranked)	0.339	0.351	0.327	2804	1439	1365
	(0.270)	(0.275)	(0.264)			
9th grade exit exam (by age 18):						
Was too old for grade when taking the 9th grade exit exams	0.479	0.506	0.450	4613	2401	2212
	(0.500)	(0.500)	(0.498)			
Taken all mandatory 9 grade exit exam by age 18	0.739	0.707	0.777	5105	2737	2368
	(0.439)	(0.455)	(0.416)			
GPA (Ranked)	0.436	0.403	0.471	3992	2033	1959
	(0.288)	(0.283)	(0.289)			
Took all subjects in Danish	0.959	0.953	0.965	4505	2334	2171
	(0.199)	(0.212)	(0.184)			
Danish (Ranked)	0.473	0.436	0.512	4319	2224	2095
	(0.184)	(0.175)	(0.186)			
Took all subjects in Math	0.984	0.981	0.988	4503	2358	2172
	(0.123)	(0.135)	(0.109)			
Math (Ranked)	0.498	0.505	0.490	4460	2314	2146
	(0.201)	(0.204)	(0.198)			

Table 1 Refugee children's characteristics at arrival and outcomes (continued)

	Refugee children			Observations		
	All	Men	Women	All	Men	Women
Panel B: Individual outcomes (continued)						
Years of education:						
By age 16	8.467	8.436	8.504	5083	2717	2366
	(0.781)	(0.843)	(0.703)			
By age 17	9.091	9.098	9.083	4893	2649	2244
	(0.800)	(0.846)	(0.742)			
By age 18	9.388	9.393	9.381	4682	2538	2144
	(0.979)	(1.073)	(0.855)			
By age 19	9.986	9.860	10.135	4325	2345	1980
	(1.385)	(1.427)	(1.317)			
By age 20	10.506	10.317	10.735	3933	2154	1779
	(1.535)	(1.615)	(1.399)			
By age 21	10.768	10.578	11.001	3502	1928	1574
	(1.598)	(1.734)	(1.379)			
Ever criminal charges (0/1):						
Penal code, ages 10-14 (as if)	0.052	0.078	0.024	4363	2303	2060
	(0.223)	(0.268)	(0.152)			
Penal code, ages 15-17	0.103	0.153	0.044	4605	2486	2119
	(0.304)	(0.360)	(0.205)			
Penal code, ages 15-21	0.195	0.281	0.091	3017	1647	1370
	(0.396)	(0.450)	(0.288)			
Ever criminal convictions (0/1):						
Penal code, ages 15-17	0.073	0.106	0.035	4988	2673	2315
	(0.261)	(0.308)	(0.185)			
Penal code, ages 15-21	0.151	0.213	0.077	3401	1851	1550
	(0.358)	(0.410)	(0.267)			
Ever inactive (neither in education nor employment) (0/1):						
Inactive at age 18	0.222	0.240	0.201	4367	2374	1993
	(0.416)	(0.427)	(0.401)			
Ever inactive during 18-19	0.343	0.364	0.317	3958	2166	1792
	(0.475)	(0.481)	(0.465)			
Ever inactive during 18-20	0.446	0.470	0.415	3506	1932	1574
	(0.497)	(0.499)	(0.493)			
Ever inactive during 18-21	0.511	0.540	0.476	3013	1658	1355
	(0.500)	(0.499)	(0.500)			
Inactive (neither in education nor employement) (0/1):						
During the enitre age range 18-19	0.115	0.120	0.109	3492	1900	1592
	(0.319)	(0.326)	(0.311)			
During the enitre age range 18-20	0.092	0.095	0.088	3069	1678	1391
	(0.289)	(0.293)	(0.284)			
During the enitre age range 18-21	0.071	0.073	0.068	2649	1443	1206
	(0.256)	(0.260)	(0.252)			

Source : Danish administrative registers 1997-2019 linked with the dataset on the individual's neighbourhood of

Notes :

[1] Public school pupils enrolled between 2010 and 2019. Standardized score within cohort (mean: 0, std. dev.: 1).

Table 2 Assigned Municipality Attributes and Individual Characteristics of Assignees

	Dependent variables: Characteristics of the assigned municipality of residence									
	Share of country population	Immigrants and descendants as a share of the population	Immigrants and descendants of non-Western origin as a share of the population	Co-national share	Share of language fellows	General employment rate	Employment rate among language fellows	Employment rate among co-nationals	High-skilled share	Youth crime conviction rate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Years of education of household head:										
(ref. category: 0-9 years)										
11-13 yrs. of educ.	3.59e-06	-4.23e-05	2.14e-05	3.90e-05	0.000244	-0.000451	0.000585	-0.00114	-0.000563	-2.34e-06
	(2.38e-05)	(0.000223)	(9.99e-05)	(6.53e-05)	(0.000210)	(0.000300)	(0.00784)	(0.00568)	(0.000396)	(2.98e-05)
More than 13 yrs. of educ.	2.64e-05	-0.000339	-0.000166	-6.33e-05	0.000208	-5.64e-05	0.000385	-0.00942*	0.000220	-4.01e-06
	(2.18e-05)	(0.000244)	(0.000102)	(7.43e-05)	(0.000248)	(0.000284)	(0.00700)	(0.00554)	(0.000323)	(2.74e-05)
Number of children aged 0-2	-1.59e-06	-2.32e-05	-5.47e-05	-1.03e-05	-4.90e-05	0.000183	0.00607	0.000804	6.51e-05	9.05e-06
	(1.34e-05)	(0.000137)	(6.77e-05)	(6.01e-05)	(0.000159)	(0.000234)	(0.00545)	(0.00428)	(0.000223)	(2.21e-05)
Number of children aged 3-17	5.01e-05	-0.000110	-9.51e-06	4.19e-05	-3.63e-05	-0.000369	0.000595	-0.00210	0.000178	4.71e-06
	(4.32e-05)	(0.000274)	(0.000161)	(8.50e-05)	(0.000172)	(0.000298)	(0.00779)	(0.00544)	(0.000516)	(3.25e-05)
Indicator for married	-1.59e-05	0.000253	-8.71e-05	-9.82e-05	-0.000231	-5.94e-05	-0.00578	0.000305	-0.000172	-1.45e-05
	(3.20e-05)	(0.000279)	(0.000141)	(0.000101)	(0.000219)	(0.000287)	(0.00663)	(0.00549)	(0.000382)	(3.25e-05)
Male	6.25e-05	-0.000497*	-0.000162	-2.91e-05	6.64e-05	-0.000114	0.00728	-0.00260	0.000635	4.02e-05*
	(5.25e-05)	(0.000286)	(0.000143)	(6.95e-05)	(0.000183)	(0.000296)	(0.00645)	(0.00439)	(0.000434)	(2.29e-05)
Controls:										
Age at arrival FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country of origin FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year of assignment FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Municipality FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	5,211									

Source : Administrative registers from Statistics Denmark 1997-2021 linked with dataset on the individual's neighborhood of residence constructed by Damm, Hassani, and Schultz-Nielsen (2021).

Notes: *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by assigned municipality in parentheses. Sample: Refugee household heads who had children when they were assigned to a municipality of residence. Additional controls: An indicator for missing information about the individual's education at arrival. Number of unique municipalities in the sample: 93 (of 98 in the country).

Table 3 Assigned Macroneighborhood Attributes and Individual Characteristics of Assignees

	Dependent variable: Characteristics of the neighborhood of assignment									
	Share of municipal population	Immigrants and descendants as a share of the population	Immigrants and descendants of non-Western origin as a share of the population	Co-national share	Share of language fellows	General employment rate	Employment rate among co-nationals	Employment rate among language fellows	High-skilled share	Youth crime conviction rate
	(1)	(2)	(3)	(4)	(5)	(6)	(8)	(9)	(10)	(16)
Years of education of household head:										
(ref. category: 0-9 years)										
11-13 yrs. of educ.	1.36e-05	0.00151	0.000788	0.000270	-0.00140	-0.00192	-0.0113	-0.00731	-0.000979	3.80e-05
	(0.000992)	(0.00354)	(0.00213)	(0.000262)	(0.00138)	(0.00354)	(0.00929)	(0.0106)	(0.00317)	(0.000199)
More than 13 yrs. of educ.	0.000599	0.00209	0.000666	6.29e-05	0.000152	-0.00311	-0.00280	-0.00124	-0.00203	-8.75e-05
	(0.000824)	(0.00299)	(0.00170)	(0.000278)	(0.00128)	(0.00302)	(0.0109)	(0.0103)	(0.00259)	(0.000162)
Number of children aged 0-2	-0.000215	0.000300	0.000186	0.000104	0.00114	-0.000738	0.00147	0.0193**	-0.00161	0.000174
	(0.000559)	(0.00240)	(0.00153)	(0.000475)	(0.00131)	(0.00244)	(0.00877)	(0.00956)	(0.00217)	(0.000136)
Number of children aged 3-17	0.000201	0.00472	0.00311	0.000326	0.00156	-0.00575	0.00428	0.00845	-0.00565*	8.34e-05
	(0.000665)	(0.00313)	(0.00207)	(0.000361)	(0.00133)	(0.00357)	(0.0108)	(0.0107)	(0.00291)	(0.000199)
Indicator for married	-0.00103	0.00279	0.00155	0.000567	-0.000197	-0.00147	-0.0120	-0.00913	0.00120	-2.22e-05
	(0.000851)	(0.00282)	(0.00183)	(0.000461)	(0.00122)	(0.00342)	(0.0103)	(0.00914)	(0.00315)	(0.000233)
Male	0.00170**	-0.00466	-0.00293	-0.000335	-0.000414	0.00376	0.00309	-0.00881	0.00136	-0.000275
	(0.000751)	(0.00320)	(0.00194)	(0.000289)	(0.00103)	(0.00334)	(0.00936)	(0.00981)	(0.00326)	(0.000198)
Controls:										
Age category FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country of origin FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year of immigration FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Municipality FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	5,211									

Source: Administrative registers from Statistics Denmark 1997-2021 linked with dataset on the individual's neighborhood of residence constructed by Damm, Hassani, and Schultz-Nielsen (2021).

Notes: *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by assigned municipality in parentheses. Sample: Refugee household heads who had children when they were assigned to a municipality of residence. Additional controls: An indicator for missing information about the individual's education at arrival. Number of unique macroneighborhoods: 1109 (of 1961 in the country).

Table 4 Effects of Assigned Neigbourhood Characteristics at Arrival on 9th Grade Exit Exam Outcomes by Age 18

	Neighbourhood definition used to delimit the co-ethnic group in the assigned area:														
	Municipality						Macroneighborhood								
	Dependent variable						Dependent variable								
	Too old for grade when taking the 9th grade exit exams?		Taken all 9th grade exams by age 18?		GPA (rank), all subjects		Too old for grade when taking the 9th grade exit exam?			Taken all 9th grade exams by age 18?			GPA (rank), all subjects		
Mean	0.479	0.479	0.739	0.739	0.437	0.436	0.479	0.479	0.479	0.739	0.739	0.739	0.437	0.436	0.437
Std. dev.	(0.500)	(0.500)	(0.439)	(0.439)	(0.288)	0.288	(0.500)	(0.500)	(0.500)	(0.439)	(0.439)	(0.439)	(0.288)	0.288	(0.288)
Specification:	(1)	(2)	(1)	(2)	(1)	(2)	(3)	(4)	(5)	(3)	(4)	(5)	(3)	(4)	(5)
Column:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Panel A: Definition of co-ethnics: Language fellows															
Explanatory variables:															
Co-ethnic group share	1.384	4.817**	-2.431*	-2.498	0.567	-2.540	-0.0977	0.483	0.725	0.215	0.721	0.251	-0.0250	-0.689***	-0.855***
	(1.548)	(2.203)	(1.449)	(1.896)	(1.422)	(1.469)	(0.350)	(0.555)	(0.476)	(0.295)	(0.535)	(0.573)	(0.170)	(0.257)	(0.252)
Employment rate of co-ethnic group	-0.0973**	-0.0797	0.0278	0.0406	-0.00545	0.00686	-0.0464	-0.0811**	-0.0997***	-0.0249	-0.0255	-0.0337	-0.0106	0.0118	-0.0115
	(0.0420)	(0.0581)	(0.0528)	(0.0530)	(0.0416)	(0.0489)	(0.0311)	(0.0350)	(0.0346)	(0.0224)	(0.0306)	(0.0323)	(0.0191)	(0.0232)	(0.0213)
Employment rate (municipality)	-0.550	-0.641	-0.845	-1.050	-0.128	0.417	-0.735	-0.803	-0.160	-0.829	-1.017	-1.355	-0.130	0.492	0.173
	(1.150)	(1.369)	(0.918)	(1.147)	(0.623)	(0.988)	(1.158)	(1.376)	(1.380)	(0.917)	(1.143)	(1.035)	(0.634)	(0.967)	(0.929)
Youth crime conviction rate	2.361	-2.286	-2.306	-3.191	-0.0615	-0.780	2.209	-2.936	1.592	-2.293	-3.283	-3.732	-0.111	-0.552	1.326
(municipality)	(3.040)	(4.111)	(2.095)	(2.862)	(1.495)	(2.040)	(3.040)	(4.147)	(3.835)	(2.069)	(2.866)	(3.218)	(1.503)	(0.63)	(2.115)
Panel B: Definition of co-ethnics: Co-nationals															
Explanatory variables:															
Co-ethnic group share	-0.373	-0.623	-6.535	-4.451	3.490	-3.551	-0.649	0.233	0.682	0.790	0.477	0.257	0.217	-0.774	-1.609***
	(4.873)	(7.073)	(4.409)	(6.441)	(3.347)	(3.811)	(1.001)	(1.196)	(1.094)	(0.623)	(0.774)	(0.863)	(0.448)	(0.567)	(0.607)
Employment rate of co-ethnic group	-0.0851**	-0.0663	0.0279	0.0358	0.00297	0.0130	-0.0468	-0.0614	-0.0657	-0.0298	-0.0244	-0.0409	-0.0322	-0.000797	-0.0376
	(0.0378)	(0.0461)	(0.0430)	(0.0420)	(0.0273)	(0.0326)	(0.0364)	(0.0466)	(0.0498)	(0.0297)	(0.0405)	(0.0397)	(0.0216)	(0.0275)	(0.0239)
Employment rate (municipality)	-0.557	-0.730	-0.879	-1.027	-0.121	0.407	-0.706	-0.778	-0.0523	-0.785	-0.960	-1.297	-0.108	0.459	0.116
	(1.143)	(1.413)	(0.919)	(1.151)	(0.638)	(0.977)	(1.151)	(1.428)	(1.593)	(0.910)	(1.150)	(1.040)	(0.634)	(0.963)	(0.932)
Youth crime conviction rate	2.205	-2.598	-2.141	-2.992	-0.0564	-0.610	2.382	-2.584	1.895	-2.188	-3.151	-3.580	-0.0724	-0.629	1.291
(municipality)	(3.037)	(4.251)	(2.084)	(2.809)	(1.493)	(2.001)	(3.029)	(4.276)	(4.136)	(2.085)	(2.861)	(3.224)	(1.495)	(2.008)	(2.103)
Observations	4,565	4,466	5,105	5,001	3,976	3,890	4,565	4,466	4,565	5,105	5,001	5,105	3,976	3,890	3,976
Controls:															
Gender	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gender, country of origin, year of arrival of HH FE, and age at assignment FE; family background	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Assigned municipal population share and non-Western immigrant share	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Assigned municipality FE	Yes	No	Yes	No	Yes	No	Yes	No	No	Yes	No	No	Yes	No	No
Assigned school district FE	No	Yes	No	Yes	No	Yes	No	Yes	No	No	Yes	No	No	Yes	No
Assigned neighborhood FE	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	Yes

Source : Danish administrative registers 1997-2019 (including the school grade register available from 2002) linked with the dataset on the individual's neighbourhood of residence constructed by Damm, Hassani and Schultz-Nielsen (2021).

Notes : *** p<0.01,** p<0.05, * p<0.10. Standard errors clustered by the assigned municipality. Sample: Children of HH heads who arrived jointly with HH or within 12 months later and who arrive before age 16 who are observed annually at age 16-18 from 2002, the start year of the national education register. Number of unique municipalities: 93, number of unique macroneighborhoods: 1109. Family background characteristics: Age category FE, single parent dummy, dummies for children aged 0-2 and children aged 3-17, and education category FE and dummy for mother missing and dummy for father missing. The following municipality characteristics and macroneighbourhood characteristics are reported using the sample of refugee children (N=5,105). Mean characteristics of the assigned municipality at the time of assignment (standard deviation): The average employment rate: 0.773 (0.039), the average youth crime conviction rate: 0.018 (0.005), the average share of language fellows: 0.005 (0.008), the average share of co-nationals: 0.002 (0.002), the average employment rate of language fellows: 0.333 (0.227), the average employment rate of co-nationals: 0.230 (0.239), the average youth crime conviction rate: 0.0377 (0.071). Mean characteristics of the assigned macroneighbourhood at the time of assignment (standard deviation): The average share of language fellows: 0.010 (0.029), the average share of co-nationals: 0.004 (0.009), the average employment rate of language fellows: 0.278 (0.312), the average employment rate of co-nationals: 0.130 (0.262).

Table 5 Effects of Assigned Neighbourhood Characteristics at Arrival on 9th Grade Exit Exams in Danish by Age 18

	Neighbourhood definition used to delimit the co-ethnic group in the assigned area:									
	Municipality				Macroneighborhood					
	Dependent variable				Dependent variable					
	Taken the 9th grade exams in that subject by age 18?		Subject GPA (rank)		Taken the 9th grade exams in that subject by age 18?			Subject GPA (rank)		
Mean	0.806	0.805	0.474	0.474	0.806	0.805	0.806	0.474	0.474	0.474
Std. dev.	(0.395)	(0.396)	(0.184)	(0.184)	(0.395)	(0.396)	(0.395)	(0.184)	(0.184)	(0.184)
Specification:	(1)	(2)	(1)	(2)	(3)	(4)	(5)	(3)	(4)	(5)
Column:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A : Definition of co-ethnics: Language fellows										
Explanatory variables:										
Co-ethnic group share	-3.292**	-3.794**	0.0695	-1.820**	0.0225	0.434	0.158	0.106	-0.324**	-0.383**
	(1.384)	(1.820)	(0.777)	(0.815)	(0.301)	(0.601)	(0.541)	(0.112)	(0.155)	(0.169)
Employment rate of co-ethnic group	-0.00405	0.0166	0.0190	0.0299	-0.0266	-0.0235	-0.0423	0.00366	0.0111	0.00559
	(0.0489)	(0.0460)	(0.0254)	(0.0315)	(0.0190)	(0.0272)	(0.0291)	(0.0102)	(0.0138)	(0.0127)
Employment rate (municipality)	-0.368	-1.067	-0.348	0.0380	-0.391	-1.069	-0.880	-0.319	0.143	-0.101
	(0.841)	(1.176)	(0.313)	(0.499)	(0.831)	(1.159)	(1.146)	(0.319)	(0.487)	(0.461)
Youth crime conviction rate	-2.330	-3.302	0.0141	-0.557	-2.275	-3.312	-2.911	0.0186	-0.383	0.287
(municipality)	(2.060)	(2.955)	(0.812)	(1.289)	(2.053)	(2.979)	(2.974)	(0.811)	(1.291)	(1.230)
Panel B: Definition of co-ethnics: Co-nationals										
Explanatory variables:										
Co-ethnic group share	-5.827	-6.191	0.370	-3.831	0.0219	-0.382	-0.341	0.555**	-0.0919	-0.317
	(4.154)	(6.440)	(1.663)	(2.013)	(0.617)	(0.726)	(0.766)	(0.243)	(0.348)	(0.468)
Employment rate of co-ethnic group	0.00769	0.0334	0.00945	0.0159	-0.0339	-0.0599	-0.0343	-0.00916	0.00209	-0.0163
	(0.0384)	(0.0360)	(0.0161)	(0.0218)	(0.0260)	(0.0340)	(0.0328)	(0.0123)	(0.0158)	(0.0142)
Employment rate (municipality)	-0.418	-1.092	-0.328	0.0744	-0.361	-1.002	-0.813	-0.298	0.125	-0.114
	(0.826)	(1.162)	(0.323)	(0.492)	(0.821)	(1.168)	(1.136)	(0.320)	(0.484)	(0.459)
Youth crime conviction rate	-2.159	-3.011	0.0283	-0.439	-2.155	-3.140	-2.709	0.0322	-0.451	0.240
(municipality)	(2.048)	(2.900)	(0.815)	(1.287)	(2.054)	(2.963)	(2.947)	(0.805)	(1.292)	(1.227)
Observations	5,040	4,936	4,292	4,198	5,040	4,936	5,040	4,292	4,198	4,292
Controls:										
Gender	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gender, country of origin, year of arrival of HH FE, and age at assignment FE; family background	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Assigned municipal population share and non-Western immigrant share	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Assigned municipality FE	Yes	No	Yes	No	Yes	No	No	Yes	No	No
Assigned school district FE	No	Yes	No	Yes	No	Yes	No	No	Yes	No
Assigned neighborhood FE	No	No	No	No	No	No	Yes	No	No	Yes

Source : Danish administrative registers 1997-2019 (including the school grade register available from 2002) linked with the dataset on the individual's neighbourhood of residence constructed by Damm, Hassani and Schultz-Nielsen (2021).

Notes: *** p<0.01,** p<0.05, * p<0.10. Standard errors clustered by the assigned municipality. Sample: Children of HH heads who arrived jointly with HH or within 12 months later and who arrive before age 16 who are observed annually at age 16-18 from 2002, the start year of the national education register. Number of unique municipalities: 93, number of unique macroneighborhoods: 1109. Family background characteristics: Age category FE, single parent dummy, dummies for children aged 0-2 and children aged 3-17, and education category FE and dummy for mother missing and dummy for father missing. The following municipality characteristics and macroneighbourhood characteristics are reported using the sample of refugee children (N=5,105). Mean characteristics of the assigned municipality at the time of assignment (standard deviation): The average employment rate: 0.773 (0.039), the average youth crime conviction rate: 0.018 (0.005), the average share of language fellows: 0.005 (0.008), the average share of co-nationals: 0.002 (0.002), the average employment rate of language fellows: 0.333 (0.227), the average employment rate of co-nationals: 0.230 (0.239), the average youth crime conviction rate: 0.0377 (0.071). Mean characteristics of the assigned macroneighbourhood at the time of assignment (standard deviation): The average share of language fellows: 0.010 (0.029), the average share of co-nationals: 0.004 (0.009), the average employment rate of language fellows: 0.278 (0.312), the average employment rate of co-nationals: 0.130 (0.262).

Table 6 Effects of Assigned Characteristics at Arrival on 9th Grade Exit Exams in Math by Age 18

	Neighbourhood definition used to delimit the co-ethnic group in the assigned area:									
	Municipality				Macroneighborhood					
	Dependent variable				Dependent variable					
	Taken the 9th grade exams in that subject by age 18?	Taken the 9th grade exams in that subject by age 18?	Subject GPA (rank)	Subject GPA (rank)	Taken the 9th grade exams in that subject by age 18?	Taken the 9th grade exams in that subject by age 18?	Taken the 9th grade exams in that subject by age 18?	Subject GPA (rank)	Subject GPA (rank)	Subject GPA (rank)
Mean	0.828	0.826	0.498	0.498	0.828	0.826	0.828	0.498	0.498	0.498
Std. dev.	(0.377)	(0.379)	(0.201)	(0.201)	(0.377)	(0.379)	(0.377)	(0.201)	(0.201)	(0.201)
Specification:	(1)	(2)	(1)	(2)	(3)	(4)	(5)	(3)	(4)	(5)
Column:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A : Definition of co-ethnics: Language fellows										
Explanatory variables:										
Co-ethnic group share	-3.549***	-4.005**	0.114	-2.470**	-0.0286	0.334	-0.197	0.0585	-0.300	-0.430**
	(1.289)	(1.880)	(1.190)	(1.058)	(0.295)	(0.577)	(0.598)	(0.117)	(0.153)	(0.214)
Employment rate of co-ethnic group	-0.0102	0.0309	-0.0106	-0.0239	-0.0103	0.00735	-0.0230	-0.00785	-0.00568	-0.00535
	(0.0540)	(0.0487)	(0.0272)	(0.0316)	(0.0214)	(0.0289)	(0.0311)	(0.0138)	(0.0178)	(0.0186)
Employment rate (municipality)	-0.707	-1.328	-0.0348	0.680	-0.733	-1.318	-1.415	-0.0598	0.665	-0.0808
	(0.749)	(1.158)	(0.424)	(0.598)	(0.751)	(1.155)	(1.012)	(0.426)	(0.587)	(0.559)
Youth crime conviction rate (municipality)	-3.182	-2.233	0.264	0.645	-3.071	-2.094	-2.084	0.233	0.780	1.339
	(1.877)	(2.763)	(1.241)	(1.619)	(1.881)	(2.781)	(2.730)	(1.247)	(1.597)	(1.799)
Panel B: Definition of co-ethnics: Co-nationals										
Explanatory variables:										
Co-ethnic group share	-5.209	-5.103	-0.472	-5.353	0.190	-0.0832	-0.392	-0.0886	-0.811	-1.585***
	(3.922)	(5.878)	(2.395)	(2.856)	(0.576)	(0.694)	(0.711)	(0.283)	(0.420)	(0.467)
Employment rate of co-ethnic group	0.0103	0.0573	0.00309	-0.0120	-0.0274	-0.0159	-0.0471	-0.0143	-0.00836	0.00437
	(0.0443)	(0.0402)	(0.0179)	(0.0222)	(0.0258)	(0.0347)	(0.0352)	(0.0152)	(0.0190)	(0.0194)
Employment rate (municipality)	-0.774	-1.370	-0.0650	0.642	-0.717	-1.263	-1.382	-0.0455	0.644	-0.121
	(0.744)	(1.158)	(0.424)	(0.588)	(0.745)	(1.164)	(1.010)	(0.424)	(0.582)	(0.556)
Youth crime conviction rate (municipality)	-2.998	-1.924	0.264	0.766	-3.006	-2.091	-1.999	0.272	0.816	1.307
	(1.879)	(2.724)	(1.244)	(1.594)	(1.886)	(2.776)	(2.709)	(1.241)	(1.586)	(1.783)
Observations	5,040	4,936	4,406	4,308	5,040	4,936	5,040	4,406	4,308	4,406
Controls:										
Gender	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gender, country of origin, year of arrival of HH FE, and age at assignment FE; family background	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Assigned municipal population share and non-Western immigrant share	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Assigned municipality FE	Yes	No	Yes	No	Yes	No	No	Yes	No	No
Assigned school district FE	No	Yes	No	Yes	No	Yes	No	No	Yes	No
Assigned neighborhood FE	No	No	No	No	No	No	Yes	No	No	Yes

Source : Danish administrative registers 1997-2019 (including the school grade register available from 2002) linked with the dataset on the individual's neighbourhood of residence constructed by Damm, Hassani and Schultz-Nielsen (2021).

Notes : *** p<0.01,** p<0.05, * p<0.10. Standard errors clustered by the assigned municipality. Sample: Children of HH heads who arrived jointly with HH or within 12 months later and who arrive before age 16 who are observed annually at age 16-18 from 2002, the start year of the national education register. Number of unique municipalities: 93, number of unique macroneighborhoods: 1109. Family background characteristics: Age category FE, single parent dummy, dummies for children aged 0-2 and children aged 3-17, and education category FE and dummy for mother missing and dummy for father missing. The following municipality characteristics and macroneighbourhood characteristics are reported using the sample of refugee children (N=5,105). Mean characteristics of the assigned municipality at the time of assignment (standard deviation): The average employment rate: 0.773 (0.039), the average youth crime conviction rate: 0.018 (0.005), the average share of language fellows: 0.005 (0.008), the average share of co-nationals: 0.002 (0.002), the average employment rate of language fellows: 0.333 (0.227), the average employment rate of co-nationals: 0.230 (0.239), the average youth crime conviction rate: 0.0377 (0.071). Mean characteristics of the assigned macroneighbourhood at the time of assignment (standard deviation): The average share of language fellows: 0.010 (0.029), the average share of co-nationals: 0.004 (0.009), the average employment rate of language fellows: 0.278 (0.312), the average employment rate of co-nationals: 0.130 (0.262).

Table 7 Effects of Assigned Neighbourhood Characteristics at Arrival on National Test Scores in Danish (reading) and Math in Grade 6

	Neighbourhood definition used to delimit the co-ethnic group in the assigned area:									
	Municipality		Macroneighborhood			Municipality		Macroneighborhood		
	Dependent variable					Dependent variable				
	Test taker	Test taker	Test taker	Test taker	Test taker	Test score	Test score	Test score	Test score	Test score
	Sample: Potential test takers					Sample: Test takers				
Specification:	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Column:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Danish (reading)										
	Dependent variable									
Mean	0.865	0.863	0.865	0.863	0.865	0.298	0.296	0.298	0.296	0.298
Std. dev.	(0.342)	(0.343)	(0.342)	(0.343)	(0.342)	(0.263)	(0.261)	(0.263)	(0.261)	(0.263)
Explanatory variables:										
Language group share	-0.831	-2.129	0.325	0.119	0.543	-1.035	-2.644	-0.0925	-0.561	-0.784*
	(1.410)	(1.868)	(0.170)	(0.339)	(0.364)	(1.809)	(2.512)	(0.145)	(0.283)	(0.398)
Employment rate of language group	0.0126	0.00502	0.0222	0.0192	0.0000564	0.0113	0.0136	-0.0133	-0.00105	0.000310
	(0.0335)	(0.0504)	(0.0217)	(0.0314)	(0.0284)	(0.0346)	(0.0479)	(0.0200)	(0.0276)	(0.0302)
Employment rate (municipality)	0.788	0.151	0.769	0.130	0.778	-0.359	0.477	-0.321	0.564	-0.187
	(0.737)	(1.315)	(0.726)	(1.282)	(1.110)	(0.626)	(1.069)	(0.626)	(1.046)	(1.087)
Youth crime conviction rate (municipality)	6.904***	5.673	6.899***	5.827	2.337	-1.294	-1.642	-1.272	-1.485	1.458
	(2.238)	(3.483)	(2.228)	(3.482)	(2.766)	(2.039)	(3.071)	(2.046)	(3.112)	(2.750)
Observations	3,154	3,097	3,154	3,097	3,154	2,728	2,674	2,728	2,674	2,728
Panel B: Math										
	Dependent variable									
Mean	0.891	0.912	0.891	0.912	0.891	0.351	0.349	0.890	0.338	0.339
Std. dev.	(0.312)	(0.00598)	(0.312)	(0.00598)	(0.312)	(0.00594)	(0.00596)	0.313	0.269	0.270
Explanatory variables:										
Language group share	-0.808	-2.892	0.624***	0.483	0.692**	2.328	-1.495	0.000513	-0.402	-0.653
	(1.402)	(1.883)	(0.165)	(0.306)	(0.310)	(1.685)	(2.240)	(0.141)	(0.353)	(0.388)
Employment rate of language group	-0.0292	-0.0487	0.0193	0.00879	-0.000503	0.0229	0.0163	0.00256	0.0109	0.0237
	(0.0308)	(0.0453)	(0.0185)	(0.0283)	(0.0264)	(0.0406)	(0.0563)	(0.0197)	(0.0330)	(0.0355)
Employment rate (municipality)	0.256	-0.0405	0.113	-0.207	-0.0414	-0.105	1.302	-0.0320	1.004	1.569
	(0.585)	(1.052)	(0.576)	(1.026)	(0.897)	(0.757)	(1.176)	(0.748)	(1.154)	(1.101)
Youth crime conviction rate (municipality)	4.704**	5.660	4.664**	5.743	2.245	-2.795	-5.428**	-2.868	-2.521	-1.729
	(2.119)	(3.402)	(2.108)	(3.387)	(2.637)	(2.295)	(2.600)	(2.318)	(2.661)	(3.081)
Observations	3,147	3,092	3,147	3,092	3,147	2,803	2,751	2,803	2,751	2,803
Controls:										
Gender	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gender, country of origin, year of arrival of HH FE, and age at assignment FE; family background	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Assigned municipal population share and non-Western immigrant share	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Assigned municipality FE	Yes	No	Yes	No	No	Yes	No	Yes	No	No
Assigned school district FE	No	Yes	No	Yes	No	No	Yes	No	Yes	No
Assigned neighborhood FE	No	No	No	No	Yes	No	No	No	No	Yes

Source: Danish administrative registers 1997-2019 linked with the dataset on the individual's neighbourhood of residence constructed by Damm, Hassani and Schultz-Nielsen (2021) and national pupil registers on national test scores 2010-2019.

Notes : *** p<0.01,** p<0.05, * p<0.10. Standard errors clustered by the assigned municipality. Sample: Children of HH heads who arrived jointly with HH or within 12 months later and who arrive before age 16 who are observed annually at age 16-18 from 2002, the start year of the national education register. Number of unique municipalities: 93, number of unique macroneighborhoods: 1109. Family background characteristics: Age category FE, single parent dummy, dummies for children aged 0-2 and children aged 3-17, and education category FE and dummy for mother missing and dummy for father missing. The following municipality characteristics and macroneighbourhood characteristics are reported using the sample of refugee children (N=5,105). Mean characteristics of the assigned municipality at the time of assignment (standard deviation): The average employment rate: 0.773 (0.039), the average youth crime conviction rate: 0.018 (0.005), the average share of language fellows: 0.005 (0.008), the average share of co-nationals: 0.002 (0.002), the average employment rate of language fellows: 0.333 (0.227), the average employment rate of co-nationals: 0.230 (0.239), the average youth crime conviction rate: 0.0377 (0.071). Mean characteristics of the assigned macroneighbourhood at the time of assignment (standard deviation): The average share of language fellows: 0.010 (0.029), the average share of co-nationals: 0.004 (0.009), the average employment rate of language fellows: 0.278 (0.312), the average employment rate of co-nationals: 0.130 (0.262).

Table 8 Effects of Assigned Neighbourhood Characteristics at Arrival on Attained Years of Education by different Ages. Definition of co-ethnics: Language fellows.

	Neighbourhood definition used to delimit the co-ethnic group in the assigned area:																			
	Municipality		Macroneighborhood			Municipality		Macroneighborhood			Municipality		Macroneighborhood			Municipality		Macroneighborhood		
	Dependent variable: Attained years of schooling by																			
	Age 18		Age 18			Age 19		Age 19			Age 20		Age 20			Age 21		Age 21		
Mean	9.408	9.410	9.408	9.410	9.408	10.13	10.13	10.13	10.13	10.13	10.75	10.75	10.75	10.75	10.75	11.04	11.04	11.04	11.04	11.04
Std. dev.	(0.646)	(0.648)	(0.646)	(0.648)	(0.646)	(1.202)	(1.201)	(1.202)	(1.201)	(1.202)	(1.299)	(1.300)	(1.299)	(1.300)	(1.299)	(1.296)	(1.297)	(1.296)	(1.297)	(1.296)
Specification:	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Column:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Explanatory variables:																				
Language group share	-2.954	-4.681	0.0371	-0.459	-0.965	2.944	2.607	-0.133	-2.640	-3.083	9.424	-10.42	-1.092	0.351	-1.442	4.674	-5.477	-0.943	2.554	3.441
	(3.253)	(5.132)	(0.421)	(0.884)	(0.857)	(7.423)	(9.950)	(0.723)	(1.940)	(2.514)	(11.00)	(16.89)	(1.399)	(2.596)	(3.104)	(14.81)	(16.58)	(1.761)	(3.085)	(3.498)
Employment rate of language group	0.0304	0.111	-0.00846	0.0694	-0.00945	0.302	0.374	0.113	0.146	0.115	0.258	0.102	0.0140	0.0665	-0.0663	0.0468	-0.121	-0.0175	-0.0115	-0.107
	(0.0779)	(0.108)	(0.0398)	(0.0602)	(0.0667)	(0.152)	(0.240)	(0.0916)	(0.135)	(0.151)	(0.201)	(0.263)	(0.116)	(0.181)	(0.190)	(0.212)	(0.287)	(0.119)	(0.175)	(0.208)
Employment rate (municipality)	-0.355	-2.553	-0.294	-2.240	-3.553	-1.575	-7.583	-0.816	-5.946	-7.597	-0.215	-9.857	0.480	-9.800	-10.22	-6.635	-16.87**	-6.437	-17.81**	-18.57**
	(1.881)	(2.587)	(1.863)	(2.543)	(2.496)	(2.815)	(4.322)	(2.853)	(4.344)	(4.257)	(3.758)	(6.054)	(3.812)	(6.136)	(7.241)	(4.464)	(6.728)	(4.555)	(6.871)	(8.487)
Youth crime conviction rate (municipality)	5.572	12.10	5.695	12.76	4.977	-4.266	-5.746	-3.881	-4.191	1.202	0.658	-2.149	0.292	-1.461	1.863	2.653	-4.427	2.440	-4.649	-0.759
	(4.901)	(7.172)	(4.845)	(6.939)	(6.551)	(10.24)	(14.59)	(10.34)	(14.64)	(12.70)	(9.009)	(15.51)	(8.963)	(15.48)	(13.58)	(9.681)	(16.04)	(9.654)	(15.93)	(12.83)
Observations	3,041	2,984	3,041	2,984	3,041	2,782	2,725	2,782	2,725	2,782	2,500	2,445	2,500	2,445	2,500	2,236	2,186	2,236	2,186	2,236
Controls:																				
Gender	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gender, country of origin, year of arrival of HH FE, and age at assignment FE; family background	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Assigned municipal population share and non-Western immigrant share	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Assigned municipality FE	Yes	No	Yes	No	No	Yes	No	Yes	No	No	Yes	No	Yes	No	No	Yes	No	Yes	No	No
Assigned school district FE	No	Yes	No	Yes	No	No	Yes	No	Yes	No	No	Yes	No	Yes	No	No	Yes	No	Yes	No
Assigned neighborhood FE	No	No	No	No	Yes	No	No	No	Yes	Yes	No	No	No	Yes	Yes	No	No	No	Yes	Yes

Source: Danish administrative registers 1997-2019 linked with the dataset on the individual's neighbourhood of residence constructed by Damm, Hassani and Schultz-Nielsen (2021).

Notes: *** p<0.01,** p<0.05, * p<0.10. Standard errors clustered by the assigned municipality. Sample: Children of HH heads who arrived jointly with HH or within 12 months later and who arrive before age 16 who are observed annually at age 16-18 from 2002, the start year of the national education register. Number of unique municipalities: 93, number of unique macroneighborhoods: 1109. Family background characteristics: Age category FE, single parent dummy, dummies for children aged 0-2 and children aged 3-17, and education category FE and dummy for mother missing and dummy for father missing. The following municipality characteristics and macroneighbourhood characteristics are reported using the sample of refugee children (N=5,105). Mean characteristics of the assigned municipality at the time of assignment (standard deviation): The average employment rate: 0.773 (0.039), the average youth crime conviction rate: 0.018 (0.005), the average share of language fellows: 0.005 (0.008), the average share of co-nationals: 0.002 (0.002), the average employment rate of language fellows: 0.333 (0.227), the average employment rate of co-nationals: 0.230 (0.239), the average youth crime conviction rate: 0.0377 (0.071). Mean characteristics of the assigned macroneighbourhood at the time of assignment (standard deviation): The average share of language fellows: 0.010 (0.029), the average share of co-nationals: 0.004 (0.009), the average employment rate of language fellows: 0.278 (0.312), the average employment rate of co-nationals: 0.130 (0.262).

Table 9 Effects of Assigned Neighbourhood Characteristics at Arrival on Being Inactive (Neither in Education Nor Employment) during that entire age range

	Neighbourhood definition used to delimit the co-ethnic group in the assigned area:														
	Municipality		Macroneighborhood			Municipality		Macroneighborhood			Municipality		Macroneighborhood		
	Dependent variable: Inactive during the entire age range														
	Ages 18-19		Ages 18-19			Ages 18-20		Ages 18-20			Ages 18-21		Ages 18-21		
Mean	0.0962	0.0967	0.0962	0.0967	0.0962	0.0769	0.0782	0.0769	0.0782	0.0769	0.0623	0.0632	0.0623	0.0632	0.0623
Std. dev.	(0.295)	(0.296)	(0.295)	(0.312)	(0.295)	(0.266)	(0.269)	(0.266)	(0.269)	(0.266)	(0.242)	(0.243)	(0.242)	(0.243)	(0.242)
Specification:	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Column:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Explanatory variables:															
Language group share	-1.012	2.667	-0.0281	-0.471	-0.828	-1.347	1.266	0.0975	-0.441	-1.273	2.471	2.273	0.708	0.429	-0.691
	(2.781)	(3.659)	(0.423)	(0.999)	(0.839)	(2.571)	(3.381)	(0.486)	(0.564)	(0.796)	(2.665)	(3.224)	(0.536)	(0.810)	(1.008)
Employment rate of language group	0.00127	-0.00315	0.00897	-0.0180	0.0377	-0.0204	-0.0263	-0.00512	-0.0314	-0.00999	-0.0207	-0.0178	-0.0222	-0.0282	-0.0181
	(0.0378)	(0.0510)	(0.0275)	(0.0339)	(0.0403)	(0.0364)	(0.0418)	(0.0249)	(0.0263)	(0.0315)	(0.0406)	(0.0456)	(0.0237)	(0.0273)	(0.0389)
Employment rate (municipality)	2.515**	3.865***	2.535**	3.993***	0.995	2.348**	2.491	2.289**	2.529	1.970	1.158	2.311	1.068	2.268	0.378
	(0.997)	(1.359)	(1.011)	(1.363)	(1.478)	(1.043)	(1.528)	(1.056)	(1.538)	(1.509)	(1.171)	(1.832)	(1.184)	(1.865)	(1.593)
Youth crime conviction rate (municipality)	3.451	7.342**	3.529	7.255**	2.837	5.361**	7.341**	2.289**	7.220**	5.814	3.621	7.546**	3.539	7.357**	6.204
	(1.962)	(2.895)	(1.969)	(2.853)	(3.036)	(2.309)	(3.250)	(1.056)	(3.255)	(3.377)	(2.508)	(3.474)	(2.467)	(3.458)	(3.473)
Observations	2515	2460	2515	2460	2515	2237	2187	2237	2187	2237	1927	1882	1927	1882	1927
Controls:															
Gender	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gender, country of origin, year of arrival of HH FE, and age at assignment FE; family	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Assigned municipal population share and non-Western immigrant share	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Assigned municipality FE	Yes	No	Yes	No	No	Yes	No	Yes	No	No	Yes	No	Yes	No	No
Assigned school district FE	No	Yes	No	Yes	No	No	Yes	No	Yes	No	No	Yes	No	Yes	No
Assigned neighborhood FE	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	Yes

Source: Danish administrative registers 1997-2019 linked with the dataset on the individual's neighbourhood of residence constructed by Damm, Hassani and Schultz-Nielsen (2021).

Notes: *** p<0.01,** p<0.05, * p<0.10. Standard errors clustered by the assigned municipality. Sample: Children of HH heads who arrived jointly with HH or within 12 months later and who arrive before age 16 who are observed annually at age 16-18 from 2002, the start year of the national education register. Number of unique municipalities: 93, number of unique macroneighborhoods: 1109. Family background characteristics: Age category FE, single parent dummy, dummies for children aged 0-2 and children aged 3-17, and education category FE and dummy for mother missing and dummy for father missing. The following municipality characteristics and macroneighbourhood characteristics are reported using the sample of refugee children (N=5,105). Mean characteristics of the assigned municipality at the time of assignment (standard deviation): The average employment rate: 0.773 (0.039), the average youth crime conviction rate: 0.018 (0.005), the average share of language fellows: 0.005 (0.008), the average share of co-nationals: 0.002 (0.002), the average employment rate of language fellows: 0.333 (0.227), the average employment rate of co-nationals: 0.230 (0.239), the average youth crime conviction rate: 0.0377 (0.071). Mean characteristics of the assigned macroneighbourhood at the time of assignment (standard deviation): The average share of language fellows: 0.010 (0.029), the average share of co-nationals: 0.004 (0.009), the average employment rate of language fellows: 0.278 (0.312), the average employment rate of co-nationals: 0.130 (0.262).

Table 10 Effects of Assigned Neighbourhood Characteristics at Arrival on Ever Convicted for a Violation of the Penal Code during Selected Age Ranges

	Neighbourhood definition used to delimit the co-ethnic group in the assigned area:									
	Municipality				Macroneighborhood					
	Dependent variable: Ever convicted for a violation of the Penal Code				Dependent variable: Ever convicted for a violation of the Penal Code					
	Aged 15-17		Aged 15-21		Aged 15-17			Aged 15-21		
Mean	0.073	0.073	0.151	0.151	0.073	0.073	0.073	0.151	0.151	0.151
Std. dev.	(0.261)	(0.261)	(0.358)	(0.358)	(0.261)	(0.261)	(0.261)	(0.358)	(0.358)	(0.358)
Specification:	(1)	(2)	(1)	(2)	(3)	(4)	(5)	(3)	(4)	(5)
Column:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Men										
Explanatory variables:										
Language group share	0.00855	2.413	4.090*	8.551**	0.138	0.307	0.572*	0.267	0.0506	0.371
	(0.994)	(1.534)	(2.143)	(3.648)	(0.218)	(0.220)	(0.311)	(0.292)	(0.705)	(0.684)
Youth crime conviction rate of	-0.0467	-0.0154	-0.0450	0.0255	-0.0430	-0.0115	-0.0607	-0.0161	0.0503	-0.114
language group (municipality)	(0.0826)	(0.0986)	(0.169)	(0.184)	(0.0824)	(0.0995)	(0.0991)	(0.166)	(0.183)	(0.203)
Youth crime conviction rate	2.163	2.672	5.419*	7.178*	2.100	2.489	2.476	5.058*	6.653*	7.999**
(municipality)	(1.587)	(1.904)	(2.908)	(3.754)	(1.587)	(1.904)	(2.022)	(2.922)	(3.787)	(3.838)
Panel B: Women										
Explanatory variables:										
Language group share	-1.035	0.996	-0.508	4.491	0.0157	0.115	0.330	-0.115	0.0231	0.0660
	(0.925)	(1.272)	(2.033)	(3.738)	(0.177)	(0.395)	(0.358)	(0.381)	(1.115)	(0.580)
Youth crime conviction rate of	-0.0108	-0.0126	-0.0701	-0.106	-0.0159	-0.0192	-0.0140	-0.0921	-0.126	-0.124
language group (municipality)	(0.0574)	(0.0530)	(0.0893)	(0.120)	(0.0558)	(0.0529)	(0.0559)	(0.0901)	(0.116)	(0.130)
Youth crime conviction rate	0.323	-0.161	4.245*	3.709	0.565	-0.00411	-1.249	4.486*	3.565	3.891
(municipality)	(1.314)	(1.641)	(2.525)	(2.990)	(1.300)	(1.626)	(1.613)	(2.493)	(2.904)	(2.984)
Additional explanatory variables (assuming homogenous effects across gender):										
Employment rate of language	-0.0163	-0.00812	-0.0475	-0.0637	0.0192	0.0148	0.00850	0.00534	-0.0116	-0.0181
group	(0.0271)	(0.0328)	(0.0466)	(0.0614)	(0.0142)	(0.0177)	(0.0196)	(0.0247)	(0.0288)	(0.0276)
Employment rate (municipality)	0.272	-0.416	0.882	0.702	0.238	-0.453	-0.269	0.740	0.559	2.154*
	(0.541)	(0.637)	(1.016)	(1.414)	(0.539)	(0.624)	(0.638)	(1.013)	(1.419)	(1.252)
Male	0.0327	0.0102	0.0930*	0.0428	0.0416	0.0206	-0.000545	0.117**	0.0628	0.0515
	(0.0263)	(0.0288)	(0.0514)	(0.0630)	(0.0259)	(0.0292)	(0.0271)	(0.0505)	(0.0627)	(0.0662)
Observations	4,988	4,884	3,401	3,304	4,988	4,884	4,988	3,401	3,304	3,401
Controls:										
Gender	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gender, country of origin, year of arrival of HH FE, and age at assignment FE; family background	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Assigned municipal population share and non-Western immigrant share	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Assigned municipality FE	Yes	No	Yes	No	Yes	No	No	Yes	No	No
Assigned school district FE	No	Yes	No	Yes	No	Yes	No	No	Yes	No
Assigned neighborhood FE	No	No	No	No	No	No	Yes	No	No	Yes

Source: Danish administrative registers 1997-2019 linked with the dataset on the individual's neighbourhood of residence constructed by Damm, Hassani and Schultz-Nielsen (2021).

Notes: *** p<0.01,** p<0.05, * p<0.10. Standard errors clustered by the assigned municipality. Sample: Children of HH heads who arrived jointly with HH or within 12 months later and who arrive before age 16 who are observed annually at age 16-18 from 2002, the start year of the national education register. Number of unique municipalities: 93, number of unique macroneighborhoods: 1109. Family background characteristics: Age category FE, single parent dummy, dummies for children aged 0-2 and children aged 3-17, and education category FE and dummy for mother missing and dummy for father missing. The following municipality characteristics and macroneighbourhood characteristics are reported using the sample of refugee children (N=5,105). Mean characteristics of the assigned municipality at the time of assignment (standard deviation): The average employment rate: 0.773 (0.039), the average youth crime conviction rate: 0.018 (0.005), the average share of language fellows: 0.005 (0.008), the average share of co-nationals: 0.002 (0.002), the average employment rate of language fellows: 0.333 (0.227), the average employment rate of co-nationals: 0.230 (0.239), the average youth crime conviction rate: 0.0377 (0.071). Mean characteristics of the assigned macroneighbourhood at the time of assignment (standard deviation): The average share of language fellows: 0.010 (0.029), the average share of co-nationals: 0.004 (0.009), the average employment rate of language fellows: 0.278 (0.312), the average employment rate of co-nationals: 0.130 (0.262).

Table 11 Effects of Assigned Macroneighbourhood Characteristics at Arrival on Ever Convicted for a Violation of the Penal Code during Selected Age Ranges

	Definition of co-ethnic group:											
	Language fellows						Co-nationals					
	Dependent variable: Ever convicted for a violation of the Penal Code						Dependent variable: Ever convicted for a violation of the Penal Code					
	Aged 15-17			Aged 15-21			Aged 15-17			Aged 15-21		
Mean	0.103	0.103	0.103	0.195	0.195	0.195	0.103	0.103	0.103	0.195	0.195	0.195
Std. dev.	(0.304)	(0.304)	(0.304)	(0.396)	(0.396)	(0.396)	(0.304)	(0.304)	(0.304)	(0.396)	(0.396)	(0.396)
Specification:	(3)	(4)	(5)	(3)	(4)	(5)	(3)	(4)	(5)	(3)	(4)	(5)
Column:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(9)	(11)	(8)	(10)	(12)
Panel A: Men												
Explanatory variables:												
Co-ethnic group share	0.147	0.308	0.527*	0.235	-0.0205	0.278	0.00120	0.372	0.908	-0.910	-0.989	1.079
	(0.210)	(0.224)	(0.309)	(0.274)	(0.697)	(0.657)	(0.723)	(0.631)	(0.862)	(1.236)	(1.342)	(1.966)
Youth crime conviction rate of co-ethnic group	0.123	0.0706	0.0824	0.0612	0.0546	0.138	0.202*	0.147*	0.174*	0.179	0.118	0.173
	(0.0853)	(0.0869)	(0.0874)	(0.102)	(0.117)	(0.133)	(0.103)	(0.0880)	(0.0963)	(0.144)	(0.137)	(0.150)
Youth crime conviction rate	-0.498	-0.465	-0.0604	0.304	0.736	1.185	-0.371	-0.341	0.0525	0.304	0.736	1.185
	(0.639)	(0.747)	(0.899)	(1.093)	(1.541)	(1.736)	(0.631)	(0.727)	(0.890)	(1.093)	(1.541)	(1.736)
Panel B: Women												
Explanatory variables:												
Co-ethnic group share	0.0505	0.176	0.395	-0.240	-0.00768	0.117	1.059	1.113	1.860*	0.598	1.475	3.119*
	(0.176)	(0.385)	(0.362)	(0.373)	(1.103)	(0.604)	(0.855)	(1.108)	(1.074)	(1.473)	(2.474)	(1.671)
Youth crime conviction rate of co-ethnic group	-0.0174	-0.0148	0.00325	-0.0699	-0.0546	-0.00263	0.000519	0.0348	0.0429	-0.0519	-0.0717	-0.0209
	(0.0391)	(0.0493)	(0.0505)	(0.0609)	(0.0746)	(0.0758)	(0.0401)	(0.0485)	(0.0458)	(0.0525)	(0.0834)	(0.0685)
Youth crime conviction rate	-0.0152	-0.506	-0.293	1.176	0.294	0.685	-0.0815	-0.580	-0.371	1.176	0.294	0.685
	(0.484)	(0.750)	(0.788)	(0.828)	(1.323)	(1.396)	(0.470)	(0.752)	(0.744)	(0.828)	(1.323)	(1.396)
Additional explanatory variables (assuming homogenous effects across gender):												
Employment rate of co-ethnic group	0.0177	0.0130	0.00721	0.00323	-0.0139	-0.0202	0.0103	0.0143	-0.00218	0.0113	0.0219	-0.00989
	(0.0144)	(0.0177)	(0.0198)	(0.0251)	(0.0288)	(0.0285)	(0.0212)	(0.0258)	(0.0261)	(0.0326)	(0.0386)	(0.0375)
Employment rate (municipality)	0.211	-0.511	-0.238	0.556	0.298	2.065*	0.251	-0.473	-0.166	0.635	0.329	2.151*
	(0.543)	(0.604)	(0.613)	(1.003)	(1.380)	(1.230)	(0.541)	(0.604)	(0.614)	(1.007)	(1.373)	(1.240)
Male	0.0735***	0.0626***	0.0585***	0.144***	0.116***	0.117***	0.0747***	0.0631***	0.0593***	0.144***	0.116***	0.117***
	(0.0173)	(0.0223)	(0.0218)	(0.0306)	(0.0409)	(0.0443)	(0.0173)	(0.0222)	(0.0219)	(0.0306)	(0.0409)	(0.0443)
Observations	4,988	4,884	4,988	3,401	3,304	3,401	4,988	4,884	4,988	3,401	3,304	3,401
Controls:												
Gender	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gender, country of origin, year of arrival of HH FE, and age at assignment FE; family background	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Assigned municipal population share and non-Western immigrant share	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Assigned municipality FE	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No
Assigned school district FE	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No
Assigned neighborhood FE	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes

Source : Danish administrative registers 1997-2019 linked with the dataset on the individual's neighbourhood of residence constructed by Damm, Hassani and Schultz-Nielsen (2021).

Notes : *** p<0.01,** p<0.05, * p<0.10. Standard errors clustered by the assigned municipality. Sample: Children of HH heads who arrived jointly with HH or within 12 months later and who arrive before age 16 who are observed annually at age 16-18 from 2002, the start year of the national education register. Number of unique municipalities: 93, number of unique macroneighborhoods: 1109. Family background characteristics: Age category FE, single parent dummy, dummies for children aged 0-2 and children aged 3-17, and education category FE and dummy for mother missing and dummy for father missing. The following municipality characteristics and macroneighbourhood characteristics are reported using the sample of refugee children (N=5,105). Mean characteristics of the assigned municipality at the time of assignment (standard deviation): The average employment rate: 0.773 (0.039), the average youth crime conviction rate: 0.0377 (0.071). Mean characteristics of the assigned macroneighbourhood at the time of assignment (standard deviation): The average share of language fellows: 0.010 (0.029), the average share of co-nationals: 0.004 (0.009), the average employment rate of language fellows: 0.278 (0.312), the average employment rate of co-nationals: 0.130 (0.262), the youth crime conviction rate of language fellows: 0.027 (0.117), the youth crime conviction rate of co-nationals: 0.018 (0.106).

Table A1.A Variable Definitions and Primary Data Sources: Household Head Characteristics

Variable	Definition	Primary data source
Refugee	Dummy for having the residence permit type of refugee.	Residence Permit Register (OPHG), Statistics Denmark (DST)
Date of initial immigration	Dates for first time of immigration.	Historical Migration Register (VNDS), DST
Date of residence permit	Dates for residence permits imputed by the Immigration Service.	Residence Permit Register (OPHG), DST
Country of origin	Dummy for source country	Population register (BEF), DST
Age at time of immigration	Age calculated as the observation year minus the year of birth observed in the population register	Population register (BEF), DST
Household head	Dummy for first-arrived adult in the household; if the spouses have arrived on the same date, the husband is defined as the household head	Residence Permit Register (OPHG) and Population Register (BEF), DST
Municipality of assignment	Municipality registered in the population registers in the year of receiving residence permit or the following year	Population register (BEF), DST
Neighborhood of assignment	neighborhood of the registered housing address in the population registers in the year of receiving residence permit or the following year	Population register (BEF), DST, and constructed neighborhood clusters by Damm et al. (2021)
Education level	Education level before immigration, constructed based on an education code of the highest degree attained before immigration	Education register (UDDA), DST
Male	Dummy for male	Population register (BEF), DST
Married	Dummy for married at arrival	Population register (BEF), DST
Child aged 0–2	Dummy for having a child aged 0–2 years	Population register (BEF), DST
Child aged 3–17	Dummy for having a child aged 3–17 years	Population register (BEF), DST

Table A1.B Variable Definitions and Primary Data Sources: Outcome Characteristics

Variable	Definition	Primary data source
National Tests [1]		
Danish test in grade 6		
Drop out in grade 6	A dummy variable taking the value 1 if the child is eligible to take the test, but does not take the test. The variable takes the value zero if the child is eligible to take the test, and apears to take the test.	
Age at test date in grade 6	A variable taking the value of the age of the child at the time the Danish test for 6 grade is taken, given the child takes the test.	
Test score in grade 6 (ranked)	A variable taking the value of the childs test ranked within the childs cohort.	
Math test in grade 6		
Drop out in grade 6	A dummy variable taking the value 1 if the child is eligible to take the test, but does not take the test. The variable takes the value zero if the child is eligible to take the test, and apears to take the test.	
Age at test date in grade 6	A variable taking the value of the age of the child at the time the Danish test for 6 grade is taken, given the child takes the test.	
Test score in grade 6 (ranked)	A variable taking the value of the childs test ranked within the childs cohort.	
School Grade Register		
Was too old for grade when taking the 9th grade exit exams	Taking the value one if the child is above 16 at the time of taking the final 9th grade exam.	Danish administrative registers 1997-2019 (including the school grade register available from 2002) linked with the dataset on the individual's neighbourhood of residence constructed by Damm, Hassani and Schultz-Nielsen (2021).
Taken all mandatory 9 grade exit exam by age 18	Taking the value one if the child has taken all exit exams by age 18.	
GPA (Ranked)	GPA of all available exams, and then ranked within cohort	
Took all subjects in Danish	An indicator variable taking the value 1 if the child took all mandatory test in Danish	
Danish (Ranked)	GPA of all available Danish exams, and then ranked within cohort	
Took all subjects in Math	An indicator variable taking the value 1 if the child took all mandatory test in Math	
Math (Ranked)	GPA of Math exams, and then ranked within cohort	
Years of education		
By age x , x = 16, 17, 18, 19, 20, 21	A variable takes the value of the number of years of education an individual has reached at age x, x = 16, 17, 18, 19, 20, 21	Danish administrative registers 1997-2019, Education register (UDDA), DST
Crime		
Ever criminal charges (0/1):	A Dummy variable taking the value 1 if the individual is ever charged in the age-group. The variable takes the value zero for the individual if the individual never is charged in the period.	Danish administrative registers 1997-2019 linked with the dataset on the individual's neighbourhood of residence constructed by Damm, Hassani and Schultz-Nielsen (2021).
Penal code, ages 10-14 (as if)	A Dummy variable taking the value 1 if the individual receives an as if charge in the age group 10-14. The variable takes the value zero for the individual if the individual never receives a if charge in the period.	
Penal code, ages 15-17	A Dummy variable taking the value 1 if the individual receives a charge in the age group 15-17. The variable takes the value zero for the individual if the individual never receives a charge in the period.	
Penal code, ages 15-21	A Dummy variable taking the value 1 if the individual receives an as if charge in the age group 10-14. The variable takes the value zero for the individual if the individual never receives a if charge in the period.	
Ever criminal convictions (0/1):	A Dummy variable taking the value 1 if the individual is convicted in the age-group. The variable takes the value zero for the individual if the individual never is convicted in the period.	
Ever inactive (neither in education nor employment) (0/1)		
Inactive at age 18	A dummy variable taking the value 1 if an individual is not enrolled in education or not registered as employed in november of the year they torn 18.	Danish administrative registers 1997-2019
Ever inactive during 18-19	A dummy variable taking the value 1 if an individual is not enrolled in education or not registered as employed in november at any point in the age span 18-19	
Ever inactive during 18-20	A dummy variable taking the value 1 if an individual is not enrolled in education or not registered as employed in november at any point in the age span 18-20	
Ever inactive during 18-21	A dummy variable taking the value 1 if an individual is not enrolled in education or not registered as employed in november at any point in the age span 18-21	

Table A1.C Variable Definitions and Primary Data Sources: Area Characteristics

Variable	Definition	Primary data source
Municipality quota	Annual maximum quota of refugees to be allocated in the municipality	Danish Immigration Service (DIS)
Population share	Number of inhabitants in the neighborhood divided by the total population of municipality	Population register, DST, and constructed neighborhood clusters by Damm et al. (2021). Authors' calculations based on full population data
Share of language fellows	Number of persons speaking the same language as a refugee speeaks living in the neighborhood divided by the number of inhabitants in the neighborhood	Population register, DST, constructed neighborhood clusters by Damm et al. (2021), and the list of official languages spoken in refugee-sending countries from UN (2017). Authors' calculations based on full population data
Share of co-nationals	Number of conationals living in the municipality divided by the number of inhabitants in the municipality	Population register, DST, and constructed neighborhood clusters by Damm et al. (2021). Authors' calculations based on full population data
Employment rate among language fellows	Number of employed same language persons aged 25–64 divided by the number of same language persons aged 25–64 in the labor force of the neighborhood	Population and employment registers, DST, constructed neighborhood clusters by Damm et al. (2021), and the list of official languages spoken in refugee-sending countries from UN (2017). Authors' calculations based on full population data
Employment rate among co-nationals	Number of employed co-nationals aged 25–64 divided by the number of co-nationals aged 25–64 in the labor force of the neighborhood	Population and employment registers, DST, and constructed neighborhood clusters by Damm et al. (2021). Authors' calculations based on full population data
Employment rate among high-skilled language fellows	Number of employed same language persons aged 25–64 with more than 10 years of education divided by the number of same language persons aged 25–64 with more than 10 years of education in the neighborhood.	Population, education, and employment registers, DST, constructed neighborhood clusters by Damm et al. (2021), and the list of official languages spoken in refugee-sending countries from UN (2017). Authors' calculations based on full population data
Employment rate among high-skilled co-nationals	Number of employed co-nationals aged 25–64 with more than 10 years of education divided by the number of co-nationals aged 25–64 with more than 10 years of education in the neighborhood	Population, education, and employment registers, DST, and constructed neighborhood clusters by Damm et al. (2021). Authors' calculations based on full population data
Employment rate among low-skilled language fellows	Number of employed same language persons aged 25–64 with at most 10 years of education divided by the number of same language persons aged 25–64 with at most 10 years of education in the neighborhood	Population, education, and employment registers, DST, constructed neighborhood clusters by Damm et al. (2021), and the list of official languages spoken in refugee-sending countries from UN (2017). Authors' calculations based on full population data.
General employment rate	Number of employed persons aged 25–64 in the neighbourhood divided by the number of persons aged 25–64 in the neighborhood	Population, education, and employment registers, DST, constructed neighborhood clusters by Damm et al. (2021), and the list of official languages spoken in refugee-sending countries from UN (2017). Authors' calculations based on full population data.
Youth crime conviction rate	Number ofconvicted individuals in the age 15–30 divided by the number of individuals in the age range 15-20 in the neighborhood	Population, education, and employment registers, DST, and constructed neighborhood clusters by Damm et al. (2021). Authors' calculations based on full population data
Employment rate among low-skilled co-nationals	Number of employed co-nationals aged 25–64 with at most 10 years of education divided by the number of co-nationals aged 25–64 with at most 10 years of education in the neighborhood	Population, education, and employment registers, DST, and constructed neighborhood clusters by Damm et al. (2021). Authors' calculations based on full population data

Table A2 Demographic and Socio-economic Characteristics of Refugee Household Heads at Arrival

	All	Men	Women
Men (0/1)	0.693	1.000	0.000
	(0.461)	(0.000)	(0.000)
Age	35.995	36.884	33.989
	(7.974)	(7.604)	(8.416)
Married (0/1)	0.754	0.876	0.477
	(0.431)	(0.329)	(0.500)
Number of children	1.911	1.992	1.728
	(1.100)	(1.135)	(0.992)
Children aged 0-2 (0/1)	0.391	0.445	0.269
	(0.488)	(0.497)	(0.443)
Children aged 3-17 (0/1)	0.855	0.851	0.864
	(0.352)	(0.356)	(0.343)
Level of education:			
Missing education	0.292	0.273	0.334
	(0.455)	(0.446)	(0.472)
<=10 years of education	0.387	0.381	0.402
	(0.487)	(0.486)	(0.490)
11-13 years of education	0.145	0.154	0.126
	(0.352)	(0.361)	(0.331)
>13 years of education	0.175	0.192	0.138
	(0.380)	(0.394)	(0.345)
Source country:			
Syria	0.328	0.346	0.287
	(0.470)	(0.476)	(0.453)
Afghanistan	0.114	0.117	0.109
	(0.318)	(0.321)	(0.312)
Iraq	0.081	0.080	0.082
	(0.272)	(0.271)	(0.275)
Iran	0.069	0.075	0.056
	(0.254)	(0.263)	(0.230)
Other countries	0.408	0.382	0.464
	(0.914)	(0.486)	(0.499)
Observations	5211	3611	1600

Source : Danish administrative registers 1997-2021.

Table A3 Characteristics of the assigned municipality at arrival of Refugee Household Heads (reported as shares)

	All	Men	Women
Population share	0.014	0.014	0.014
	(0.144)	(0.014)	(0.015)
Immigrant & descendants	0.072	0.071	0.075
	(0.038)	(0.037)	(0.040)
Employed	0.769	0.769	0.770
	(0.039)	(0.038)	(0.039)
>10 yrs of educ	0.749	0.746	0.756
	(0.064)	(0.064)	(0.065)
>13 yrs of educ	0.432	0.428	0.440
	(0.076)	(0.074)	(0.079)
Criminals	0.007	0.007	0.007
	(0.002)	(0.002)	(0.002)
Public housing	0.156	0.155	0.158
	(0.068)	(0.066)	(0.071)
Other types of rental housing	0.182	0.181	0.183
	(0.049)	(0.047)	(0.053)
Non-Western (NW):			
NW immigrants	0.032	0.032	0.033
	(0.016)	(0.016)	(0.017)
Employed NW	0.487	0.484	0.493
	(0.071)	(0.071)	(0.068)
NW with >10 yrs of educ	0.591	0.591	0.592
	(0.052)	(0.051)	(0.054)
NW with >13 yrs of educ	0.328	0.328	0.330
	(0.053)	(0.052)	(0.055)
Co-nationals:			
Co-national share	0.002	0.002	0.002
	(0.003)	(0.003)	(0.002)
Employed co-nationals	0.238	0.239	0.237
	(0.227)	(0.229)	(0.224)
Co-nationals with >10 yrs of educ	0.437	0.434	0.445
	(0.283)	(0.284)	(0.281)
Co-nationals with >13 yrs of educ	0.244	0.245	0.242
	(0.210)	(0.211)	(0.207)
Criminal co-nationals	0.021	0.020	0.023
	(0.046)	(0.042)	(0.053)
Language fellows:			
Share of language fellows	0.008	0.007	0.009
	(0.010)	(0.010)	(0.011)
Employed language fellows	0.340	0.327	0.369
	(0.200)	(0.203)	(0.189)
Language fellows with >10 yrs of educ	0.472	0.469	0.482
	(0.178)	(0.18)	(0.17)
Criminal language fellows	0.017	0.017	0.017
	(0.023)	(0.023)	(0.024)
Observations	5211	3611	1600
Number of municipalities	93	93	91
Municipalities that did not receive	Brøndby, Herlev, Albertslund, Høje-Taastrup, Ishøj		

Source : Danish administrative registers 1997-2021.

Table A4 Characteristics of the assigned neighbourhood at arrival of Refugee Household Heads (reported as shares)

	All	Men	Women
Population share	0.063	0.063	0.062
	(0.058)	(0.060)	(0.054)
Immigrant & descendants	0.096	0.093	0.101
	(0.088)	(0.087)	(0.089)
Employed	0.734	0.735	0.731
	(0.097)	(0.097)	(0.096)
>10 yrs of educ	0.719	0.717	0.725
	(0.096)	(0.096)	(0.095)
>13 yrs of educ	0.407	0.404	0.413
	(0.099)	(0.098)	(0.101)
Criminals	0.008	0.008	0.009
	(0.005)	(0.005)	(0.005)
Public housing	0.219	0.214	0.233
	(0.217)	(0.213)	(0.224)
Other types of rental housing	0.184	0.181	0.188
	(0.126)	(0.124)	(0.131)
Non-Western (NW):			
NW immigrants	0.049	0.047	0.052
	(0.053)	(0.053)	(0.052)
Employed NW	0.472	0.472	0.472
	(0.137)	(0.139)	(0.135)
NW with >10 yrs of educ	0.582	0.582	0.581
	(0.124)	(0.126)	(0.121)
NW with >13 yrs of educ	0.326	0.326	0.325
	(0.114)	(0.115)	(0.112)
Co-nationals:			
Co-national share	0.004	0.004	0.004
	(0.011)	(0.011)	(0.010)
Employed co-nationals	0.143	0.144	0.140
	(0.263)	(0.265)	(0.257)
Co-nationals with >10 yrs of educ	0.262	0.258	0.272
	(0.349)	(0.347)	(0.353)
Co-nationals with >13 yrs of educ	0.151	0.149	0.156
	(0.264)	(0.262)	(0.270)
Criminal co-nationals	0.012	0.012	0.015
	(0.065)	(0.062)	(0.070)
Language fellows:			
Share of language fellows	0.014	0.013	0.015
	(0.034)	(0.033)	(0.036)
Employed language fellows	0.275	0.258	0.311
	(0.292)	(0.289)	(0.296)
Observations	5211	3611	1600
Number of neighbourhoods	1116	1003	697

Source : Danish administrative registers 1997-2021 linked with the dataset on the individual's neighbourhood of residence constructed by Damm, Hassani and Schultz-Nielsen (2021).

Table A5 Characteristics of the assigned municipality at arrival (reported as shares)

	Sample: All			Men			Women		
	Mean	SD Between	SD Within	Mean	SD Between	SD Within	Mean	SD Between	SD Within
Population share	0.011			0.011			0.012		
	(0.011)	(0.012)	(0.001)	(0.01)	(0.012)	(0.001)	(0.013)	(0.012)	(0.001)
Immigrant & descendants	0.07			0.067			0.075		
	(0.035)	(0.034)	(0.02)	(0.034)	(0.036)	(0.017)	(0.039)	(0.034)	(0.018)
Employed	0.78			0.77			0.78		
	(0.041)	(0.039)	(0.014)	(0.041)	(0.039)	(0.014)	(0.039)	(0.038)	(0.012)
>10 yrs of educ	0.75			0.74			0.76		
	(0.066)	(0.054)	(0.040)	(0.065)	(0.055)	(0.038)	(0.068)	(0.057)	(0.038)
>13 yrs of educ	0.43			0.42			0.44		
	(0.076)	(0.067)	(0.040)	(0.073)	(0.068)	(0.038)	(0.080)	(0.067)	(0.039)
Public housing	0.15			0.15			0.16		
	(0.075)	(0.094)	(0.011)	(0.071)	(0.093)	(0.011)	(0.083)	(0.094)	(0.010)
Other types of rental housing	0.17			0.17			0.17		
	(0.05)	(0.05)	(0.018)	(0.047)	(0.051)	(0.017)	(0.055)	(0.050)	(0.017)
Non-Western (NW):									
NW immigrants	0.031			0.03			0.034		
	(0.016)	(0.016)	(0.007)	(0.015)	(0.017)	(0.007)	(0.017)	(0.016)	(0.0076)
Employed NW	0.50			0.50			0.51		
	(0.078)	(0.055)	(0.058)	(0.079)	(0.056)	(0.059)	(0.074)	(0.069)	(0.051)
NW with >10 yrs of educ	0.59			0.59			0.60		
	(0.057)	(0.053)	(0.035)	(0.058)	(0.054)	(0.035)	(0.055)	(0.056)	(0.031)
NW with >13 yrs of educ	0.33			0.33			0.33		
	(0.057)	(0.061)	(0.034)	(0.059)	(0.063)	(0.033)	(0.054)	(0.047)	(0.030)
Co-nationals:									
Co-national share	0.002			0.002			0.002		
	(0.003)	(0.001)	(0.003)	(0.003)	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)
Employed co-nationals	0.27			0.27			0.27		
	(0.24)	(0.097)	(0.23)	(0.25)	(0.11)	(0.23)	(0.23)	(0.13)	(0.20)
Co-nationals with >10 yrs of educ	0.45			0.44			0.47		
	(0.29)	(0.13)	(0.27)	(0.30)	(0.14)	(0.28)	(0.28)	(0.18)	(0.24)
Co-nationals with >13 yrs of educ	0.25			0.25			0.26		
	(0.22)	(0.09)	(0.21)	(0.22)	(0.094)	(0.21)	(0.21)	(0.13)	(0.18)
Language fellows:									
Share of language fellows	0.006			0.006			0.008		
	(0.008)	(0.005)	(0.006)	(0.008)	(0.005)	(0.006)	(0.01)	(0.007)	(0.007)
Employed language fellows	0.35			0.35			0.4		
	(0.22)	(0.1)	(0.21)	(0.22)	(0.1)	(0.21)	(0.19)	(0.13)	(0.17)
Number of observations	1464			1001			463		
Number of unique observations	93			93			91		

Table A6 Characteristics of the assigned macroneighbourhood at arrival w. standard deviation between and within neighbourhood across time (reported as shares)

	Sample:								
	All			Men			Women		
	Mean	SD Between	SD Within	Mean	SD Between	SD Within	Mean	SD Between	SD Within
Population share	0.065			0.066			0.063		
	(0.062)	(0.060)	(0.004)	(0.066)	(0.063)	(0.0038)	(0.052)	(0.058)	(0.004)
Immigrant & descendants	0.092			0.088			0.1		
	(0.086)	(0.083)	(0.023)	(0.084)	(0.082)	(0.019)	(0.09)	(0.093)	(0.018)
Employed	0.74			0.74			0.73		
	(0.093)	(0.086)	(0.023)	(0.093)	(0.086)	(0.022)	(0.094)	(0.094)	(0.017)
>10 yrs of educ	0.72			0.72			0.72		
	(0.093)	(0.088)	(0.033)	(0.093)	(0.089)	(0.031)	(0.093)	(0.092)	(0.026)
>13 yrs of educ	0.40			0.40			0.41		
	(0.094)	(0.095)	(0.031)	(0.093)	(0.093)	(0.029)	(0.097)	(0.098)	(0.025)
Public housing	0.23			0.21			0.23		
	(0.21)	(0.21)	(0.038)	(0.21)	(0.21)	(0.036)	(0.22)	(0.23)	(0.02)
Other types of rental housing	0.18			0.18			0.19		
	(0.12)	(0.12)	(0.034)	(0.12)	(0.12)	(0.033)	(0.13)	(0.13)	(0.024)
Non-Western (NW):									
NW immigrants	0.047			0.045			0.051		
	(0.052)	(0.048)	(0.013)	(0.051)	(0.048)	(0.011)	(0.053)	(0.054)	(0.01)
Employed NW	0.48			0.48			0.48		
	(0.14)	(0.12)	(0.081)	(0.14)	(0.13)	(0.078)	(0.13)	(0.13)	(0.062)
NW with >10 yrs of educ	0.59			0.59			0.59		
	(0.12)	(0.11)	(0.072)	(0.12)	(0.12)	(0.069)	(0.12)	(0.12)	(0.053)
NW with >13 yrs of educ	0.33			0.33			0.33		
	(0.11)	(0.11)	(0.07)	(0.11)	(0.11)	(0.063)	(0.11)	(0.11)	(0.046)
Co-nationals:									
Co-national share	0.004			0.004			0.004		
	(0.011)	(0.0093)	(0.0076)	(0.011)	(0.012)	(0.0066)	(0.011)	(0.011)	(0.0049)
Employed co-nationals	0.15			0.15			0.14		
	(0.26)	(0.21)	(0.21)	(0.27)	(0.23)	(0.20)	(0.25)	(0.22)	(0.16)
Co-nationals with >10 yrs of educ	0.26			0.26			0.27		
	(0.35)	(0.27)	(0.29)	(0.35)	(0.28)	(0.26)	(0.35)	(0.32)	(0.20)
Co-nationals with >13 yrs of educ	0.15			0.15			0.15		
	(0.26)	(0.20)	(0.21)	(0.26)	(0.21)	(0.20)	(0.26)	(0.24)	(0.16)
Language fellows:									
Share of language fellows	0.012			0.012			0.014		
	(0.033)	(0.033)	(0.018)	(0.031)	(0.033)	(0.016)	(0.037)	(0.042)	(0.013)
Employed language fellows	0.28			0.26			0.31		
	(0.30)	(0.23)	(0.23)	(0.29)	(0.24)	(0.22)	(0.30)	(0.26)	(0.18)
Number of individuals in neighbourhood	3023.72			3054.37			2952.15		
	(1069.85)	(1010.37)	(479.45)	(1063.97)	(1017.83)	(446.37)	(1080.60)	(1020.98)	(392.70)
Number of observations	3608			2520			1088		
Number of unique observations	1119			982			644		