Recent Migrant Peers and the School Performance of Incumbent Students*

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Abstract

We study the impact of exposure to recent migrants and asylum seekers on compulsory school students in Sweden from 2008 to 2022, an environment with a particularly high migrant and refugee population. We use administrative student registers with data on school assignments and test scores for all Swedish compulsory school students. Using a combination of school and family fixed effects, we find a small positive effect of exposure to recent migrants on the academic performance of native students, but signs of negative effects on students with immigrant background. Reductions in class size and differential impact on resources available to native and immigrant student are suggestive mechanisms. An event study analysis of the more acute exposure to refugees during the 2015–2016 refugee crisis, corroborates the main finding of small positive effects on student outcomes of recent migrant exposure.

Keywords: schooling, peers, migration
JEL-codes: I21,I24,J15

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1 Introduction

Growing migration and refugee flows have consequences for receiving host community labor markets and schools.[1] Immigration is often associated with poor school results and increasing school segregation as migrant students are disproportionately accommodated in disadvantaged schools and because the performance of migrant students generally lags that of their native peers (Card, 2009). Yet, causal evidence on the effects on schools and host country students of exposure to migrants and refugees is inconclusive, with results ranging from negative (Gould, Lavy and Daniele Paserman, 2009; Jensen and Rasmussen, 2011; Ballatore, Fort and Ichino, 2018) to limited (Ohinata and Van Ours, 2013; Bossavie, 2020; Geay, McNally and Telhaj, 2013; Green and Iversen, 2022; Figlio and Özek, 2019; Brandén, Birkelund and Szulkin, 2019; Morales, 2022) to positive effects (Tumen, 2021; Figlio et al., 2023).

Exposure to migrants and newly arrived refugees potentially affects students because the student composition of schools and peer effects matter for student outcomes (Coleman, 1988; Hoxby, 2000), identity formation (Akerlof and Kranton, 2002) and teacher turnover (Karbownik, 2020). Competition for resources, classroom disruptions and reorientation of teaching activity are possible reasons (Lazear, 2001; Card, 2009; Sacerdote, 2011), as are impacts on students' rank in the classroom (Delaney and Devereux, 2021; Dadgar, 2022; Delaney and Devereux, 2022) and effects of relative grading. Changes to the student composition due to migration flows may also affect school choices and cause families to change neighborhoods or schools, which further changes the student composition of receiving schools (Clotfelter, 1976, 2001; Böhlmark, Holmlund and Lindahl, 2016; Böhlmark and Willén, 2020).[2] Depending on the initial student composition, school responses and the composition of migrants, the net effect of these different channels may well be negative, neutral or positive.

In this paper, we study the effect on incumbent student school outcomes of exposure to recent migrants, i.e. recently immigrated Swedish residents and asylum seekers. We focus on Swedish compulsory schools between 2008 and 2022, a period characterized by an increasingly high migrant and refugee exposure.[3] To this end, we use administrative student registers with information on school assignment throughout compulsory school grades (0-9), and national test score outcomes in grades 3, 6, and 9 for the universe of Swedish compulsory school students. We can then link this data to population and tax-registers containing information on family links, birth records, migration background, and parental education and earnings. We follow the strategy of Brandén, Birkelund and Szulkin (2019) and Figlio et al. (2023) and exploit i) within-school variation in migrant exposure across cohorts and over time and ii) within-sibling variation in exposure to migrants to account for non-random sorting of both migrant and native students to schools. We estimate the effects of both contemporaneous

[1] See Borjas (2014); Dustmann, Schönberg and Stuhler (2016); Brell, Dustmann and Preston (2020) for reviews of the literature on impact of immigrants and refugees on labor market outcomes.

[2] Even modest preferences for similarity can lead to high levels of segregation (Schelling, 1971).

[3] Incumbent students are students of Nordic native origin and foreign born students who immigrated to Sweden before school start. Recently immigrated Swedish resident students refers to students who were granted a residence permit within the last four years. Asylum seeking students are students in the asylum process who have not yet received a residence permit.

and cumulative migrant exposure on incumbent students' national test scores.[4] We also study if families selectively change schools for their children in response to recent migrant exposure depending on their child's characteristics. Moreover, we exploit variation in exposure to migrants across the school years for a given individual as an alternative approach to handle selection. Further, as an alternative strategy to estimate effects on incumbent students of refugee exposure, we use the substantial variation in how schools were affected by the refugee crisis in 2015-2016 in an events study approach.

The recent Swedish experience offers an excellent opportunity to study how exposure to recent immigrants affects incumbent students. The average share of foreign born students in Swedish schools almost doubled from 7 to 13 percent 2008 and 2019, and is high compared to the US and other European countries. The fraction of recent immigrant students rose rapidly during the Syrian conflict and reached a peak of 6.4 percent percent of all students in 2018, just after the European refugee crisis. This can be compared to the 2018 European average share of foreign born students, which was 5-6 percent. In 2015 alone, Sweden received some 70000 refugee minors, half of whom were unaccompanied, of mainly Afghan origin (Bunar, 2017). In addition, the distribution of migrants across schools is very uneven. While many schools were unaffected by the rapid influx of asylum seekers, other schools, typically in rural areas, saw their student body increase dramatically.

Our results suggest that the negative association between migration of school performance stems for significant negative sorting of migrants and incumbent children to exposed schools. Once we account for this sorting, we find that both contemporary and cumulative exposure have small positive effects on student performance. The positive effects are driven by improvements in Swedish and English test scores of the natives and boys while the converse holds for immigrants. A closer examination of effects across the performance distribution, shows that while boys in the middle and top of the distribution benefit, academically weak girls benefit.

We also explore effects of exposure to different types of migrants. It seems that the positive effects of recent migrant exposure for Nordic natives are driven by exposure to Non-Western migrants, asylum seekers and poor country migrants. We further find that immigrant background school performance is suggestively negatively affected by cumulative exposure to non-western migrants and migrants from poor countries, while exposure to recent migrants from rich countries has no impact on scores. In an attempt to explore mechanisms behind the overall positive effects and for the differences between Nordic natives and immigrant background student, we find evidence of reduced classroom sizes in response to high recent migrant exposure, however this does not fully account for the positive effects. We also find that the fraction of students who participate in home language classes increases among Nordic native students, but decreases among immigrant background students. The analysis of the 2015-16 refugee crisis, corroborates our finding of an modest positive effect on test scores of being exposed to recent migrants.

We contribute to two main strands of empirical literature. The first one studies the effect of different facets of peer composition in school on educational outcomes more broadly (e.g.,

[4]Contemporaneous exposure refers to the fraction of recent migrant students by grade and school in a given year, while cumulative exposure averages recent migrant exposure over a students school history.

Balestra, Eugster and Liebert (2022); Bietenbeck (2020); Brenøe and Lundberg (2018)). The other strand focuses more specifically on host country effect of migration, and in particular on effects of exposure to migrant peers on the school performance of incumbent students (e.g., Andersson, Berg and Dahlberg (2021); Borjas (2014); Card (2009); Figlio and Özek (2019); Green and Iversen (2022)). In what is perhaps the contextually closest study, Brandén, Birkelund and Szulkin (2019) find limited effects of exposure to migrants in Sweden on the local students compulsory school leaving grades for the period 1998-2012. We are able to extend their results by considering a later period which involves a more sudden and intense exposure spurred by the 2015–2016 refugee crisis. In addition to that, we use standardized national tests results for grades 3, 6, and 9, as opposed to more locally influenced teacher-set compulsory school leaving grades. Access to student registers also allows us to measure both contemporary exposure and cumulative exposure over students school history to recent migrants, including to asylum seekers. Our findings broadly corroborate their results, showing limited effects on individual students, although we also detect some positive effects. A recent study, very close to ours methodologically, shows positive effects of exposure to foreign born students (Figlio et al., 2023). Using detailed data on both the incumbents and recent migrants, we broadly corroborate their findings, but in the European context, and a context of refugee migration. We also extend their analysis with models which include individual fixed effect, showing limited results within the same individuals depending on their exposure across time. Our event study of the 2015 refugee crisis is a further contribution to the literature focusing on refugee migration, e.g. Özek (2021); Figlio and Özek (2019). We are able to show that the positive effects on Nordic native students, extend also to an event which put substantial pressure on receiving communities.

2 Literature Review

There is a large literature on the impact of immigrants and refugees on labor market outcomes (see, for example, Borjas, 2014; Dustmann, Schönberg and Stuhler, 2016; Brell, Dustmann and Preston, 2020). The literature on the impact of refugee children on the academic outcomes of native students is growing but still scarce (Figlio et al., 2023). Nevertheless, children (under age 18) represented 42% of the displaced population in 2021 (UNHCR, 2021), demonstrating the importance of studying school effects. There is also a general concern in the debate that immigration is associated with poor school outcomes and school segregation (Card, 2009), but there is no consensus in the empirical literature on whether these adverse effects are real or anecdotal. Given the potentially large impact of refugees and immigrants on the achievement of native students, some recent international studies focus on these potential spillover effects. While the presence of immigrants in schools is often assumed to have a negative effect on overall performance—and correlational studies often find a negative correlation between immigrant concentration and native student performance (Brunello and Rocco, 2013)—the causal evidence is much less clear.

Within the US context, Özek (2021) studies the influx of Puerto Rican migrants into public schools in Florida after Hurricane Maria in 2017. The study focuses on internal rather than cross-border immigration and finds significant negative effects in the same year as the influx,

but no effects in the year after the influx. An important explanatory factor for their findings is the compensatory allocation of resources within schools following the influx of migrants. Similarly focusing on a natural disaster on host communities, Figlio and Özek (2019) examines the influx of poor non-English speaking Haitian migrants into Florida public schools following the 2010 earthquake. They find no or modest positive effects from the influx of migrants.

Morales (2022) examines the concentration of refugee children in schools in Georgia, USA, between 2008 and 2017 and finds no (English test scores) or modest positive (math test scores) effects on the academic achievement of native students. Suggestive evidence supports the hypothesis that the positive effects on math scores are driven by increased resources, such as increased teacher concentration and reduced class sizes. van der Werf (2021) focus on historical data using the influx of refugees from Southeast Asia to the US at the end of the Vietnam War and find no impact on native student test scores in math and reading. Figlio et al. (2023) focus on the concentration of immigrants in Florida schools rather than a sudden and unexpected influx of refugees. Moreover, they include not only the contemporaneous impact but also a cumulative exposure through the longitudinal dimension of their data. Comparing the educational outcomes in math and reading of siblings with different school- and cohort-specific exposures, they find a positive impact of immigrant concentration on native test scores.

Outside the US, Gould, Lavy and Daniele Paserman (2009) focuses on an influx of refugees from the former Soviet Union to Israel in the early 1990s and find adverse effects on the passing rates of the high school matriculation exam among incumbent native students. Green and Iversen (2022) use administrative school data in Norway and find zero (English and Norwegian) or negative (math) effects on native students' performance using within-sibling and within-school variation in exposure to refugees. Tumen (2021) examines the concurrent influx of mainly Syrian refugees to Turkey, and instead finds positive effects on PISA test scores in math, science, and reading. Using administrative Danish data and PISA test scores in the years 2000 and 2005, Jensen and Rasmussen (2011) find a negative impact of immigrant concentration in schools on native math and reading scores, although the impact on reading is insignificant in the more demanding specification.

Brandén, Birkelund and Szulkin (2019) focus on the immigrant composition in schools in Sweden between 1998 and 2012 (before the large influx of refugees during the European migrant crisis) and find no effects on grades, but a small negative effect on the level of eligibility for upper secondary school. Schneeweis (2015) focus on an earlier period (1980–2001) in Austrian primary schools and finds that immigrant concentration does not impact the likelihood of native students repeating a grade, nor their likelihood of continuing on an academic track. However, immigrant students (especially co-ethnic students) were negatively affected by immigrant concentration. Geay, McNally and Telhaj (2013) rule out negative spillover effects from non-native English speakers in the UK. Ohinata and Van Ours (2013) and Bossavie (2020) study the Dutch context and find no or small negative effects of immigrant concentration on test scores. The small negative effect on verbal scores found in Bossavie (2020) diminishes with years since immigration. Ballatore, Fort and Ichino (2018) find adverse effects of immigrant concentration on native test scores in Italy, and the impact is more negative when considering first-generation immigrants. Frattini and Meschi (2019) also find small negative effects of

immigrant concentration in schools on natives' test scores in vocational schools in Italy, and the effects are particularly large for low-achieving native students.

In sum, the impact of immigrant concentration and refugee influx in schools on the scholastic achievements of incumbent students varies from negative, to zero, to positive, depending on the context. Thus, it is not clear whether an increased number of immigrant or refugee children helps or hinders the performance of native students. These conflicting results underscore the importance of carefully delineating both the institutional setting and the potential mechanisms behind the effects, before designing policies based on single findings from contexts other than the specific one.

Related to theories on peer effects of immigrants are theories of "white flight" and tipping points, which were introduced by Grodzins (1957). Theories around segregation along ethnic lines were later formalized in work by Schelling (1971) where he shows how even modest preferences for ethnic similarity can lead to high levels of segregation in equilibrium outcomes. Moreover, Clotfelter (1976, 2001) outlined a model on "white flight" in schools, where white families abandon public schools after an influx of poor minority schoolchildren. This phenomenon has also been empirically documented in later studies for both neighborhoods (Müller, Grund and Koskinen, 2018; Böhlmark and Willén, 2020; Andersson, Berg and Dahlberg, 2021) and schools (Li, 2009; Betts and Fairlie, 2003; Cascio and Lewis, 2012; Tumen, 2019; Figlio et al., 2023).

However, even though there is an abundance of studies documenting white flight from public schools following an increased concentration of minority students in the US, studies focusing on immigrant concentration in the European context are relatively scarce (Alesina and Tabellini, 2023). Two European studies on a native flight from public schools are Gerdes (2013) in Denmark and Farré, Ortega and Tanaka (2018) in Spain. A drawback with Gerdes (2013) is the use of aggregate non-individual data, and a drawback with Farré, Ortega and Tanaka (2018) is the use of survey data and lack of data on school enrollment (instead proxied along the public-private dimension by education expenditure). In a Swedish context, previous studies have found that high SES-students are more likely to opt for independent, privately operated, schools if the local public school has a more disadvantaged student body (Holmlund et al., 2014; Böhlmark, Holmlund and Lindahl, 2016).

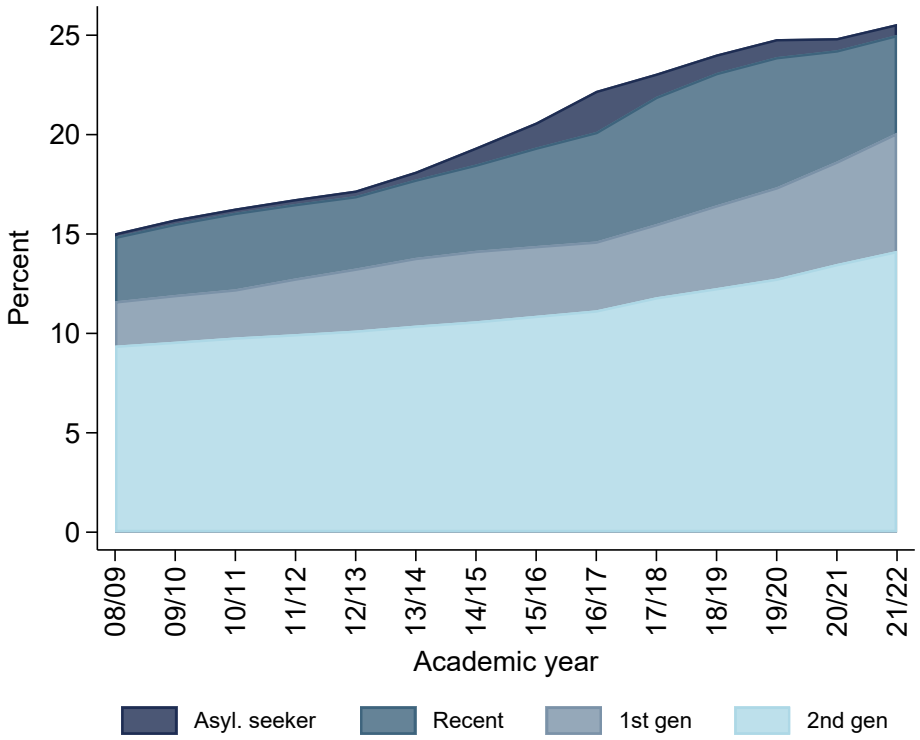
3 Background

We set the scene for the present study by first showing how the presence of migrant students has evolved, what this has implied for the exposure to migrants of different groups of students, and second, by presenting the Swedish school system.

3.1 Refugee immigration in Sweden

Immigration in a European, and Swedish context, is signified by refugee migration. This differs from the US setting where refugee immigration is of less importance. Even within Europe, Sweden is somewhat of an outlier. Sweden had until 2016, when migration policy changed rad-

Figure 1: Stock of Students Based on Immigrant Status

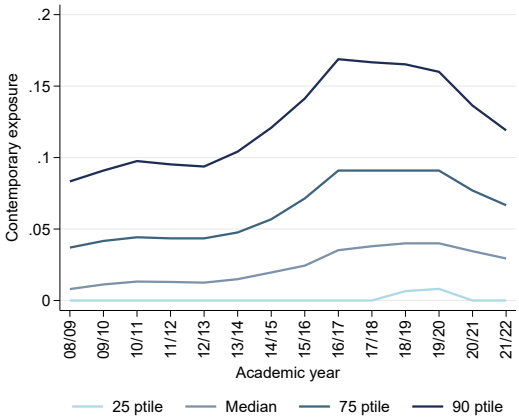


Notes: The figure shows the fraction of non-Nordic migrant students for our main period of analysis separated by immigrant status. Asylum seekers include students with asylum seeking status, recent includes students that are non-Nordic and have been in Sweden for at most four years, 1st gen are non-Nordic students who have been in Sweden for more than four years, and 2nd gen are students born in Sweden to two non-Nordic foreign-born parents.

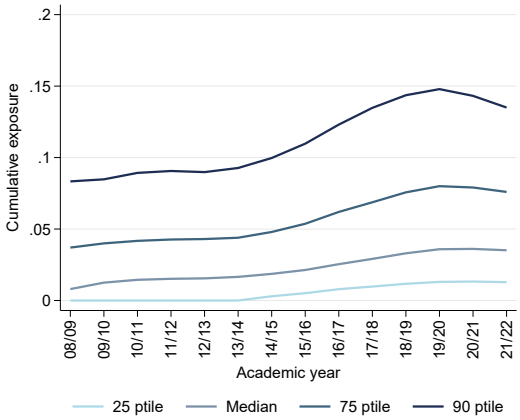
ically, the highest per capita refugee inflow in Europe. In the last two decades (the 2000s and 2010s), refugees from the Middle East and Northeast Africa have constituted the majority of the immigrant inflow. Compared to other European countries, Sweden thus has a relatively high fraction of foreign-born (20% in 2020) and the highest number of refugees per capita (9% in 2020). In the European context, only a few papers, (e.g., Green and Iversen, 2022; Tumen, 2019), focus on the influx of refugees during the refugee crisis in the mid-2010s, with an exceptionally high inflow of refugees, mainly from Syria (about one million refugees came to Europe during these years). The influx also led to a political debates in many European countries about the strain the crisis put on host communities. The ability of schools to accommodate the large influx of refugee children who do not speak the language of instruction, have had limited access to functioning schooling, and may be suffering from trauma also came into focus and the need for additional resources called for policy response. In Sweden, the government introduced both general support programs to improve refugee reception in schools and targeted support to heavily affected municipalities.[5]

[5]See e.g. Mörtlund (2020) and Bunar (2017).

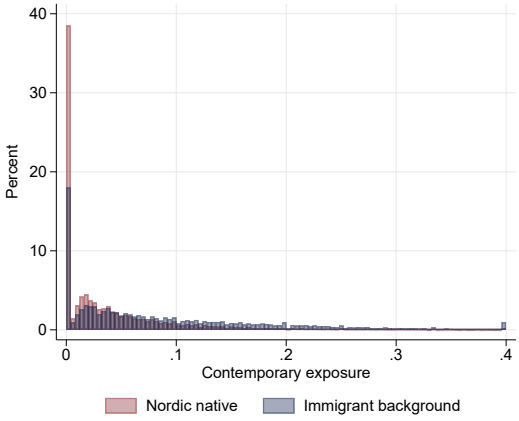
Figure 2: Exposure to recent immigrant and asylum seeking students



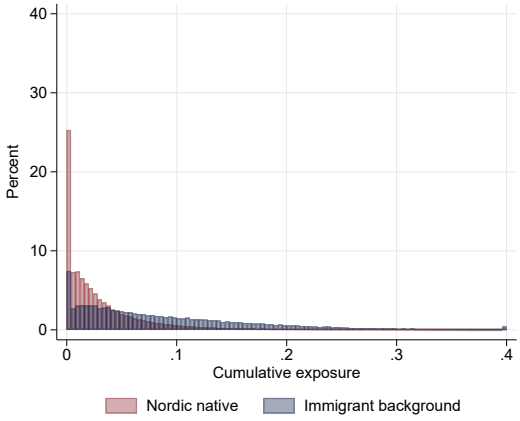
(a) Contemporary exposure by percentiles



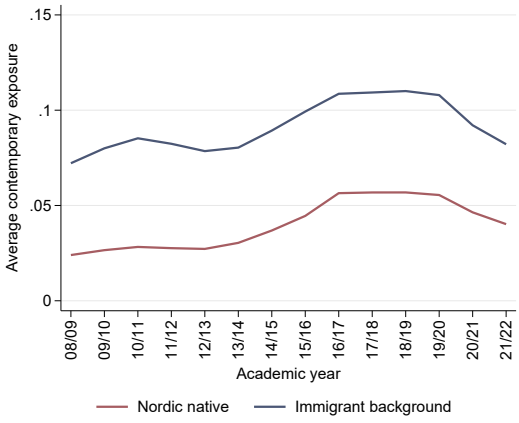
(b) Cumulative exposure by percentiles



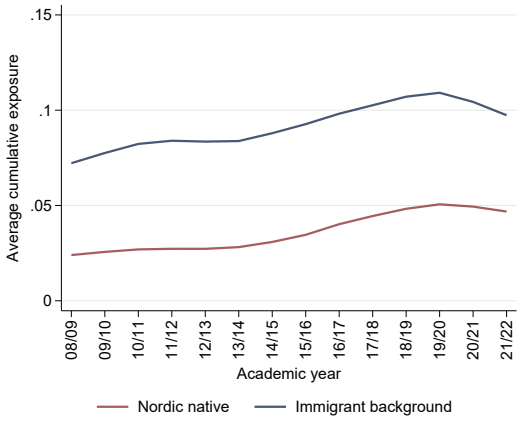
(c) Distribution of contemporary exposure



(d) Distribution of cumulative exposure



(e) Average contemporary exposure



(f) Average cumulative exposure

Notes: The figures shows the distribution (upper) and trends (lower) in exposure to newly arrived non-Nordic students in Sweden. The left panels shows the contemporary exposure; the right panel the by students accumulated exposure over time.

In Figure 1, we show how the share of students with migrant background from outside the Nordic countries as fraction of the total student population has evolved in Swedish compulsory schools since the academic year 2008/09. Over that period, the fraction of students with at least one parent born in a Nordic country has declined from approximately 85% to around 75%. There is a steady increase in the fraction of second generation non-Nordic immigrant students from just below 10 percent in 2008/09 to some 12 percent in 2021/22. At the same time, the total group of first generation immigrant students, comprised of non-Nordic born students with more than four year of residency, recently arrived with at most four years of residency and asylum seekers doubles from about 6 percent to over 12 percent. Although asylum seeker make up a small share of the overall student population, there is a clear peek during crisis years around 2015–2017. As these students become residents, the group of recent migrants grows as a fraction of first generation immigrant students. Over time, a growing fraction of first generation immigrant students also accumulate more than 4 years of residency.

These average numbers hide significant heterogeneity in the fraction of migrant students across schools, and also by incumbent students' own migration background. The top panel of Figure 2, show the evolution of the distribution of recent migrant a) contemporary and b) cumulative exposure. While the 25 percent of students remain largely unexposed to immigrant students throughout the study period, median exposure rises by a few percentage points from one to 4 percent, during the refugee crisis. At the other end, the 75th and 90th percentile of the distribution, migrant exposure rises from just below 5 and 10 percent respectively to just below 10 percent and some 17 percent during the peak of the crisis. The evolution of cumulative exposure is less dramatic, and some what less unevenly distributed. At the 25th percentile, there is low, but non-zero exposure from 2014/15 and at the 90th percentile cumulative exposure peaks at 15 percent in 2019/2020.

The mid panels show the variation in c) contemporary and d) cumulative exposure over the entire study period for Nordic native students and for incumbent students of immigrant background. The figures reveal a much higher spike at zero exposure for Nordic native students than for students of immigrant background, and that Nordic native students have more mass at low levels of exposure.

The bottom panels show how average e) contemporary and f) cumulative exposure of Nordic native students and immigrant background students have evolved. While average native student exposure to recent migrants rises from some 2.5 percent in 2008/09 and peaks at around 6 percent during the refugee crisis years, students who themselves have immigrant background have 5 percentage point (or approximately 100%) higher exposure to recent immigrants and asylum seekers, rising from a bit over 7 percent in 2008/09 to 11 percent during the crisis.

These patterns are evidence of clustering of immigrant background students in certain schools, but also of the fact that the refugee crisis actually did not increase segregation: exposure increased in a similar way for natives and immigrant background students. A reason for this is that many refugees were received in small rural municipalities where accommodation was available, but which had little previous experience of immigration.

Our estimation strategies exploit 1) the year-to-year variation in exposure across grades

within schools and 2) the variation in exposure to recent migrants in across schools and grades resulting from the refugee crisis. Arguably, variation in exposure across grades and years *within* schools should be as good as random because the age composition of recent immigrants will vary. Moreover, the sudden nature of the refugee crisis, and the need to rapidly accommodate new students also introduces an element of exogeneity in exactly which schools were more and less exposed.

We have argued that the Swedish context is one of refugee migration. Table 1 shows the composition of students in Swedish compulsory schools by country or region of origin. The origin of students is defined by the county of birth of the student or the students mother. The immigrant student population is very diverse, but the largest groups are immigrants from former Yugoslavia and Bosnia and Herzegovina, Northeast Africa, Middle East and North Africa, and Iraq.[6]

3.2 The Swedish School System

Sweden requires resident children 6-16 years of age to attend compulsory school and offers schooling to refugee children during the asylum process. Since the early 1990's, the Swedish school system is very decentralized. There is a national curriculum, but municipalities are responsible for financing schools, both municipal run schools and independent schools. The latter are entitled to funding, provided they follow the national curriculum and do not charge fees to students, see e.g., Holmlund and Böhlmark (2019). Municipal schools are responsible for providing slots for all students in the municipality, while independent schools can choose their size. There is school choice in the sense that families can wish for a specific school, independent or municipal. While independent schools can admit student based on queue time, residential proximity or give priority to siblings, municipal schools are restricted to admitting students based on residential proximity, and are required to provide slots for any school age child arriving in the municipality at any time during the year, including refugee children (Björklund et al., 2004). because of these different rules regarding school placement and school size, children moving to a new municipality during their school years, including refugee children, typically are received in municipal schools.

Increased residential segregation and school choice have contributed to rising school segregation since the 1990's (Böhlmark, Holmlund and Lindahl, 2016). Holmlund and Böhlmark (2019) show that some 70% of the increase in the intra-school correlation in a composite measure of student background was due to rising residential segregation and the remainder due to school choice. However, the analysis in Holmlund and Böhlmark (2019) also shows that school segregation, in the immigrant/native dimension actually declined during the refugee crisis. Grönqvist and Niknami (2017) document the school performance of refugee children in Swedish since the 1990's and find a substantial performance gap to native students. However, they also show that much of the gap is accounted for by socioeconomic background and neighborhood effects.

Compulsory school is organized in three school stages, comprising the lower stage from

[6]Table F.1 presents the country and region classification.

Table 1: Migration Background

	Frequency	Percent	Cumulative
Sweden	2,440,731	87.51	87.51
Finland	9,496	0.34	87.85
Denmark	7,539	0.27	88.12
Norway and Iceland	9,428	0.34	88.46
Bosnia and Herzegovina	21,050	0.75	89.21
Former Yugoslavia	37,121	1.33	90.54
Poland	6,742	0.24	90.78
UK and Ireland	989	0.04	90.82
Germany	3,099	0.11	90.93
Mediterranean Europe	1,619	0.06	90.99
The Baltic states	1,915	0.07	91.06
E Europe, Caucasia, C Asia	11,443	0.41	91.47
Czechia, Slovakia, Hungary	1,813	0.07	91.53
Continental Europe	1,626	0.06	91.59
US and Canada	797	0.03	91.62
Mexico and Central America	1,888	0.07	91.69
Chile	6,717	0.24	91.93
South America	7,086	0.25	92.18
Northeast Africa	32,546	1.17	93.35
Middle East and N Africa	55,262	1.98	95.33
West, Central, South Africa	8,744	0.31	95.64
Iran	13,520	0.48	96.13
Iraq	45,022	1.61	97.74
Turkey	21,195	0.76	98.50
East Asia	12,635	0.45	98.95
Southeast Asia	13,709	0.49	99.45
South Asia and Mongolia	14,785	0.53	99.98
Oceania	146	0.01	99.98
Unknown	512	0.02	100.00
Total	2,789,175	100.00	

Notes: School composition by region of origin. For a complete list of countries included in each source region, see Table F.1.

the pre-school year (year 0) to 3rd grade, middle stage from 4th to 6th grade and the upper stage from 7th to 9th grade. The grade configuration of schools varies. In the beginning of our study period about 60 percent of schools with 9th grade, were 0-9th grade schools, 20 percent were 7th to 9th grade schools, 18 percent were 6 to 9th grade schools and the remainder 4th to 9th grade schools. There are also feeder schools with grade configuration 0 to 3rd or 0 to 6th grade.[7] This means that many students need to change schools in either 4th, 6th or 7th grade. Because there are fewer 6 to 9th grade schools it less frequent to change schools in 6th grade. We will thus base measures of expected exposure to migrants on school choice and transitions taking place at the beginning of the three school stages.

At the end of each stage, students take mandatory national tests in the core subjects (Mathematics and Swedish in grades 3,6,9 and English in grade 6 and 9).[8] National tests are locally graded at the school using national guidelines. In 6th and 9th grade they serve as a guidance when teachers set the end of year grades. [9] In 9th grade, the national tests are crucial for students since they influence the final compulsory school grades, which determine high school eligibility. They thus affect one's ability to compete for admission to popular schools and high school programs. In this paper, we use the mean of the students grade on the national tests in Mathematics, English and Swedish in grade 3, 6 and 9 as our measures of student outcome, once the test grades have been standardized within grade and test year in the incumbent student population.

4 Data

Our main body of data comes from the Student Register (Elevregistret), which includes the universe of primary and lower secondary school students (grundskola) in Sweden in each grade that they attend between 2008 and 2022. Using this data, we can establish peer composition at the school-cohort and, for a majority of the students, classroom level. To this data, we match the national test scores in Swedish, English (only 6th and 9th grade) and Math at the end of each school stage, i.e. in grades 3, 6, and 9, which come from the National Exams Register (Nationella provregistret). These data are available from 2010 (grade 3), 2012 (grade 6) and since 2003 (grade 9). We link students to parents and siblings and match on background information using population registers (Flergenerationsreg and RTB) containing information family links and country or region of origin of parents and children. Socioeconomic information on parents, i.e. education and earnings data, come from the LISA register based on the Income and Tax Register (Inkomst- och Taxeringsregistret) and the Education Register (Utbildningsregistret).

In our sample of incumbent students, we include Nordic native and foreign students who

[7] See Holmlund and Böhlmark (2019).

[8] In 9th grade there are national tests also in one of the social science subjects (Geography, History, Religion, Social science) and one of the natural science subjects (Biology, Chemistry, Physics), which subject is randomized at the school level.

[9] Vlachos (2019) shows that although the test grades are subject to teacher subjectivity, they are more objective measures of student performance than the teacher set end of year grades.

immigrate before school start for whom we can observe the national test results in at least one of the three grades (3, 6, or 9) and who have a sibling for whom we can observe the same outcome. This allows us to include family fixed effects. This leaves us with a panel of approximately 2.7 million student–year observations over a fourteen-year period during which we can measure exposure to migrants and outcomes in terms of national test scores. As our main outcome variable measuring school performance, we use the average grade on national tests in Mathematics, English and Swedish. Test grades are first standardized at the test year and grade level within the incumbent population. This is done to avoid trending results in the native populations as the fraction of recent migrants increases. During the pandemic years, (academic years 2019/2020 and 2020/2021) no national test were held for students in compulsory school. To include these years, we have imputed the test scores from grades in the same subjects (Math, English and Swedish). For 2018, the national test in Mathematics leaked beforehand for grade 9 and the student's test scores were to a large extent dismissed. Again, we have imputed Mathematics test scores from grades for that cohort. To ensure that our results are not driven by systematic differences in our imputation, we also rerun our analysis on sub-samples without imputations.

We use two measures of exposure to recent migrants: contemporaneous (i.e. exposure in the last year) and cumulative. Contemporaneous exposure is the share of recent immigrants, i.e. immigrants who were granted resident status within the last four years and asylum seekers, in the same year when we measure the outcome, in a given school, grade and year. Because school performance in a given year is likely to depend not only on the current teaching environment and peers, but also on previous experiences, we also follow Figlio et al. (2023) and compute a measure of the student's cumulative exposure. For each individual student i, in school s, grade g and academic year t, we average exposure to recent immigrants over the students' school history (grades 0 to 9) using the following equation:[10]

$$\text{Cumulative Exposure}_{isgt} = \frac{1}{g} \sum_{g'<g} \text{Share Newcomers}_{isg't}.$$

Table 2 presents summary statistics for the population of students with Swedish residency, i.e. excluding asylum seekers for whom there is no information other than sex and age. The Nordic native population includes Nordic born students with at least one Nordic born parent. Students with immigrant background are Nordic-born students with two foreign-born parents. Recent immigrants are students who immigrated during the last four years. The incumbent population is comprised of the first two groups.

There are some interesting differences between the groups of students. Higher birth order for immigrant background students suggest they have more siblings, on average. It is also clear that both mother's and father's income percentiles and years of education are higher in the Nordic native population. Test scores are higher among natives and while immigrant background children have test scores around 0,30 below the Native population, recent immigrants do much worse. The indicator for changing school from one grade to the next, excluding changes due to the grade-configuration of the school, shows that immigrant background stu-

[10] We also compute similar measures at the classroom level.

Table 2: Summary statistics

	Nordic Native		Immigrant Background		Recent Immigrant	
	Mean	SD	Mean	SD	Mean	SD
Male	0.51	0.50	0.51	0.50	0.53	0.50
Birth Order	1.89	0.94	2.28	1.33	1.98	1.22
Age in Months	152.08	29.36	150.71	29.37	155.59	30.44
Mothers Income Percentile	54.96	24.29	33.80	25.15	8.60	14.63
Fathers Income Percentile	72.07	24.24	47.31	30.13	17.83	23.04
Mother Years of Education	13.21	2.21	11.46	2.61	10.97	2.97
Father Years of Education	12.57	2.34	11.50	2.65	11.35	3.04
Predicted Test Score	0.05	0.37	-0.27	0.41	-0.88	0.46
Actual Test Score	0.05	0.97	-0.26	1.03	-0.94	1.18
Change school	0.06	0.24	0.09	0.28	0.11	0.31
Contemporary Exposure	0.04	0.06	0.09	0.09	0.16	0.13
Cumulative Exposure	0.03	0.04	0.09	0.08	0.17	0.13
Observations	2488759		300416		178594	

Notes: This table presents summary statistics for the key variables in the paper.

dents and recent immigrants are more likely to change schools than Nordic native students. As we saw in Figure 2, the exposure to recent immigrants also varies substantially across the groups.

5 Empirical strategy

Our aim is to estimate the causal effect on incumbent student school performance of being exposed to recent migrants. There are a number of challenges that need to be overcome. First, exposure to migrants is unlikely to be random across schools since migrants and refugees are more likely to move to or be placed in some areas than others even within municipalities, and because new-coming students are more likely to be assigned to schools where there are free slots or where the municipality can more readily arrange new places. Second, because of residential segregation and school choice, native and other incumbent students are not randomly distributed across schools. Better-informed and resourceful families are more likely to have exercised school choice and their children are thus more likely to go to oversubscribed schools, which are less likely to accommodate new students. Third, some families may react to inflow of migrants and refugees and switch schools.

In our main analysis, We follow the strategy proposed by Brandén, Birkelund and Szulkin (2019) and Figlio et al. (2023) to overcome these identification problems. First, we use the within-school cohort-to-cohort variation in migrant exposure to address the fact that exposure

is not random at the school level. Second, we account non-random selection of native and other incumbent students to schools by controlling for family fixed effects. We also try to account for possible selection, also within families, should families selectively choose schools for their depending on how thy judge the child would be harmed by or benefit from exposure to migrant children. We do this by accounting for individual fixed effects, exploiting variation in exposure to migration during different school stages for a given individual and by introducing measures of expected exposure, rather than actual exposure.

In section 7, we present an alternative estimation strategy where instead of using year to year variation in exposure within schools, we use an event study approach to compare outcomes of students in schools more or less impacted by the refugee crisis of 2025-2016.

5.1 Specification

We estimate the following main specification:

$$Y_{igst} = \beta_1 \times \text{Share Newcomers}_{igst} + \alpha_{\text{school} \times \text{year}} + \delta_{\text{grade} \times \text{year}} + \sigma_{\text{fam}} + X_i\gamma' + e_{isgt} \tag{1}$$

Y_{igst} is the average test score for incumbent student i in grade g in school s in calendar year t. The explanatory variable is $\text{ShareNewcomers}_{igst}$, which represents the exposure to recent immigrants, of the students attending g in school s in calendar year t.

In our preferred specification, $\alpha_{\text{school} \times \text{year}}$ denotes school-by-year effects, $\delta_{\text{grade} \times \text{year}}$ grade-by-year fixed effects, and σ_{fam} family fixed effects. X_i is a vector of controls that reflect the student's socio-economic background based on available parental data, alongside cohort size. For comparative purposes, we also include the simple OLS, as well as specifications that only include school by year and grade by year fixed effects, and individual and family controls. We cluster standard errors on the school-by-cohort level, thus allowing students' outcomes to correlate within their respective school-cohort. β_1 then represents the coefficient of interest.

When analyzing peer effects at the school-cohort level, the primary threat to identification lies in potential sorting of students. While the inclusion of school-by-year and grade-by-year fixed effects addresses potential non-random placement of migrants to schools, it is still plausible that incumbent students sort into different schools based on a number of observable and unobservable characteristics. To address this, in our preferred specification we include family fixed effects. This allows us to compare the outcomes of siblings who were exposed to different shares of newcomers in their school. This strategy allows us to absorb selection into schools that occurs based on familial socio-economic characteristics and unobserved family characteristics.

Such strategy, however, still leaves the possibility that families send siblings to different schools based on their scholastic performance and react differentially to inflows of migrants to their children's school cohorts. We address this in two ways. First, we include an additional specification where we use individual fixed effects to compare the results *within* the same individual in different grades, based on their exposure. This specification is more restrictive in its econometric setup as it only allows us to compare individuals across time and not in the cross-section in the same calendar year. However, if these estimates are shown to be compa-

rable to the one produced in the specification with family fixed effects, this would alleviate our concern about selection on the family level.

Second, we estimate our family fixed effects specification using the student's expected, rather than actual, exposure to newcomers. Expected contemporaneous exposure is measured by assigning to the student the contemporaneous exposure it would have had if the student had remained in the school in which it enrolled in the initial year of a given school stage (year 0, 4 or 7). Expected cumulative exposure averages the expected contemporaneous exposure over the stages for each student.

5.2 Threats to identification and balance tests

In order to examine if our identification strategy successfully accounts for non-random sorting of incumbent students and newcomer exposure, we estimate the model using predicted test scores as the outcome variable. The predicted test score of student i in grades $g = 3, 6, 9$ of compulsory school is based on the following model:

$$Y_{igt} = \beta \times X_{igt} + e_{igt} \tag{2}$$

where Y_{igt} is the test score of student i in grade g and X_{igt} is a vector of individual and family characteristics of the student, i.e. indicators for sex, being a first or second generation immigrant and country/region of origin dummies, birth order, age in months, indicators for maternal and paternal years of schooling and measures of maternal and paternal earnings. Naturally, family fixed effects will account for any differences in predicted test scores, but if families choose schools for their children depending on scholastic aptitude and in a way that is correlated with those characteristics, we might see that exposure to newcomers is correlated with predicted test scores, even when controlling for family fixed effects. Table A.1 presents the results. The first three columns show that there is considerable negative sorting of students to schools and even to cohorts within schools which are exposed to recent immigrants. In the fourth column, which controls for family fixed effects, there is no longer any correlation between individual predicted test scores and cumulative exposure. However, it appears that within sibling pairs, high contemporary exposure is positively associated with higher predicted scores. This suggests that even within sibling pairs, girls, first-borns and children born early in the year are more likely to experience high newcomer exposure, which motivates including these individual characteristics as controls. Note, however, that the magnitude of the estimate is however small: a 10 percentage point increase in contemporary exposure is associated with 0.002 of a standard deviation increase in predicted test scores.

As discussed, one threat to the identification could come from the students selecting into different schools as a response in exposure to recent migrants. In that case, our estimates could be reflecting compositional changes across schools as opposed to the true effect of the exposure. To address this concern, we can directly empirically test for evidence of such behaviour by estimating our model using an indicator for whether a student changes schools between grade g, year t and grade $g + 1$, year $t + 1$. The results of this exercise are shown in Table A.2. We do find such evidence in our sample, both for students with native and immigrant back-

ground. This suggests a flight behavior of students, in response to exposure to newly arrived immigrants. Again, it needs to be pointed out that the effects are rather small. A 10 percent increase in the exposure to migrants leads to an increase in the likelihood of moving schools by 0.23 percentage points, or 4 (0.23/4.8) percent among Nordic native students and by 0.26 percentage points, or 3 (0.26/8.0) percent among students with immigrant background.

We have established that our empirical strategy, including both school by year and family fixed effects successfully eliminates the correlation between predetermined characteristics and exposure to migrants over student's school history, but that some evidence of positive selection is present form contemporaneous exposure. Moreover, we have established that families do change schools for their children in response to inflows of migrants, but that the effects are small.

6 Results

We now turn to presenting the results of estimating the effects of exposure to recent migrant on school performance using the model presented in Equation 1. We first present effects on test scores for the whole incumbent student population. Then, we investigate heterogenous effects for different groups of students, effects across the test score distribution, and whether the type of recent migrant exposure matters. We also explore possible mechanisms by investigating school resource responses.

Table 3 illustrates the importance of accounting for sorting of both migrants and incumbents students to schools, and also that contemporaneous, short-run exposure, not necessarily has the same effects as long-run, cumulative exposure. The estimates in the first column show that the association between exposure and test scores within schools and across cohorts is negative. As controls for grade by year fixed effects and school by year fixed effects are introduced in the second column, the negative association between contemporaneous exposure and test scores is reduced markedly, but the association to cumulative exposure remains high. In the third column, we introduce controls for individual characteristics and family background. This markedly reduces the negative estimates further, illustrating that there is negative sorting of incumbent children to schools which have more migrant exposure. In the fourth column, we control an individual fixed effect, which accounts for remaining selection, but at the same time limiting the sample and available variation. The estimates then turn positive, but are insignificant. In the fifth column, we instead control for family fixed effects, accounting for unobservable characteristics shared by siblings. This appears to also address the issue of negative selection.

Both the estimates of contemporary and cumulative exposure become positive, albeit relatively small, and of comparable size to the individual fixed effects estimates. Thus, in our preferred specification in column 4, a 10 percentage point increase in the cumulative exposure to recent immigrants increases the standardized test scores of natives by approximately to 0.01 of a standard deviation. The estimate is somewhat smaller for contemporary exposure, but the estimates are comparable to when measuring the result within the same individuals across time. In the last column, we also include a family specific trend. Effect sizes then in-

Table 3: Effect of exposure to recent migrants on test scores

Exposure:	**Standardized scores**					
Contemporary	-0.225***	-0.167***	-0.034	0.043	0.083***	0.109***
	(0.034)	(0.033)	(0.032)	(0.042)	(0.031)	(0.036)
Cumulative	-1.530***	-1.127***	-0.357***	0.082	0.105***	0.197***
	(0.033)	(0.031)	(0.028)	(0.072)	(0.033)	(0.042)
Grade x Year FE	X	X	X	X	X	X
School x Year FE	X	X	X	X	X	X
Individual controls		X	X		X	X
Family controls			X			
Individual FE				X		
Family FE					X	
Family FE/Trends						X
Mean LHS	0.015	0.015	0.015	0.022	0.015	0.015
SD LHS	0.983	0.983	0.983	0.971	0.983	0.983
Observations	2,789,175	2,789,175	2,789,175	2,477,192	2,789,175	2,789,175
R-squared	0.142	0.165	0.255	0.823	0.624	0.734

Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01.

Notes: The dependent variable is our main measure of academic performance in school. When student has taken the (obligatory) national tests in math, Swedish, and English, the outcome is the average of the scores from these tests standardized on an annual level. If student has missed one of the tests we instead use the course grade in the same subject standardized on the annual level. For comparison of results depending on variable of academic performance, see Table 4. The regressions are run separately for contemporary and cumulative exposure. Observations are the number of incumbent students, including only students with at least one sibling in the sample. Incumbent students are defined as students born in Sweden or another Nordic country. Standard errors are clustered at the school by cohort level.

crease Both the pattern and the magnitude of the results are highly comparable to the findings of Figlio et al. (2023) in Florida schools, suggesting that the effect is similar in the Swedish context.[11]

In Table 4 we re-estimate model 1, our preferred specification from column 5 in Table 3, with standardized teacher set grades in 6th and 9th grade and test scores from each subject separately (without imputations for missing scores). As can be seen, the positive results in Table 3 are driven by positive effects for test scores in English and Swedish. There are no positive effects on mathematics test scores and, with the exception of English grades, there are no effects on grades. In Table C.1 we show the results for our preferred specification, estimated for each grade separately with standardized scores (including imputes scores when test scores are missing) and standardized grades as outcomes. The results show that there

[11]In Table B.1 in the Appendix, the model is estimated measuring exposure at the classroom level instead. Results are very similar.

are no significant effects on test scores in Grade 3, when children are 10 years old. There is evidence of positive effects of exposure to migrants in both grade 6 and 9.

Table 4: Effect of exposure to recent migrants on grades and test scores in different subjects

	Standardized grades				**Standardized test scores**			
Exposure:	**Math**	**Swedish**	**English**	**All**	**Math**	**Swedish**	**English**	**All**
Contemporary	0.001	0.065	0.045	0.045	0.027	0.149***	0.098**	0.102***
	(0.049)	(0.053)	(0.050)	(0.047)	(0.035)	(0.035)	(0.047)	(0.032)
Cumulative	-0.005	0.033	0.101**	0.054	0.018	0.128***	0.140***	0.115***
	(0.043)	(0.045)	(0.045)	(0.042)	(0.038)	(0.038)	(0.048)	(0.036)
Grade x Year FE	X	X	X	X	X	X	X	X
School x Year FE	X	X	X	X	X	X	X	X
Individual controls	X	X	X	X	X	X	X	X
Family FE	X	X	X	X	X	X	X	X
Mean LHS	0.029	0.019	0.003	0.019	0.029	0.014	-0.003	0.018
SD LHS	0.996	0.991	0.991	0.992	0.984	0.978	0.996	0.981
Observations	1,751,858	1,751,858	1,751,858	1,751,858	2,325,753	2,442,289	1,565,772	2,456,763
R-squared	0.694	0.694	0.676	0.722	0.603	0.562	0.683	0.628

Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01.

Notes: The regressions are run separately for contemporary and cumulative exposure. Observations are the number of incumbent students, including only students with at least one sibling in the sample. Incumbent students are defined as students born in Sweden or another Nordic country and foreign born students who immigrated before school start. Standard errors are clustered at the school by cohort level.

6.1 Effects exposure to migrants for different groups of students

We have so far seen that exposure to recent migrants has an overall positive, but small effect on school outcomes of incumbent students. In what follows, we investigate if the effects are similar for boys and girls and by student migration background. We introduce and interaction term between female student and the measure of exposure to investigate differential effects by gender. We also estimate split sample regressions to investigate effects on Nordic natives and immigrant background students. The results are presented in Table 5. The first column show the effects for Nordic natives, the second column show results for students with immigrant background and columns 5 and 6 show results for students with low and high predicted test scores, and columns 7 and 8 show effects for girls and boys. First, it is clear from columns 1 and 2 that the overall positive effects of exposure to recent immigrants are only present for Nordic natives. There is even a negative, but insignificant point estimate for cumulative exposure. We can further note that for the incumbent population as a whole, column 5 and 6 suggest that the effects of contemporary exposure is positive and for boys and girls, but that the positive effect of cumulative exposure is larger for boys than for girls and only significantly positive for boys.

Table 5: Effect of exposure to recent migrants on test scores for different groups of students

	Standardized scores					
Exposure:	Nordic native	Immigrant background	Low PS	High PS	Female	Male
Contemporary	0.098***	-0.001	0.008	0.220***	0.079**	0.087***
	(0.033)	(0.070)	(0.033)	(0.033)	(0.032)	(0.032)
Cumulative	0.148***	-0.113	0.075**	0.166***	0.040	0.167***
	(0.037)	(0.070)	(0.035)	(0.038)	(0.035)	(0.036)
Grade x Year FE	X	X	X	X	X	X
School x Year FE	X	X	X	X	X	X
Individual controls	X	X	X	X	X	X
Family FE	X	X	X	X	X	X
Mean LHS	0.049	-0.263	0.015	0.015	0.015	0.015
SD LHS	0.971	1.037	0.983	0.983	0.983	0.983
Observations	2,488,060	290,257	2,789,175	2,789,175	2,789,175	2,789,175
R-squared	0.626	0.641	0.624	0.624	0.624	0.624

Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01.

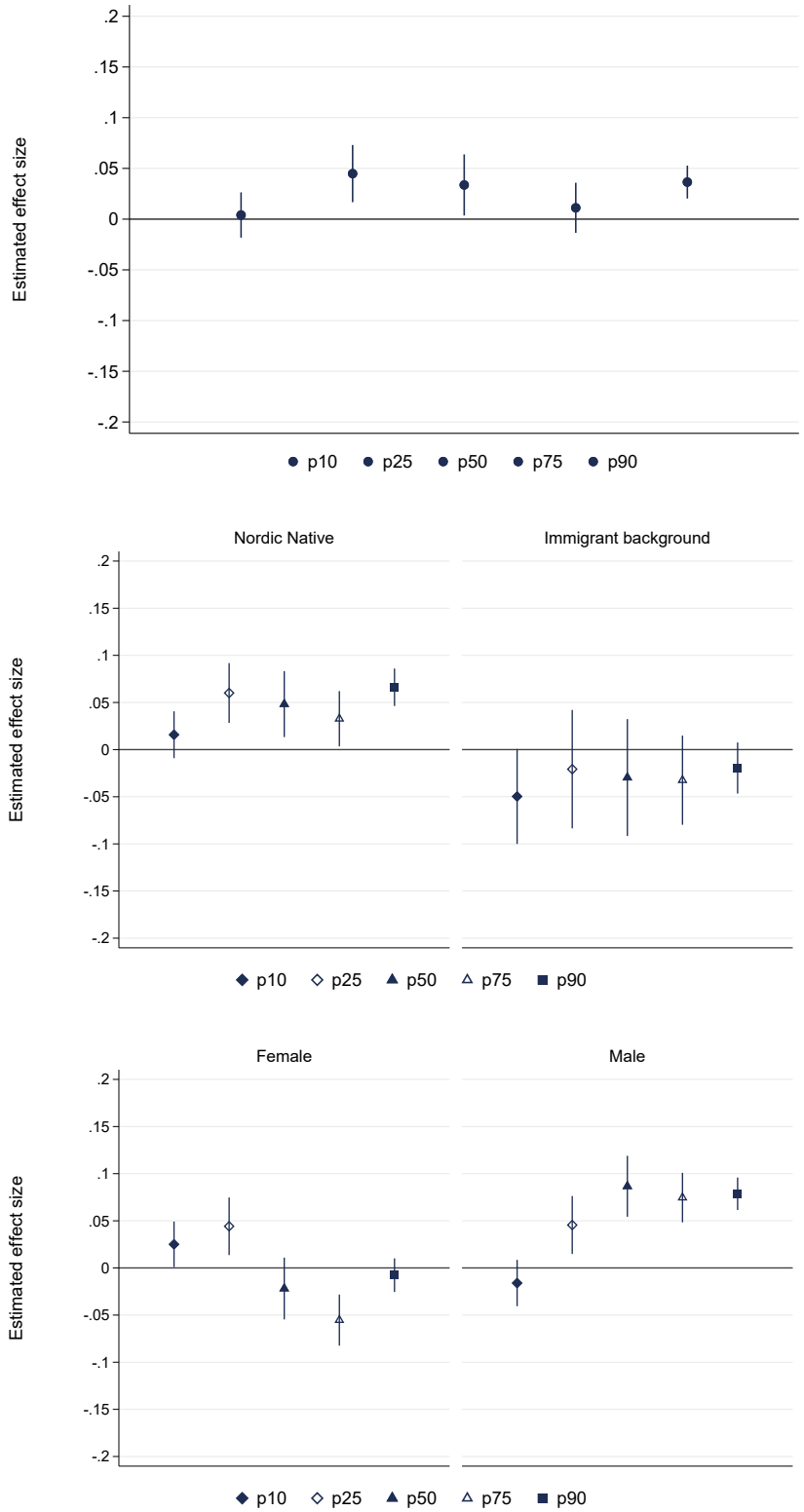
Notes: The regressions are run separately for contemporary and cumulative exposure. Observations are the number of incumbent students, including only students with at least one sibling in the sample. Incumbent students are defined as students born in Sweden or another Nordic country and foreign born students who immigrated before school start. Standard errors are clustered at the school by cohort level.

A possible reason for differential results between Nordic natives and immigrant background students could be that they are, in fact, exposed to different types migrants, but also that there are non-linearities in the effects of exposure: immigrant background students generally have higher levels of exposure than and Nordic natives. In Figure F.2, we investigate if there are significant differences in the type of recent migrants that natives and students with immigrant background are exposed to by plotting the distribution of predicted and actual test scores of the recent migrants that comprise the exposure of the respective groups. The evidence suggests that there are no systematic differences in scholastic aptitude of the recent migrants that Nordic natives and immigrant background students are exposed to.

We also explore the possibility that effects of recent migrant exposure are different at different levels of exposure. We do this by estimating a piece-wise linear regression model, with levels of exposure corresponding to the bottom, second, third and top quarters of the exposure distribution. The estimates are plotted in Figure F.3. The top two panels show that the positive effects on Nordic natives are driven by high levels of exposure. The third panel shows a very different pattern for immigrants, who experience a positive but insignificant effect of exposure at low levels, but effects close to zero at other levels of exposure. We can hence conclude that the differential effects of recent migrant exposure on Nordic natives and immigrant background students are not driven by different types and levels of exposure, but by heterogeneous responses to exposure.

We further explore heterogenous effects by investigating if the effects of exposure to re-

Figure 3: Heterogeneity of effects by position in the distribution of standardized scores



Notes: Each point in the graph represents the point estimate of effect of cumulative exposure to recent arrivals on the probability of having standardized scores above the 10th, 25th, 50th, 75th, and 90th percentile, respectively. The first graphs shows the results for the main analysis sample.

cent migrants are similar across the test score distribution, i.e. if high- and low performing students are equally affected. Figure 3 presents graph showing the separate point estimates for the effects of cumulative exposure on the probability of obtaining test scores above given percentile in the test score distribution. The top panel (a) shows that for the overall incumbent population, there are significant positive effects of exposure in the middle (25th percentile and 50th percentile) and the top (90th percentile) of the distribution. Hence, the weakest students do no seem to gain. This pattern is confirmed in the LHS middle panel for Nordic native students. However, for students with immigrant background, there are negative point estimates throughout the distribution, and it seems that the weakest immigrant background children may in fact be harmed by recent immigrant exposure. The bottom panel show the results for girls and boys. The differences are stark. With the exception of the weakest boys, boys in general gain from being exposed. For girls, the pattern is different, with scholastically weaker girls gaining while rather high performing girls suffer.

6.2 Exposure to different migrants

We next examine how exposure to different types of recent migrants affect incumbent student outcomes. Based on the country or region of birth of the migrant students and their parents, we compute separate exposure measure for exposure to recent migrants from Non-western countries, exposure to rich countries and poor countries and one measure for exposure to asylum seeking students. The classification of rich and poor countries is of course arbitrary, but done with the idea of capturing differences in the migrant students' language skills and school preparedness.[12] We also classify countries/regions by the educational performance of students who come from the respective countries/regions. The results, presented in Table C.2, show that Nordic native students benefit from exposure to Non-western recent migrants, and the the positive effect of exposure to asylum seekers is substantial, as is the effect of exposure to migrants from poor countries. As for, immigrant background students, there is instead an insignificant negative effect of cumulative exposure to Non-Western recent immigrants and migrants from poor countries. For immigrant background students, exposure to recent immigrants from rich countries has no impact on school performance.

6.3 School responses

We have so far found that Nordic Native students gain marginally from being exposed to recent migrants, but that immigrant background students do not. What can possibly explain these positive effects on Nordic natives? One mechanism suggested in the previous literature is that schools respond to migrant influx by increasing resources. We investigate this possibility by estimating the effect on class size, which we can measure at the grade level and by investigating if students are more or less likely to participate in home language classes. Students who speak

[12]Europe, Northern America, Chile, East Asian and Oceania are classified as rich regions of origin. MENA countries, Africa, South and South East Asia and Latin America (excluding Chile) are classified as poor regions of origin. While being an asylum seeking student, there is no information of country of origin in the data, but during the time period studied, many of these students come Irak, Iran, Afghanistan, Syria, the horn of Africa

another language than Swedish at home are by law entitled to classes to learn and develop this language. Lack of teachers and too few students in the language in question are reasons for why students are not provided home language classes. Participation is, however, voluntary, which also means that students' own motivation and parents demands matter for participation.

The effects of recent migrant exposure on class size are presented presented in Table D.1. We can see that there is a clear negative correlation between class size and migrant exposure. However, this negative relation between contemporary exposure disappears as family fixed effects are included. However, a negative effect persists for cumulative exposure, suggesting that students who have had high cumulative exposure have typically also attended a smaller class. It is possible that this reflects an increase in school resources in response to the migrant exposure, which benefits some students. In Table B.2, we re-estimate our main results, including class size as a control, well aware that this is an endogenous control. It turns out that the increase in class size does not account for the improvement in test scores.

Table D.2 displays the results for participation in home language classes. While exposure to recent migrants leads Nordic native students increase their participation in home language classes, the opposite is the case for immigrant background students. The initial level is, naturally, much higher for immigrant background students, where 43 percent take such classes, as compared to 5 percent among Nordic native students. These results suggest that Nordic native students actually gain access to teaching resources, while immigrant background students instead seem to lose resources.

7 Migration crisis 2015–2017

In this section, we focus more specifically on the effect of the 2015–2017 migration shock that came in the form of a large immigration flow into Europe. During that year, Sweden admitted the largest number of migrants per capita: over 160 thousand relative to the then population of 10.5 million.[13] This was an acute and largely unexpected shock to the infrastructure of the country, including the schooling system.

Due to this nature of the shock, many refugees were placed in schools located in smaller and more rural municipalities where accommodation was more readily available.[14] This led to a higher exposure to asylum seekers in more rural schools that had previously seen relatively low shares of foreign students. We illustrate this in Figure F.1. As can be seen in the figure, it was schools in smaller municipalities that received a proportionally higher share of asylum-seeking students. These circumstances, therefore, create a suitable institutional framework for disentangling the effect of a sudden and significant inflow of refugee students from a substantially different cultural background.

Based on the pattern shown in the top panel of Figure 2, we create a measure of crisis exposure at the grade and school level based on the average share of recent migrants in the

[13]Please see the following data from Statistics Sweden for further detail. The figure is a combined number of those who specifically applied for asylum upon arrival and individuals using other immigration channel.

[14]Please see the report from the National Authority on Education (Skolverket) for further detail and allocation statistics.

school and grade during the school years 2015/16- 2017/2018 which we use a a continuous treatment variable. We then estimate the following event study equation with the school year 2014/15 as the reference year

$$y_{igst} = \beta_t \times \sum_{k=2008}^{2021} 1_{t=k} \times \text{ Share Newcomers}_{gs2015-2017} + \alpha_{\text{school s}} + \delta_{\text{year t}} + \sigma_{\text{fam}} + X_i\gamma' + e_{isgt} \quad (3)$$

We also summarize the effect of crisis exposure by estimating the following continuous difference-in-differences specification:

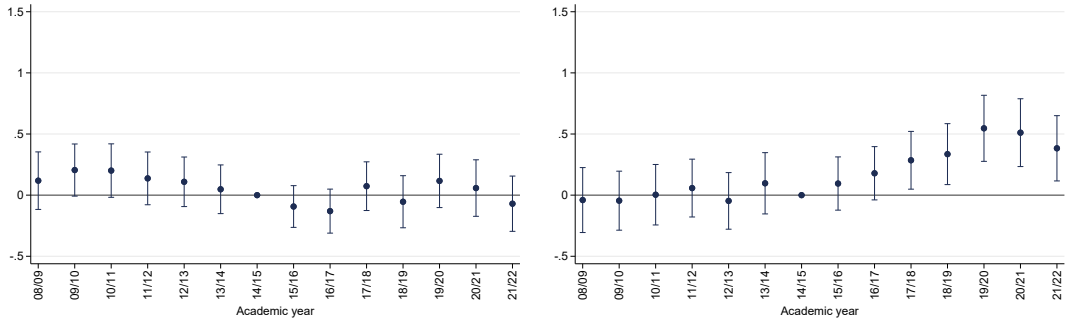
$$Y_{igst} = \beta_1 \times \text{Share Newcomers}_{gs2015-2017} \times \ 1[\text{year} > 2014] + \alpha_{\text{school}} + \delta_{\text{year}} + \sigma_{\text{fam}} + X_i\gamma' + e_{isgt} \quad (4)$$

In the equations above, Share Newcomers$_{gs2015-2017}$ is a continuous variable indicating the share of students who are recent migrants, i.e. either newly arrived (at most four years) or that are asylum seekers (with a pending asylum case) in school s and grade g during 2015-2017 and 1[year > 2014] is an indicator variable for the period from 2015 onward. Similarly to Equation 1, the other terms represent the respective fixed effects and the vector of individual controls. This identification strategy hinges on the recipient schools facing similar trends in in school outcomes prior to the crisis. We show that to be the case in panel b of Figure 4, which displays the results of estimating Equation 3, while accounting for selection of students to school using family fixed effects. We observe no relationship between test scores and the share of recent migrants or asylum-seeking students prior to 2015, with none of the estimates being statistically significant at the 5% level.

Panel (a) which does not control for family fixed effects, shows that test scores were on a decline in schools that later became exposed to the crisis. Since the negative disappears when family fixed effects are included in the model, it seems that this trend is related to deteriorating, but unobserved family characteristics. The event study graphs also show evidence of improved test scores in schools that were more exposed to the crisis. As of the academic year 2017/18 estimates are positive and significant. The bottom two panels show the effects when the exposure measure focuses on asylum seekers. Results are similar to exposure to recent immigrants, but more noisy. In Figure E.1 we estimate the events study separately for Nordic nattives and students of immigrant backgound. While exposed Nordic natives' test scores improve, we see no such effect on immigrant background students.

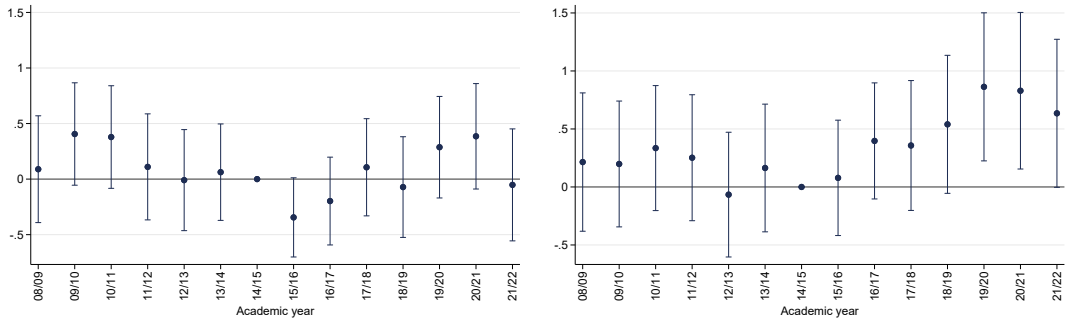
We show the formal results of estimating Equation 4 in Table E.1. In the first column, we restrict the followup treatment period to 2018, the year by which the migration crisis was no longer acute. In the second column, we use the entire post crisis period when data is available to identify the effect. This adjustment does not appear to substantially influence our results. A 10 percentage point increase in the exposure to recent migrant students increases the test scores of the incumbent students by approximately 0.02 to 0.025 standard deviations. The magnitude of the effect is somewhat larger, although comparable to that of the overall migrant exposure. Thus, we observe a positive and statistically significant, albeit mild, effect of the shock experienced by Swedish schools during 2015-16 refugee crisis.

Figure 4: Event-study graphs showing the estimated coefficient of crisis exposure on student outcomes



(a) Without Family FE
Exposure to recent immigrants

(b) With Family FE
Exposure to recent immigrants



(c) Without Family FE
Exposure to asylum seekers

(d) With Family FE
Exposure to asylum seekers

Notes: The upper figures shows effect from exposure to recent immigrants (in Sweden for at most four years), while the lower figures shows effect from exposure to asylum seekers specifically. For a separation of Nordic native and immigrant background incumbent students, see Figure E.1.

8 Conclusion

In this paper, we study the effect of recent migrant peers on incumbent students. We utilize data on the universe of compulsory-school students in Sweden between 2008 and 2022, a period characterized by high levels of global and local immigration. To account for non-random sorting of migrant and native students into schools, we combine school and family fixed effects to account for non-observable characteristics on the family level.

Our findings suggest that the negative association between migration of school performance stems for significant negative sorting of migrants and incumbent children to schools. Once we account for this sorting, we find that both contemporaneous and cumulative exposure to recent migrants have small positive effects on student outcomes. While Nordic native students are most likely to benefit, incumbent students with immigrant background do not benefit, and even display a negative, albeit insignificant effects. Our analysis also shows that the type of migrant exposure matters.

In an attempt to explore mechanisms behind the overall positive effects and for the differ-

ences between Nordic natives and immigrant background student, we find evidence of reduced classroom sizes in response to high recent migrant exposure, however this does not fully account for the positive effects. We also find that the fraction of students who participate in home language classes increases among Nordic native students, but decreases among immigrant background students. The analysis of the 2015-16 refugee crisis, supports our finding of an overall positive effect on test scores of being exposed to recent migrants.

Our results adds to the evidence of positive effects of exposure to migrant students, and also supports that resource allocation matters. Of particular importance is that we find positive effects also in a context with high refugee migration, also during a crisis which put significant pressure on the receiving schools. The presence of negative effects of recent migrant exposure among students with immigrant background points to a risk that compensating resource allocation may not sufficiently reach this group of students.

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Appendix A Balancing tests

Table A.1: Correlation between exposure to newcomers and incumbents predicted test scores

Exposure:	**Predicted standardized scores**			
Contemporary	-1.318***	-1.354***	-0.165***	0.017***
	(0.011)	(0.012)	(0.009)	(0.005)
Cumulative	-1.875***	-1.890***	-1.191***	0.008
	(0.014)	(0.015)	(0.015)	(0.006)
Grade x Year FE		X	X	X
School x Year FE			X	X
Family FE				X
Mean LHS	0.009	0.009	0.009	0.009
SD LHS	0.391	0.391	0.391	0.391
Observations	2,789,175	2,789,175	2,789,175	2,789,175
R-squared	0.064	0.065	0.228	0.890

Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01.

Notes: The regressions are run separately for contemporary and cumulative exposure. Observations are the number of incumbent students, including only students with at least one sibling in the sample. Incumbent students are defined as students born in Sweden or another Nordic country. Standard errors are clustered at the school by cohort level.

Table A.2: Effect of Newcomers on Incumbents' Propensity to Change Schools

	Change school		
Exposure	**Nordic native**	**Immigrant background**	**Total**
Contemporary	0.023***	0.026***	0.024***
	(0.004)	(0.008)	(0.004)
Grade x Year FE	X	X	X
School x Year FE	X	X	X
Individual Controls	X	X	X
Family FE	X	X	X
Mean LHS	0.048	0.080	0.052
SD LHS	0.213	0.271	0.221
Observations	8,651,544	1,199,789	9,858,022
R-squared	0.201	0.245	0.201

Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01.

Notes: The dependent variable is a binary variable equal to one if the students changed school in the following year, and zero otherwise. Immigrant background is defined as both parents being born outside the Nordic countries. Observations are the number of incumbent students, including only students with at least one sibling in the sample. Incumbent students are defined as students born in Sweden or another Nordic country. Standard errors are clustered at the school by cohort level.

Appendix B Robustness Checks

Table B.1: Exposure measured at the classroom level

Exposure:	**Standardized scores**					
Contemporary	-0.200***	-0.138***	-0.014	0.026	0.077***	0.089***
	(0.020)	(0.020)	(0.018)	(0.018)	(0.016)	(0.019)
Cumulative	-1.226***	-0.901***	-0.278***	0.032	0.131***	0.204***
	(0.028)	(0.027)	(0.024)	(0.051)	(0.026)	(0.033)
Grade x Year FE	X	X	X	X	X	X
School x Year FE	X	X	X	X	X	X
Individual controls		X	X		X	X
Family controls			X			
Individual FE				X		
Family FE					X	
Family FE/Trends						X
Mean LHS	0.015	0.015	0.015	0.022	0.015	0.015
SD LHS	0.983	0.983	0.983	0.971	0.983	0.983
Observations	2,789,175	2,789,175	2,789,175	2,477,192	2,789,175	2,789,175
R-squared	0.142	0.165	0.255	0.823	0.624	0.734

Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01.

Notes:

Table B.2: Classroom size included in individual controls

Exposure:	**Standardized scores**			
Contemporary	-0.205***	-0.136***	-0.010	0.100***
	(0.035)	(0.034)	(0.033)	(0.032)
Cumulative	-1.542***	-1.108***	-0.347***	0.113***
	(0.034)	(0.032)	(0.029)	(0.034)
Grade x Year FE	X	X	X	X
School x Year FE	X	X	X	X
Individual controls		X	X	X
Family controls			X	
Family FE				X
Mean LHS	0.010	0.010	0.010	0.010
SD LHS	0.984	0.984	0.984	0.984
Observations	2,497,105	2,497,105	2,497,105	2,497,105
R-squared	0.144	0.171	0.261	0.636

Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01.

Notes:

Appendix C Effect Heterogeneity

Table C.1: Effect of exposure to recent migrants on standardized scores and grades in grades 3,6, and 9.

	Standardized scores			**Standardized grades**	
Exposure:	**Grade 3**	**Grade 6**	**Grade 9**	**Grade 6**	**Grade 9**
Contemporary	0.007	0.073**	0.035	0.090**	0.024
	(0.048)	(0.035)	(0.034)	(0.038)	(0.034)
Cumulative	0.066	0.087*	0.171***	0.085	0.110**
	(0.058)	(0.047)	(0.052)	(0.053)	(0.052)
Year FE	X	X	X	X	X
School FE	X	X	X	X	X
Individual controls	X	X	X	X	X
Family FE	X	X	X	X	X
Mean LHS	0.030	0.015	0.018	0.024	0.021
SD LHS	0.944	0.995	0.996	0.993	0.992
Observations	669,556	831,957	910,116	607,367	907,174
R-squared	0.643	0.706	0.735	0.741	0.735

Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01.

Notes: The regressions are run separately for each grade. Observations are the number of incumbent students, including only students with at least one sibling in the sample. Including family fixed effects means that we only include observations where we have data on siblings in the same grade. Standard errors are clustered at the school by cohort level.

Table C.2: Different types of exposure

	Standardized scores	
Exposure:	Nordic Native	Immigrant Background
Contemporary (Non-Western)	0.110***	-0.004
	(0.034)	(0.072)
Cumulative (Non-Western)	0.186***	-0.126*
	(0.039)	(0.072)
Contemporary (Asyl)	0.005	0.307
	(0.076)	(0.194)
Cumulative (Asyl)	0.550***	0.300
	(0.121)	(0.313)
Contemporary (Poor)	0.119***	0.005
	(0.038)	(0.079)
Cumulative (Poor)	0.242***	-0.160*
	(0.047)	(0.083)
Contemporary (Rich)	0.013	0.009
	(0.059)	(0.128)
Cumulative (Rich)	-0.042	0.030
	(0.062)	(0.138)
Grade x Year FE	X	X
School x Year FE	X	X
Individual controls	X	X
Family FE	X	X
Observations	2,488,060	290,257
R-squared	0.63	0.64

Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01.

Notes: Europe, Northern America, Chile, East Asian and Oceania are classified as rich regions of origin. MENA countries, Africa, South and South East Asia and Latin America (excluding Chile) are classified as poor regions of origin. While being an asylum seeking student, there is no information of country of origin in the data, but during the time period studied, many of these students come Irak, Iran, Afghanistan, Syria, the horn of Africa.

Appendix D School Responses

Table D.1: Classroom size

Exposure:	**Classroom size**					
Contemporary	-0.992**	-0.972**	-0.928**	1.921***	-0.213	-0.185
	(0.390)	(0.390)	(0.390)	(0.510)	(0.365)	(0.408)
Cumulative	-2.455***	-2.355***	-2.095***	3.013***	-1.953***	-2.415***
	(0.221)	(0.223)	(0.224)	(0.671)	(0.287)	(0.359)
Grade x Year FE	X	X	X	X	X	X
School x Year FE	X	X	X	X	X	X
Individual controls		X	X		X	X
Family controls			X			
Individual FE				X		
Family FE					X	
Family FE/Trends						X
Mean LHS	22.646	22.646	22.646	22.580	22.637	22.637
SD LHS	5.842	5.842	5.842	5.884	5.845	5.845
Observations	2,529,355	2,529,355	2,529,355	2,183,474	2,497,105	2,497,105
R-squared	0.745	0.745	0.745	0.899	0.813	0.866

Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01.

Notes: The dependent variable is our main measure of academic performance in school. When student has taken the (obligatory) national tests in math, Swedish, and English, the outcome is the average of the scores from these tests standardized on an annual level. If student has missed one of the tests we instead use the course grade in the same subject standardized on the annual level. The regressions are run separately for contemporary and cumulative exposure. Exposure are measured on classroom level. We do not have complete coverage on classroom identifiers, which means that there are slightly fewer observations in this regression compared to our main analysis. Observations are the number of incumbent students, including only students with at least one sibling in the sample. Incumbent students are defined as students born in Sweden or another Nordic country. Standard errors are clustered at the school by cohort level.

Table D.2: Effects of exposure to recent migrants on participation in home language classes

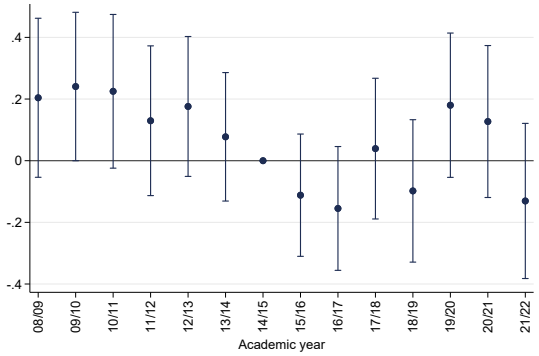
	Participation in home language classes	
Exposure:	Nordic native	Immigrant background
Contemporary	0.084***	-0.014
	(0.019)	(0.030)
Cumulative	0.063***	-0.069*
	(0.021)	(0.039)
Year FE	X	X
School FE	X	X
Individual controls	X	X
Family FE	X	X
Mean LHS	0.052	0.429
SD LHS	0.222	0.495
Observations	1,625,697	191,527
R-squared	0.574	0.632

Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01.

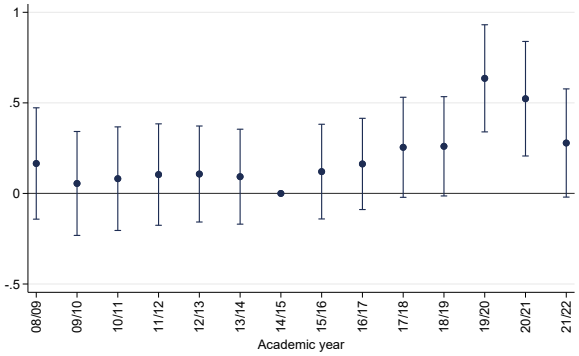
Notes: The dependent variable is a binary variable for participating in home language classes, 1 if participating and zero otherwise. The number of observations are fewer than our main analysis sample due to home language classes only being available for grade 6 and 9 and not for all years in our data.

Appendix E Migration Crisis

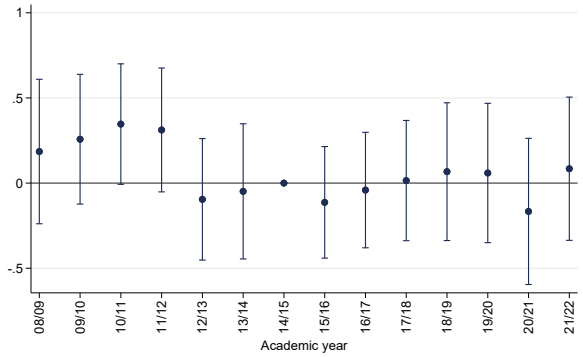
Figure E.1: Event-study graphs showing the estimated coefficient of crisis exposure on student outcomes



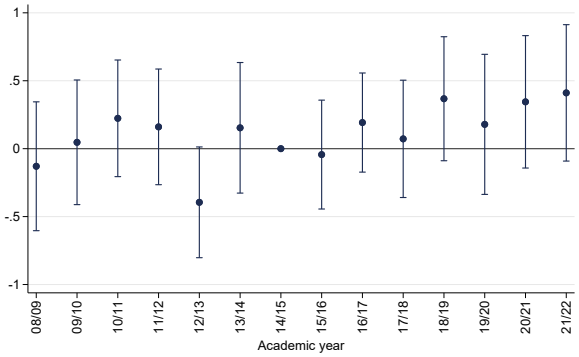
(a) Nordic Natives — Without Family FE
Exposure to recent immigrants



(b) Nordic Natives — With Family FE
Exposure to recent immigrants



(c) Immigrant background — Without Family FE
Exposure to asylum seekers



(d) Immigrant background — With Family FE
Exposure to asylum seekers

Table E.1: Differences-in-Differences

	Standardized scores	
Exposure:	2008–2018	2008–2021
Exposure to crisis × post	0.217***	0.261***
	(0.082)	(0.076)
Year FE	X	X
Grade FE	X	X
School FE	X	X
Individual controls	X	X
Family FE	X	X
Mean LHS	0.047	0.043
SD LHS	0.998	0.995
Observations	501,051	697,941
R-squared	0.748	0.740

Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01.

Notes: The table shows the effect of exposure to recent immigrants on test scores.

Appendix F Additional Figures and Tables

Figure F.1: Distribution of Asylum Seekers in Schools by Municipality Size

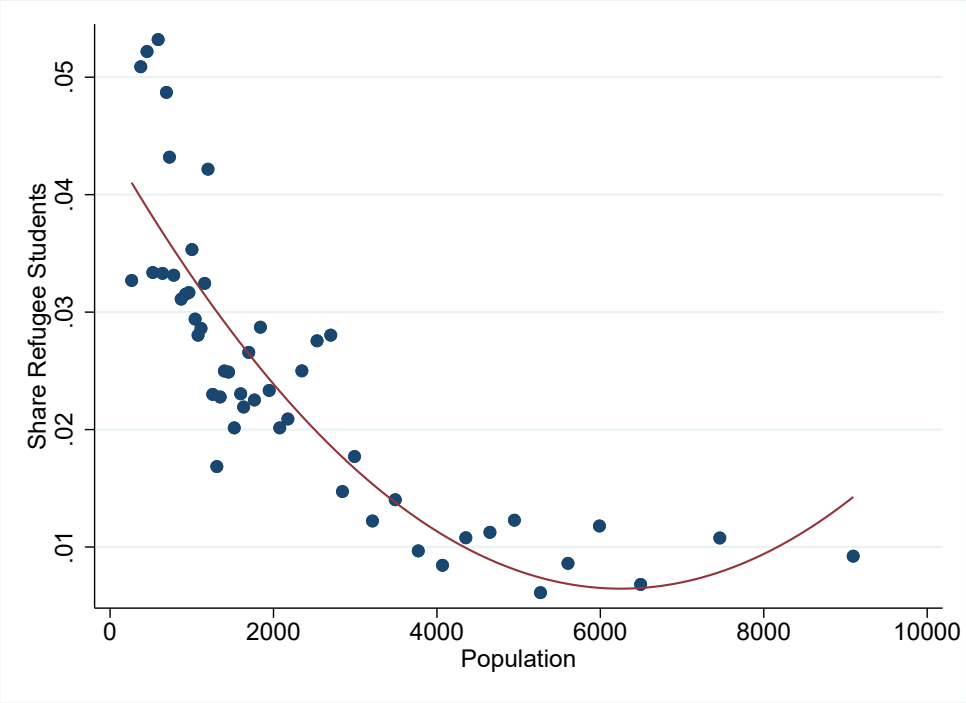
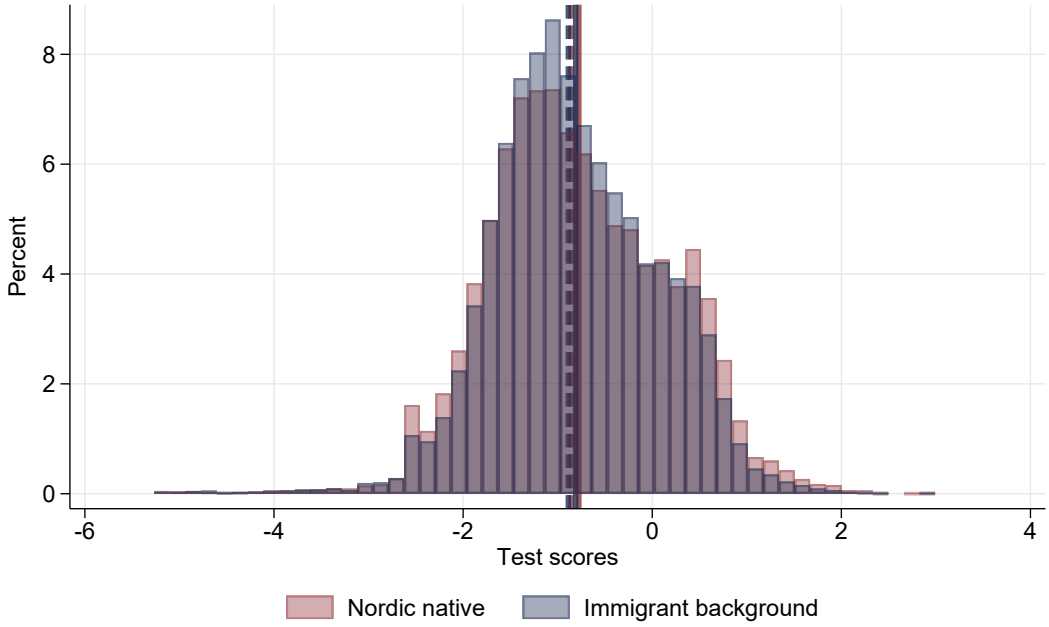
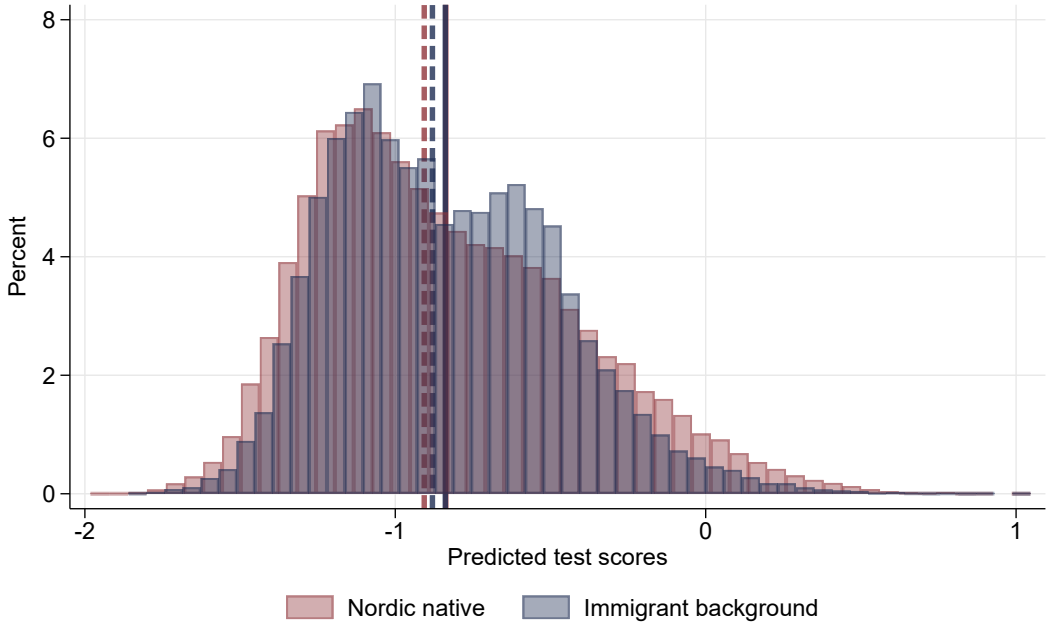


Figure F.2: Distribution of test scores for recent arrivals



(a) Actual test scores

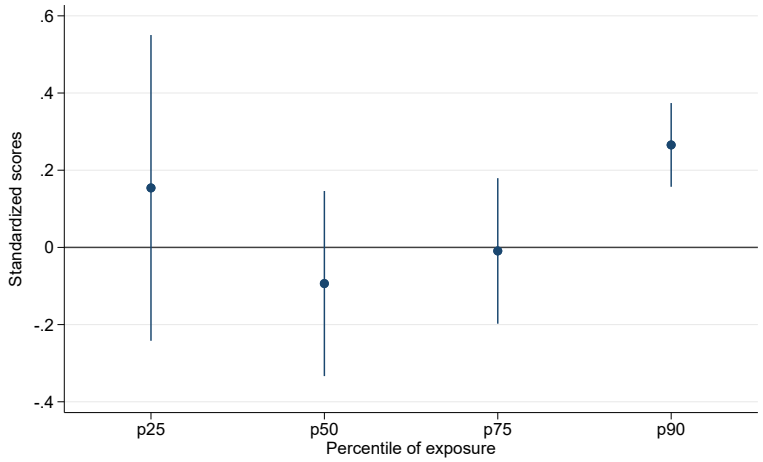


(b) Predicted test scores

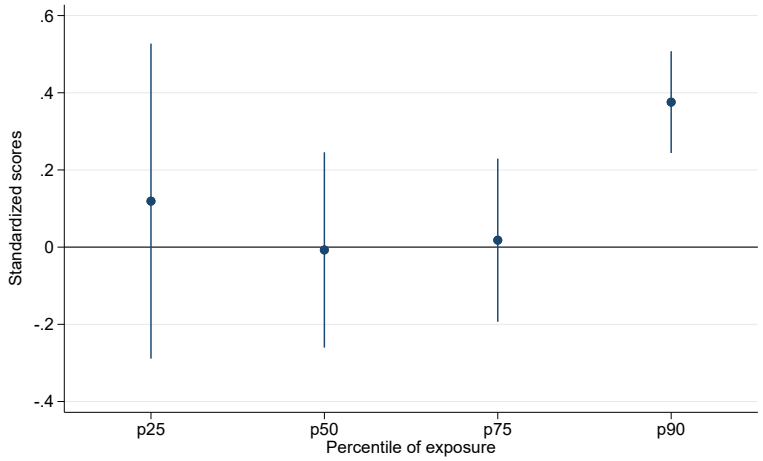
Notes: The figures shows the distribution of actual (upper) and predicted (lower) test scores among recent arrivals that students with nordic native and immigrant background are exposed to, respectively. The solid blue (red) line shows the mean test score of newly arrived immigrants that native (immigrant background) students are exposed to. The dashed blue (red) line shows the median test score of newly arrived immigrants that native (immigrant background) students are exposed to.

Figure F.3: Piecewise linear regression

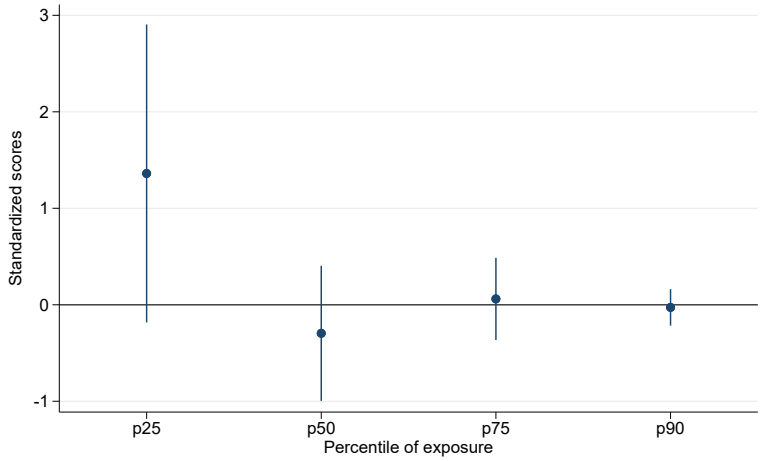
(a) Total



(b) Nordic natives



(c) Immigrant background



Notes: The figures shows piecewise linear regression models for our main analysis sample with standardized scores as outcomes.

Table F.1: Countries and Regions

1.	Sweden	
2.	Finland	
3.	Denmark	
4.	Norway and Iceland	
5.	UK and Ireland	
6.	Germany	
7.	Mediterranean Europe	Greece, Italy, Malta, Monaco, Portugal, San Marino, Spain
8.	Continental Europe	Andorra, Austria, Belgium, France, Liechtenstein, Luxembourg, The Netherlands, Switzerland
9.	US and Canada	
10.	Bosnia and Herzegovina	
11.	Former Yugoslavia	Croatia, Kosovo, Macedonia, Serbia, Montenegro, Slovenia, Yugoslavia
12.	Poland	
13.	The Baltic states	Estonia, Latvia, Lithuania
14.	E Europe, Caucasus and C Asia	Albania, Armenia, Azerbaijan, Belarus, Bulgaria, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Romania, Russia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan
15.	Czechia, Slovakia and Hungary	
16.	Mexico and Central America	
17.	Chile	
18.	South America	Argentina, Bolivia, Brazil, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela
19.	Northeast Africa	Djibouti, Eritrea, Ethiopia, Somalia, South Sudan, Sudan
20.	Middle East and North Africa	Algeria, Bahrain, Cyprus, Israel, Jordan, Kuwait, Lebanon, Libya, Morocco, Palestine, Qatar, Saudi Arabia, Syria, Tunisia, United Arab Emirates, Yemen
21.	West, Central, South Africa	Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Democratic Republic of the Congo, Ivory Coast, Egypt, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, South Africa, Swaziland, Tanzania, United Republic of Togo, Uganda, Zambia, Zimbabwe
22.	Iran	
23.	Iraq	
24.	Turkey	
25.	East Asia	China, Hong Kong, Japan, Korea, Taiwan
26	Southeast Asia	Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam
27.	South Asia and Mongolia	Afghanistan, Bangladesh, Bhutan, Brunei, Cambodia, India, Maldives, Mongolia, Nepal, Oman, Pakistan, Sri Lanka, Timor-Leste
28.	Oceania	Australia, New Zealand, Fiji, Kiribati, Micronesia, Nauru, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Vanuatu

Notes: This table shows the countries included for the regions that we use in our analysis.