



LUND UNIVERSITY
School of Economics and Management

Master's Programme in Economic Growth and Development

Ethnic School Segregation and Reading Performance

A Comparative Study of Second-Generation Migrants and Natives in Denmark and Sweden

by

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Abstract

This study examines the relationship between ethnic school segregation and reading performance among second-generation migrant students compared to natives in Denmark and Sweden, using PISA 2015 data. The research explores how different integration policies influence educational outcomes in the context of ethnic segregation. Findings reveal that higher proportions of migrant students in schools negatively correlate with reading scores in both countries. However, this relationship is more pronounced in Denmark, where ethnic distinctions persist even after controlling for socioeconomic factors. In Sweden, socioeconomic status fully accounts for performance differences. Notably, Denmark shows a significant interaction effect where increased migrant proportions in schools are associated with lower reading scores for second-generation migrants, an effect not observed in Sweden. Further analyses demonstrate that this relationship is subject-specific to reading and emphasize the greater influence of school-level socioeconomic factors compared to individual socioeconomic status. The study suggests that these disparities stem from contrasting integration policies: Sweden's inclusive approach may mitigate negative effects of school segregation, while Denmark's emphasis on cultural homogeneity may exacerbate challenges for migrant students.

EKHS42

Master's Thesis (15 credits ECTS)

June 2024

Supervisor: Luciana Quaranta

Examiner: Finn Hedefalk

Word Count: 13,338

Acknowledgements

I would like to express my sincere gratitude to everyone who supported and contributed to the completion of this project. First and foremost, I am deeply grateful to my supervisor, Luciana Quaranta, for her invaluable guidance and advice throughout this process. I am also very appreciative of the people I met during this year and their endless support, with special thanks to my MEDEG classmates and friends with whom I had the chance to engage in insightful discussions on the topics covered in this paper.

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1 Introduction

The integration of immigrant populations has become a critical challenge for many European countries, particularly in the field of education (Porcu et al., 2023). As societies become increasingly diverse, understanding how school systems can effectively support students from various backgrounds is critical for social cohesion and economic prosperity. This research focuses on two Scandinavian countries, Denmark and Sweden, which despite sharing similar welfare state models, have adopted divergent approaches to immigrant integration. In recent decades, both Denmark and Sweden have experienced significant immigration, leading to growing populations of second-generation migrants – children born in the host country to immigrant parents.

The academic performance of immigrant students, particularly those of second generation, serves as an important indicator of the effectiveness of a country's integration policies and educational practices. Previous research consistently reveals a persistent achievement gap between immigrant and native students, even after accounting for socioeconomic factors (Porcu et al., 2023). This disparity is influenced by a complex interplay of factors, including socioeconomic background, family financial resources, place of origin, and language proficiency (Heath & Brinbaum, 2007; Schnell & Azzolini, 2015; Schnepf, 2006).

In recent years, attention has increasingly focused on the role of school composition in shaping student outcomes. Rumberger & Palardy (2005) demonstrated that the socioeconomic composition of schools significantly influences student achievement, sometimes more than individual SES (socioeconomic status). Building on this, studies by Rumberger & Thomas (2000) and Van Ewijk & Slegers (2010) have highlighted the influence of ethnic composition on academic performance. Their research highlights the following trend: high concentrations of ethnic minorities often correlate with lower academic outcomes for those minority students. This finding brings to the forefront a key aspect of school composition that has emerged as a significant factor in educational outcomes: ethnic school segregation.

Ethnic school segregation, defined as the concentration of ethnic minority students in certain schools, has become a subject of intense debate in educational research (Roscigno, 1998; Van

Ewijk & Slegers, 2010; Van der Slik's, 2006). This occurrence can result from various factors, including housing patterns, school choice policies, and societal attitudes. The impact of such segregation on student performance, particularly in crucial areas like reading proficiency, varies across different national contexts (Schnepf, 2006). As such, it remains a critical area of investigation, with research seeking to understand how different levels of ethnic concentration in schools influence academic outcomes and what this means for educational policy and practice.

Despite extensive research, comparative studies focusing on ethnic school segregation and reading performance among second-generation migrant students across different integration policies remain scarce. That is why this study aims to investigate the relationship between the degree of ethnic school segregation and reading performance among second-generation migrant students compared to native peers in Denmark and Sweden for the year 2015, while considering the influence of integration policies.

1.1 Aim and Scope

This research is twofold. First, it examines ethnic segregation at the school level and the term “ethnic” refers to the distribution or clustering of individuals based on their own or their parents' country of birth, as this information is available to us. However, we recognize that a more precise application of the term “ethnic” would require additional information about religion, language, and cultural affiliation. Second, the study looks at how the different integration policy approaches in Denmark and Sweden, from more restrictive to more inclusive, moderate the relationship between ethnic school segregation and the reading performance of second-generation migrant students.

Since extensive empirical research has shown strong correlations between language proficiency and successful integration across various immigrant populations and host countries (Esser, 2006), reading performance is emphasized as the primary measure. This study focuses on second-generation migrant students, who are born in the host country, as they are more likely to have language skills comparable to native students. This makes comparisons in reading performance particularly meaningful.

By focusing on second-generation migrants, this research aims to provide a clearer picture of long-term integration outcomes. Unlike first-generation migrants, who often face immediate challenges such as language barriers and adjusting to new educational systems, second-generation migrants better reflect the ongoing integration processes within the host society. Research using data from the OECD's PISA dataset consistently shows that second-generation migrants tend to perform better than first-generation migrants, although they still often lag behind their native peers. Studies by Gabrielli et al. (2022) emphasize that systemic issues, including school segregation and socioeconomic inequalities, remain key barriers to full integration. Comparing second-generation migrants to native students allows this study to minimize confounding factors like language barriers and adjustment to a new educational system and any differences found between these groups could point to deeper or more systematic issues in how integration and education policies work.

Despite a substantial body of research, there is a notable gap in comparative studies specifically addressing the relationship between ethnic school segregation on the reading performance of second-generation migrant students across different integration policies. This study aims to fill the gap by comparing Denmark and Sweden, two countries that, despite both adhering to the Scandinavian welfare state model, have divergent approaches to immigrant integration, thereby offering valuable insights into how varying integration policies influence educational outcomes in the context of ethnic segregation. By comparing these two countries, this study aims to shed light on how differing integration policies interact with ethnic school segregation to influence the reading performance of second-generation migrant students. This research will examine the contextual factors of schools, focusing specifically on the impact of ethnic segregation at the school level in combination with integration policies. This comparison helps to gain insight on the complex interplay between school composition, integration policies, and educational outcomes, narrowing the existing gap in the literature by exploring these dynamics in countries with similar welfare models but different approaches to immigrant integration.

The integration policies that this research paper focuses on encompass educational policies, social inclusion measures, structural adjustments and labor market integration. The idea behind this is that the relationship between ethnic school segregation and reading performance is likely moderated by educational institutions and integration policies in Denmark and Sweden. Policies that promote the integration of migrants and target ethnic segregation may influence how ethnic concentration in schools affects reading performance, potentially mitigating the negative effects

of segregation on educational outcomes. Moreover, while much attention has been given to the influence of racial peers, the impact of immigrant and ethnic peers remains relatively underexplored, adding another layer of contribution to this study.

Finally, by analysing the year 2015, a fairly recent year, we can assess the effects of integration policies that were in place before the refugee crisis and the major policy shifts that followed. This timing allows us to take a more historical approach, examining how these earlier policies shaped the educational landscape for immigrant students, especially second-generation migrants, before the major influx of refugees altered the social and political context. In this way, the study provides valuable insights into the long-term outcomes of integration strategies that were designed and executed prior to the significant policy transformations that followed 2015.

1.2 Outline of the Thesis

This section is followed by previous literature done on this topic. Then background context on Denmark and Sweden is provided, focusing on their migration history as well as integration policies that they have implemented over the years. Then, the theoretical framework as well as hypotheses are provided. The fifth section includes information on the data used for the analysis as well as descriptive statistics for the sample chosen. The sixth section explains the methodology employed followed by the empirical analysis and results, including a discussion of the results and the limitations of the research. The final section presents conclusions and main contributions including remarks for further research.

2 Previous research

Previous research consistently shows that immigrant students tend to perform below their native peers across various contexts, even after adjusting for socioeconomic factors. This performance comparison is crucial for evaluating the effectiveness of immigrant integration policies. According to international assessments like PISA, immigrant students continue to lag behind native peers, reflecting each country's unique migration history. For instance, a recent study analyzing PISA data from 2009 to 2018 in traditional (France, Germany, United Kingdom) and new immigration countries (Italy, Spain) found that while the performance gap is narrowing over time, disparities persist, highlighting ongoing challenges in immigrant integration efforts (Porcu et al., 2023).

Several factors contribute to these disparities, including socioeconomic background, family financial resources, place of origin, and language ability (Heath and Brinbaum, 2007; Schnell and Azzolini, 2015; Schnepf, 2006). Schnepf (2006) examines the gap in educational achievement between immigrants and natives across ten OECD countries. The findings indicate that while language proficiency is significant in English-speaking countries, segregated schools and socioeconomic backgrounds are critical in explaining disparities in Continental Europe. Additionally, Portes and MacLeod (1999) investigate how school contexts affect second-generation migrant students' academic achievement in the United States, revealing that nationality distinctions persist even after accounting for factors such as parental socioeconomic status and other human capital variables.

2.1 The Role of School Composition

Although Coleman et al. (1967) suggest that students' achievements are largely influenced by their socioeconomic background, a growing number of studies have shown that school factors also play a critical role (Hanushek, 1986; Murnane, 1981).

Socioeconomic composition

Rumberger & Palardy (2005) examine whether the increasing racial and socioeconomic segregation in the U.S. is still a contributing factor in the disparities in student accomplishment. They confirm that the socioeconomic composition of a school significantly impacts student achievement, more so than racial composition. Their findings show that students from high social class backgrounds, regardless of their race, tend to learn more when attending schools with peers from similar backgrounds. The effect of schools' SES (socioeconomic status) on student achievement was found to be nearly as significant as, and sometimes greater than, the effect of individual socioeconomic status across subjects like mathematics, science, reading, and history.

Ethnic composition

While socioeconomic factors are crucial, ethnic composition also plays a vital role. Rumberger and Thomas (2000) investigate dropout and turnover rates among high schools in the U.S. and identify school composition and resources as key determinants of differences in overall achievement and dropout rates beyond student background characteristics. Their findings show that the strongest predictor of turnover was the ethnic composition of the school. Specifically, schools with a student population comprising over 40% Black or Hispanic students experienced turnover rates exceeding those of comparable schools with lower minority concentrations.

Further supporting this, Van Ewijk and Slegers (2010) conducted a meta-analysis examining the effects of ethnic minority share in U.S. schools on test scores. Their analysis showed that a high proportion of students from a particular ethnic minority group negatively impacts that group's academic performance more than it does the performance of other minority groups or the ethnic majority.

Interplay between socioeconomic and ethnic factors

The relationship between socioeconomic and ethnic factors is complex. Van der Slik's (2006) study in the Dutch context found that ethnic minority concentration, as indicated by home language, initially had a negative impact on national language ability at the primary school level. However, when the variation in parental wealth between school classes was considered, the impact of ethnic concentration either diminished to insignificance (grade 4) or was mitigated (grade 6), suggesting that in this case, the issue was more socioeconomic than socioethnic.

Conversely, Roscigno (1998) indicated that while a significant factor in the poor achievement correlation of minority schools is the high concentration of low SES students, ethnic segregation impacts academic achievement regardless of the school's SES. This suggests that the effects of segregation extend beyond mere socioeconomic factors and may involve other mechanisms related to ethnicity and cultural background.

While these studies primarily focus on the U.S., their findings on school composition may still apply to the Danish and Swedish contexts. Unlike the U.S., Denmark and Sweden have experienced more recent waves of immigration, with ethnic minorities often comprising first or second-generation immigrants from non-Western countries.

For instance, Fallesen (2015) examines the educational attainment of children from non-Western immigrant families, with a particular emphasis on the differences between being born in Denmark and anywhere else. By contrasting local and immigrant upper secondary completion rates between 1990 and 2007, when children graduate from compulsory school, the study investigates the extent of the educational divide and whether immigrants are gradually catching up to natives. The findings indicate that there is an educational gap between native-born Danes and immigrants, with immigrants born outside of the country having a much lower upper secondary completion rate. Family background accounts for most of the educational attainment gap, but its significance diminishes when the child's prior performance is considered. Once grades from compulsory school are factored in, the disparity in upper secondary school performance disappears entirely. This indicates that efforts to address educational integration should be more focused on the compulsory schooling phase.

Moreover, Szulkin and Jonsson (2007) investigate how ethnic density in Swedish schools impacts grades of students aged sixteen using data from two cohorts graduating in 1998 and 1999 – comprising 188,000 students across 1,043 schools. The research links school records with Census data on social origin, distinguishing between first- and second-generation immigrants. The multilevel analysis reveals that a higher proportion of first-generation immigrant students in a school is associated with lower grades overall, especially for first-generation immigrants themselves, reflecting some of the U.S. findings.

2.2 Structural effects and educational institutions

Education systems are essential to ensuring modern societies are integrated (Van de Werfhorst and Mijs, 2010). This is evident in the work of Riederer and Verwiebe (2015) who examine the structural effects at the national level, such as the degree of stratification, defined as the number of school types for 15-year-old students that exist in parallel, on first- and second-generation immigrants' reading scores by means of a multilevel analysis of 24 Western nations based on data from PISA 2000 to 2012. They discover that for the past ten years, there has been less of a correlation between stratification and reading performance. Similarly, Van de Werfhorst and Mijs (2010) review how national educational institutions impact student achievement inequality using PISA, TIMSS and PIRLS data. They examine two key institutional characteristics: the system of school-type differentiation (tracking) and the level of standardization (with relation to school autonomy and central examinations). The review focuses on two types of inequality: the disparities in opportunities and test results between students based on their social background and race/ethnicity. Their findings suggest that tracking systems tend to increase inequality, while standardization tends to decrease it.

Further insights from Griga & Hadjar (2013) using the European Social Survey indicate that less stratified secondary school systems and alternative pathways to higher education enhance the likelihood of higher education attainment for individuals with a migrant background and low social origin. This aligns with the analysis of Danish educational transitions, which reveals that compared to typical academic tracks, vocationally oriented tracks are less socially selective. Although these vocational tracks decrease the likelihood of enrolling in higher education, they improve access to lower-tier higher education for low-SES students (Holm et al., 2013). This paradox highlights how tracking can have negative effects at the individual level but promote equality of educational opportunities at the macro level.

Moreover, Rangvid (2007) uses information from a PISA duplicate study for Copenhagen to investigate possible causes of the test score difference between immigrants and natives. Results demonstrate that variations in other school inputs persist even in a system of education where native and immigrant pupils attend schools with equal resources. More specifically, schools attended by immigrant students have less favorable academic expectations, encouragement and pressure to achieve from teachers.

Böhlmark et al. (2015) study how school segregation changed in Sweden after the country implemented a school voucher reform in 1992. This reform allowed all children, regardless of family background, to receive equal access to education and led to the creation of new independent voucher schools as well as the introduction of parental choice. They assess the variations in school choice opportunities and provide evidence that school segregation between native and immigrant students, as well as between students from highly educated and less educated parents, has increased in areas with greater school choice compared to areas with limited school choice. However, the estimates indicate that only a slight increase in school segregation can be attributed to student choice, even 15 years after the voucher reform. Sweden is still classified as having a low-to-medium segregated educational system compared internationally.

2.3 Background characteristics

Socioeconomic Status

When analysing the impact of ethnic segregation on school performance, it is also important to consider background characteristics. Previous research has increasingly examined the relationship between academic achievement and socio-economic background (Coleman, 1988; McLoyd, 1998). White (1982) conducted a meta-analytic study examining the relationship between SES (socioeconomic status) and academic achievement, demonstrating significant variation based on different SES components.

Sirin (2005) reviews studies from 1990 to 2000, highlighting the tripartite nature of SES. There appears to be consensus on the definition of the tripartite nature of SES in Spike et al. (1975), which includes parental income, parental education, and parental occupation as the three primary indicators of SES, despite disagreements regarding the conceptual definition of SES (Hauser, 1994; Mueller & Parcel, 1981). These studies take unique components of SES and each one measures a significantly different aspect of SES that should be viewed as distinct from the rest. For instance, parental income as a measure of SES displays the potential for social and economic resources that the student may have access to. The second common SES component, being parental education, is regarded as one of the most stable characteristics of SES since it usually develops early in life and stays constant over time. Furthermore, it also serves as an indicator of parental income given the strong correlation between income and education. For

instance, Dustmann et al. (2012) analyse the educational performance of second-generation immigrants compared to native students in various OECD countries. Their findings reveal a strong correlation between the children's test scores and their parent's educational attainment. Rangvid (2010) investigates the test score disparities between natives and immigrant students by country of origin using the PISA 2000 dataset. Her findings suggest that the less favorable socio-economic background of immigrant children accounts for a significant portion of the test score gaps. However, even after accounting for these socio-economic differences, the educational performance of both immigrants born in Denmark and those born abroad remains lower than that of native students. Occupation, the third traditional SES component, is evaluated according to the level of education and income needed to hold a specific occupation (Hauser, 1994). There is also a fourth indicator, home resources, which is not used as often as the other three. However, its importance has been emphasized by researchers as an indicator of family SES background (Coleman, 1988). These resources consist of common home items such as computers, books and a study room.

Gender differences

Gender has been consistently identified as a significant predictor of academic achievement, particularly in reading (Guez, Peyre & Ramus, 2020). Various meta-analyses analysing gender differences in academic performance have demonstrated that girls perform better on language tests (Hedges & Nowell, 1995; Hyde and Linn, 1988), while boys outperform girls in mathematics (Else-Quest, Hyde & Linn, 2010; Hyde, Fennema & Lamon, 1990). This is also confirmed in studies using PISA: at age 15, girls did better than boys in reading tests in most of the participating countries, while the difference was reversed in maths (OECD, 2015). Therefore, gender is included as a control variable in the analysis.

Language at home

Since migration background is the main independent variable being investigated and is relevant for this present study, it is important to look into the influence of the test and home language mismatch on students' academic performance. This element is worth investigating since whenever it does not coincide with the teaching language, immigrants perform worse than their native classmates. According to OECD (2018), "immigrant students in OECD countries who do not speak the language of assessment at home are around eight percentage points less likely to be academically resilient than native-speaking immigrant students" (p.14) (Lopez, González-Betancor, Marcenaro-Gutierrez, 2021). As a result, divergences between the test language and

the one spoken at home can have a negative impact on students' academic performance. Multiple studies have researched on these differences between home language and test language and have found that those who did not speak English at home obtained lower test scores in reading (Kennedy & Park, 1994; Cresswell, 2004).

3 Context

The purpose of this section is to bring forward background context on Sweden and Denmark and their integration policies over the years to provide a clearer picture on how they could affect the relationship investigated. The integration policies discussed in this research paper include educational reforms, social inclusion initiatives, structural changes, and labor market integration efforts. As mentioned earlier, the premise is that educational institutions and integration policies likely influence the relationship between ethnic school segregation and reading performance. This section is structured in a parallel way for Denmark and Sweden, focusing on similar themes in each subsection.

3.1 Historical overview of integration

Denmark's journey with immigrant integration began in the 1960s with its first significant wave of immigrants, primarily labor migrants from Turkey, Pakistan, and former Yugoslavia. These workers were invited to address labor shortages during Denmark's economic boom. Initially, their presence in Danish society received little attention from the public and politicians. However, the landscape began to change in the 1970s as these guest-workers' families expanded and increasingly engaged with welfare institutions such as day-care, schools, healthcare systems, and social services. This development presented unforeseen cultural challenges to the Danish welfare system. The 1973 oil crisis and subsequent economic downturn prompted Denmark to impose an immigration stop, halting new labor migration but allowing existing immigrants to remain and bring their families through reunification policies. The situation was further complicated in the late 1980s and early 1990s by a large influx of refugee groups from the Middle East, Sri Lanka, Bosnia, and Somalia. This diverse influx exacerbated the cultural challenges already facing the welfare system (Matthiessen, 2009).

As a result, from the 1980s onwards, with heightened attention from the mid-1990s, Denmark began to focus more intently on immigrant integration. The growing number of immigrants and refugees sparked increased public and political interest in integration issues. The 1980s and

1990s were characterized by intensifying debates on how to effectively integrate these new residents into Danish society. Immigrants and refugees were expected to assimilate into Danish society and conform to broadly defined Danish norms and standards. (Olwig & Pærregaard, K, 2007:10).

As for Sweden, it has experienced both significant emigration and immigration. In the 19th century, approximately one million Swedes emigrated to America. However, since the mid-20th century, it has primarily become a destination country. During the 1960s and 1970s, a significant influx of migrants arrived in Sweden primarily from countries like Greece and Finland, driven by substantial demand for labor in Sweden's industrial sector. The precursor to the current Migration Agency, the State Immigration Agency (SIV), was established in 1969. At that time, it was tasked with managing both integration and immigration affairs. In 1975, a significant policy shift occurred with the adoption of multiculturalism, which aimed to embrace cultural diversity and support minorities in preserving their cultural identities. This period saw a rise in the influx of individuals seeking international protection, initially from South America and subsequently from Iran, Iraq and the Horn of Africa. Similarly, from the 1980s onward, due to events such as the Balkan War in the 1990s, Sweden welcomed over 100, 000 refugees from the former Yugoslavia. In the 2010s, there was a steady rise in asylum seekers in Sweden, peaking in 2015. In 2016, several new laws were implemented, marking a shift in Sweden's migration policies from being among the more generous in the EU to adopting minimum standards (Cetrez et al., 2020).

3.2 Integration strategy

In Denmark, policies for integration are implemented both locally and nationally. The Integration Act, which was passed on January 1, 1999, which gave municipalities control over integration, was the first major institutional reform and furthermore stated labor market integration as an explicit goal for the first time in Denmark. This can be seen additionally through the Immigrant Package in 2000 designed with the goal of putting forward actions to speed up labor market integration. Newcomers do not have the freedom to choose where they want to live in Denmark, they are assigned to various municipalities according to predetermined standards and quotas. The municipality is then given the responsibility for the implementation of the integration programme for new migrants. Therefore, local authorities are responsible for

providing education, housing, and social services to immigrants, ensuring that integration efforts are tailored to the specific needs of their communities. This is the only integration program that Denmark has ever had, even after going through a number of modifications and revisions over the years.

Danish policy has been focused on restrictions and sanctions with the goal to modify the composition of immigrants in the country in the last 15 years. This has been achieved through controlling the immigration system, which includes, among other things, making it harder to obtain asylum and family reunification, while making it easier to access the country with the title of a student or a labor migrant (Bak Jørgensen, 2014).

Encouraging self-sufficiency has been another major objective of Danish policy which has made labor market participation both the means and the purpose of integration. New policy has encouraged migrants to handle their own integration, by requiring them to sign a certificate of “active citizenship” and a “integration contract” in order to receive permanent residence or family reunification (Bak Jørgensen, 2014). These contracts highlight the newcomers’ active involvement in Danish society through self-sufficiency, early entry into the Danish labor market, and attendance at integration-related activities in the respective municipalities.

As for Sweden, the Minister for Integration was a cabinet position within the Swedish Government, established in 1996 and continued until 2014. The main areas of responsibility were related to Swedish citizenship and addressing discrimination based on religious and ethnic backgrounds. In the 1990s, there was criticism of immigration policies that grouped newly arrived immigrants together with those who had been in the country longer but still had immigrant backgrounds. This led to new integration policies that aimed to foster a broader multicultural approach across all policies, while specifically targeting newcomers to facilitate their initial settlement in Sweden. This shift marked a transition "from immigrant policies to integration policies".

In 2007, a new Ministry of Integration and Gender Equality was established. In 2008, it reformed the integration system and introduced a comprehensive strategy called Empowerment against Exclusion. This strategy aimed to boost both labor supply and demand and promote equality in schools. Migrant integration was intended to be primarily achieved through mainstream policies, with additional targeted measures provided during the first two years after newcomers obtained residence permits. Since 2008, Sweden’s integration policy has officially

aimed to ‘ensure equal rights, obligations, and opportunities for all, regardless of ethnic and cultural background’ (Governance of migrant integration in Sweden, 2024).

3.3 Attempts to counteract segregation

Both countries have taken action to tackle socio-economic and ethnic segregation, however Denmark’s anti-segregation policies are rather recent compared to Sweden’s long-standing efforts since the 1970s.

Denmark's approach to immigrant integration has undergone a significant evolution over the past few decades. Initially characterized by a restrictive and centralized framework, the country has gradually shifted towards a more decentralized and mainstreamed approach (Bak Jørgensen, 2014), acknowledging that immigrant integration is a multidimensional policy issue. This transition was marked by the 2010 Act of Local Government, which granted municipalities greater autonomy in adapting and implementing integration policies. Even before this national shift, some cities like Aarhus had already taken initiative, developing local integration policies as early as 1996. After going through revision, the new policy was implemented in 2007, with the main objective to ‘strengthen cohesion’ in the local community of Aarhus and ensure that everyone actively participates in promoting core democratic values, irrespective of their ethnicity or cultural background.

The concept of 'mainstreaming' integration—embedding it across various aspects of governance and social services—has gained traction, particularly at the local level. Cities like Aarhus and Copenhagen have been at the forefront, emphasizing diversity, inclusion, and community cohesion in their policies. This localized approach has led to varied strategies across municipalities, reflecting the complex, multidimensional nature of immigrant integration. While this diversity allows for tailored solutions, it also presents challenges in maintaining national policy coherence. Local initiatives, such as those in Aarhus, underscore the significance of localized efforts in integration.

In recent years, Denmark has enacted stringent measures to integrate immigrants and their descendants into mainstream Danish culture in 2018 (Davis, 2022). This initiative refers to the “Ghetto Plan”, implemented in 2018, which seeks to uphold the social cohesion that has been disrupted by parallel societies. This involves initiatives in multiple sectors such as housing, e.g.

the destruction of housing in areas where parallel societies prevail, to encourage a more diverse population mix.

As for education, the reforms are also rather recent. The Ministry of Education's first school integration effort, designed to thin out ethnic enclaves and promote assimilation, is exemplified in the Høje-Taastrup Gymnasium (HGT). HGT, serving students between the ages of 16 and 19, has established a reputation for being a friendly environment for students whose families are not from the European Union. HGT is known as an "immigrant school" even though most of its student's families have resided in the country for two or three generations. The Danish government has mandated HGT and similar schools to attract more ethnic Danish students to prevent the formation of "parallel societies" and to promote assimilation. If they failed to do so, these schools faced potential shutdowns (Davis, 2022).

In addition to ensuring a "more representative student composition," the ministry's aim for these schools is to draw in more students overall, according to Martin Vitved Schäfer, press secretary for the ministry, who cited lawmakers' worries about the "teaching challenges" posed by segregated schools. In Denmark, students can apply to multiple schools based on their grades and interests rather than being allocated to an upper secondary school based on their location. Just over ten years ago, ethnic Danes began to transfer out of HGT as more students from immigrant backgrounds enrolled. This leads to further increases of school segregation as white, affluent families are breaking away from larger school districts to form their own and moving into predominantly white districts. The policy reflects broader concerns about ethnic segregation in Denmark, exacerbated by recent immigration trends and the 2015 refugee crisis. It seemed to have an opposing effect, despite counteracting some of the ethnic segregation in schools. HGT staff and students argue that the integration policy threatened the positive culture and could undermine the progress made by students who feel safe and included at the school. This outcome highlights the complexities of balancing integration efforts while maintaining a supportive educational environment for all students.

Sweden, with a longer history of addressing segregation, has been actively countering residential segregation since the 1970s, recognizing it as a pressing issue. Due to slight variations in disposable income, residential segregation in Sweden remained quite low until the 1970s. This was achieved by a mix of wage policy, aiming for equal wages between sectors, firms and occupations, adult education and training programmes, progressive taxation, and many welfare systems. Although many of these welfare system aspects still exist, they have not

been able to stop the rise in socioeconomic inequality since the 1980s. Growing capital earnings and educational investments for the middle and upper classes are responsible for this polarization process, while individuals without a college degree typically lag behind (Gustavsson, 2006). The growing socioeconomic divide between households and people has resulted in polarization within neighborhoods.

Swedish housing policy has been mainly targeted towards combating the extensive housing shortage before the mid-1970s. The Million Homes Programme solved this issue; however, it was acknowledged that the housing stock in certain neighborhoods built within the Million Homes Programme was too homogenous. This contributed to the increasing demographic and socio-economic segregation. Due to this undesirable outcome, a new goal was set in place for the national housing policy which was aimed to achieve ‘a social mix’ with regards to age, income and household types in all neighborhoods with the belief that it would equalise housing and social opportunities. This policy was discussed in detail in a series of reports under the title ‘A Housing Policy Based on Solidarity’. With the construction of new housing, all residential areas would be given a variety of housing stock, regarding housing type, tenure and/or apartment size which was anticipated to result in a greater social mix. As freedom of choice was highly cherished, social mixing was not forced upon anybody; rather, it was presented as a new housing alternative. The available but limited research on the effects of this type of mixing suggests that while mixed housing promotes better social integration among neighbors of different ages and socioeconomic classes, it also fosters stronger geographical integration (Holmqvist, 2009).

The last time the conservatives/liberals held a majority (1991 to 1994), they implemented significant changes with notable consequences for segregation. First, housing policy underwent radical reform, with housing allowances cut and rent subsidies for new housing drastically reduced. Second, in 1992, a free school choice model was introduced. Previously, children had to attend the municipal school closest to their home. This educational reform allowed students from impoverished, predominantly immigrant neighborhoods to attend schools in more desirable inner-city districts. However, the overall outcome was that middle-class students living near these impoverished areas, who had previously attended local schools, now avoided institutions with poor reputations (Bunar & Kallstenius, 2008).

Despite these efforts, the effectiveness of area-based policies in reducing segregation was limited, as segregation is a city-wide phenomenon rather than confined to specific

neighborhoods. By the late 1990s, the focus had shifted to social mix policies, but their effectiveness was challenged due to the deregulation of the housing market, which reduced municipalities' ability to implement such strategies effectively. Although most of Sweden's largest municipalities continue to pursue social mix goals, the impact has been mixed. Studies indicate that while mixed housing can enhance social integration and geographical mobility, it does not fully address the broader issue of city-wide segregation (Bergsten & Holmqvist, 2007; Holmqvist, 2009).

While the effectiveness of these policies remains somewhat ambiguous, Sweden has made numerous efforts to address segregation. These efforts include welfare state interventions aimed at ensuring a basic quality of life for ethnic minorities and a strong focus within the education system on promoting equity and social cohesion (Trumberg et al., 2022). Such policies are likely to mitigate the negative effects of ethnic segregation on academic performance.

3.4 MIPEX

In recent years, the international Migrant Integration Policy Index (MIPEX), a unique tool which measures policies to integrate migrants in countries across six continents, has served as an effective instrument for assessing and contrasting governmental efforts to foster migrant integration across the analysed countries. This index is based on eight policy areas like access to nationality, anti-discrimination, education, family reunion, health, labour market mobility, permanent residence, and political participation. These policy indicators have been developed with the goal of providing a comprehensive and extended view of the opportunities available to migrants for societal participation.

This index reveals Denmark to be one of the few countries to move backwards in terms of its migrant integration performance. As the country places a greater emphasis on temporary integration, third-country nationals have equal opportunities and enjoy basic rights, however, they also face barriers to long-term settlement. The country's integration strategy also serves as an obstacle as it encourages the local population to perceive migrants as foreigners (Governance of migrant integration in Denmark, 2024). More precisely, according to the 2020 MIPEX scale, Denmark scored a total of 49 out of a possible 100 points, a relatively low score (Denmark, MIPEX 2020).

A prime example of this is shown in the antidiscrimination policies in the country. Fighting against discrimination is not a strong focus at the national level. However, fighting discrimination is a key concern in the large cities such as Copenhagen and Aarhus. In Copenhagen, the shift occurred in 2006 with several targeted initiatives to combat exclusion and discrimination. In Aarhus, antidiscrimination policies are seen as essential prerequisites for a successful integration process, social cohesion, and citizenship. (Bak Jørgensen, 2014).

As for Sweden, the 2020 MIPEX evaluates Sweden as one of the top ten countries in the world in terms of integration policies, with a score of 86 out of 100 points (Sweden, MIPEX 2020). Sweden's integration policies guarantee equal rights and opportunities for newcomers and citizens. It ranks first among numerous other European nations in terms of anti-discrimination with its laws shielding people against discrimination in all spheres of life on the basis of race, nationality, religion, and ethnicity.

3.5 Discussion of the findings

The first thing to be noticed is their different fundamental approaches. Denmark has a more socio-centered and bottom-up approach in integration policies, considering cultural homogeneity as essential to society and the welfare state, whereas Sweden takes a state-centered approach, said to facilitate integration by promoting social inclusion and treating all citizens equally (Borevi, 2017).

Denmark initially adopted a more restrictive and centralized focus on assimilation, while Sweden embraced multiculturalism earlier, starting in 1975, to celebrate cultural diversity. Over time, Denmark has shifted from centralization to decentralization, particularly after the 2010 Act of Local Government. Conversely, in the 1990s, Sweden transitioned from immigrant policies to broader integration policies, emphasizing multiculturalism.

Denmark's integration strategies emphasize labor market participation and self-sufficiency, using contracts and certificates to promote active citizenship. In contrast, Sweden aims for equal rights, obligations, and opportunities for everyone, regardless of background, through mainstream policies. Anti-segregation efforts also differ: Denmark's initiatives are more recent, including the controversial 2018 "Ghetto Plan," while Sweden has been addressing segregation since the 1970s, focusing on social mixing in housing and education.

Both countries are increasingly adopting local approaches, with cities like Aarhus in Denmark and larger municipalities in Sweden leading integration efforts. Education policies reflect these trends, with Denmark recently implementing measures to diversify student composition in schools with high immigrant populations, while Sweden introduced a free school choice model in 1992, which has had mixed effects on segregation.

4 Theoretical Approach

The theoretical framework for this study draws upon several complementary theories to analyse the relationship between ethnic school segregation and reading performances among second-generation migrant students in Denmark and Sweden while considering the countries' respective integration policies.

Segregation often results from the typical pathways of immigration, which are guided by networks and personal contacts, directed towards metropolitan areas with available low-skilled employment, and culminate in segregated neighborhoods (Burgess, 1925). Beyond preferential choices, discrimination in housing markets also contributes to the unequal distribution of ethnic groups throughout urban areas (Lersch, 2012). Consequently, this residential segregation naturally leads to school segregation, as neighborhoods typically serve as school catchment areas (OECD, 2015a). Economic factors drive immigrants to settle in lower-income neighborhoods with more affordable housing, resulting in schools that serve both second-generation migrants and disadvantaged native students. The situation is exacerbated when more affluent native families choose schools and neighborhoods with fewer migrants, further increasing school segregation.

Neighborhood and school segregation significantly influence the educational choices and performance of immigrant-origin students. The availability and the propagation of strategic knowledge within the community can shape their likelihood of success in various educational pathways (Erikson and Jonsson, 1996). Immigrants often lack strategic knowledge of the host country's school system, and community-specific norms or segmented labor market opportunities can affect the perceived benefits of educational choices. The Segmented Assimilation Theory (Portes & Zhou, 1993) further elucidates this by explaining how immigrants encounter a pluralistic and fragmented environment, leading to varied adaptation patterns based on factors such as parental human capital, modes of integration, and family structure. This theory helps to understand why second-generation students from similar ethnic backgrounds may have differing educational outcomes, even when facing similar levels of school segregation.

The importance of geographical aspects, such as sociospatial neighbourhood conditions, is emphasized by Hedelfalk and Dribe (2020) who find that growing up in a low-class neighborhood in Sweden lowered educational attainment. This is further supported by Sundell's (2014) observation of a clear correlation between residential segregation and school segregation in small and medium-sized Swedish cities, with high levels of ethnic segregation and separation at the school level.

While schools with a high proportion of immigrants may offer fewer opportunities to learn the host country's language, they can also provide a supportive environment where children of immigrants experience less pressure to adapt and fewer conflicts, potentially leading to higher achievement (Portes & Hao, 2004). This complex interplay of factors results in some schools primarily serving native students while others mainly cater to immigrant populations. The impact of this segregation on educational outcomes remains debated, with potential for both widening disparities (Brunello & De Paola, 2017) and creating supportive environments for immigrant students.

In the context of this research, integration policies play a crucial role in moderating the impact of ethnic school segregation on reading performance. Effective integration policies can help mitigate the potentially negative effects of high immigrant concentrations in schools by ensuring the availability of additional resources. Crul and Schneider (2010) present a comparative integration context theory based on the findings of the TIES survey, which focused on the second generation in eight European countries. The theory highlights the impact of institutional arrangements in education, employment, housing, religion, and law on the outcomes of integration. Their findings reveal that social and cultural participation among the second generation is strongly dependent on these integration contexts, with high degrees of local involvement and a diminishing focus on single ethnic identities. Additionally, Dronkers et al. (2011) show that the impact of immigrant composition in schools on educational outcomes is moderated by educational institutions and policies.

4.1 Hypothesis

Based on the theoretical framework and previous research on ethnic school segregation, integration policies, and educational outcomes, this study proposes several hypotheses to examine the relationship between ethnic school segregation and reading performance among second-generation migrant students in Denmark and Sweden. These hypotheses aim to investigate not only the direct effects of ethnic segregation on academic performance but also the moderating role of integration policies. By testing these hypotheses, we seek to contribute to the understanding of how school composition and national integration approaches interact to shape educational outcomes for migrant-origin students.

Hypothesis 1: Higher levels of ethnic school segregation is negatively correlated with test scores, so that the larger the school proportion of first- and second-generation immigrants, the lower the performance of students overall.

Hypothesis 2: This correlation is dependent on the socioeconomic background and depending on policies, it might affect test scores differently in Sweden and Denmark.

Hypothesis 3: Higher levels of ethnic school segregation, as measured by the proportion of first- and second-generation migrants per school, will be more strongly associated with lower reading performance among second-generation migrant students compared to native students in Denmark. This association may be weaker in Sweden, potentially due to the influence of inclusive integration policies.

5 Data

5.1 Source Material

The OECD's PISA (Programme for International Student Assessment) dataset is used for this analysis. This cross-sectional database represents the most extended international student assessment undertaken and measures 15 year-olds' ability to use their reading, mathematics and science knowledge containing the full set of responses from individual students, school principals and parents. Additionally, it provides detailed insights into the academic performance of students across different countries and regions, along with additional contextual data such as students' backgrounds, attitudes towards learning, and the learning environments in their schools. The eight accessible waves of the survey are used to identify high-performing education systems, and the examinations are administered in more than 70 countries (2000, 2003, 2006, 2009, 2012, 2015, 2018, and 2022).

The final sample chosen consists of Sweden and Denmark, the two countries analysed. The year 2015 is being analysed since it is somewhat recent and marks the refugee crisis. After this year, integration policies underwent changes, and since our analysis is based on a more historical approach and focuses primarily on integration policies implemented before 2015, we examine how these earlier policies shaped the educational landscape for immigrant students prior to the significant influx of refugees and subsequent policy shifts. There are 7,161 observations from Denmark and 5,458 observations from Sweden, resulting in a total of 12,619 observations. The sample consists of 535 schools in total for both countries with 333 schools from Denmark and 202 schools from Sweden.

There are three types of respondents in the sample: native, first-generation, and second-generation migrant students. In this research, we classify individuals as second-generation migrants if at least one parent was born outside the country of destination and the individual was born in the country where the survey is conducted.

5.1.1 Selection of variables

Outcome variable

PISA reports student performance through plausible values (PVs) from *Item Response Theory models*. The basic idea behind these models is to deduce a student's aptitude based on how well they do on tests. Plausible values are generated through multiple imputations based on students' replies to the background questionnaires and the subset of test questions to which they were randomly assigned. A set of plausible values is provided for each student which corresponds to different draws in the plausible distribution of abilities of the pupils. In the PISA 2015 dataset, each student is assigned ten plausible values, so the test scores were calculated ten times, and all analyses were conducted ten times. In accordance with the method recommended by PISA, the final coefficient is obtained by taking the average of all ten models, and the final standard errors were also adjusted. The method is further explained in section 5.1. In this research, the reading competency will be specifically investigated as mentioned earlier, since empirical research has confirmed consistent relationships between language and integration for many immigrant groups and receiving countries (Esser, 2006).

Main independent variables

To proxy for ethnic segregation, we take the proportion of first and second-generation immigrants per school as shown in Teltemann and Schunck (2016). It is argued that immigrants often lack strategic knowledge of the host countries' school system. Similarly, the advantages of different educational options may differ if certain norms are dominant within a community or if an ethnic community offers specific (segmented) labor market opportunities (Portes and Zhou, 1993). This measure effectively captures the extent to which immigrant students are concentrated in particular schools, making it a good proxy for ethnic segregation. It is measured with the following equation:

$$\text{Proportion of Immigrants}_i = \frac{N_i}{T_i} \quad (\text{eq. 1})$$

Where *Proportion of Immigrants* represents the proportion of immigrant students in school i , N_i is the number of first- and second-generation immigrant students in school i , and T_i is the total number of students in school i .

Control variables

In order to assess the relation between ethnic segregation and reading performance of second-generation immigrants, it is crucial to account for variations in the background of the students. Therefore, we control for individual characteristics which have a strong association to educational performance. These include a sex dummy of the pupil; the socio-economic status of the parents, indicated by the International Socio-Economic Index of occupational status (ISE), utilizing the value of the parent with the higher ISEI score, noted as HISEI); and language spoken at home (a dummy indicating whether it is the language of the test, or another language). These variables are discussed below.

SES

According to Sirin (2005), the socio-economic status is the most commonly employed contextual variable in academic research and plays a crucial part in students' academic performance. As discussed in the previous literature section, this control variable plays a significant role in our analysis.

The PISA measure of socio-economic status (ESCS) is typically calculated as a weighted average of three factors: the highest level of parental education, the highest parental occupational status according to the "International Socio-Economic Index" (ISEI) scale (Ganzeboom 2010), as well as a measure of household possessions. The first two components of ESCS – parental education and occupational status – are consistent with traditional measures (Cowan et al., 2012). The third component, an index of household possessions, reflects the household's income or, more precisely, its "permanent" income component (Friedman 1957), based on the ownership or consumption of durable goods. This ESCS Index is a combination of all potential SES measures, therefore, we choose it as our primary indicator of SES.

Gender

As highlighted in the literature review, gender has been consistently identified as a significant predictor of academic achievement, particularly in reading (Guez, Peyre & Ramus, 2020). Previous studies have shown that girls generally excel in language-related tests, whereas boys tend to outperform in mathematics (Hedges & Nowell, 1995; Hyde and Linn, 1988; Else-Quest,

Hyde & Linn, 2010; Hyde, Fennema & Lamon, 1990). The OECD (2015) further confirms these patterns in their PISA results, with girls surpassing boys in reading and boys doing better in maths. Therefore, gender is included as a control variable in the analysis to account for its impact on academic performance.

Language at home

As previously mentioned, the mismatch between the language spoken at home and the language of instruction can significantly affect academic outcomes for immigrant students. The influence of this language barrier is evident in various studies, which have shown that students who do not speak the test language at home often achieve lower test scores (Kennedy & Park, 1994; Cresswell, 2004). The OECD (2018) report highlights that immigrant students who do not speak the language of assessment at home are less likely to be academically resilient compared to their peers who do. That is why a foreign language spoken at home is taken into account as a control variable.

5.2 Descriptive statistics

Table 1 shows the summary statistics by country. The descriptive statistics reveal notable differences between Denmark and Sweden in terms of student demographics and educational outcomes. Sweden demonstrates a higher mean reading score (500.19) compared to Denmark (487.26), with greater score variation. Denmark has a higher overall average socioeconomic status (ESCS). As for ethnic segregation, Denmark has a larger proportion of first- and second-generation migrants (0.25 vs 0.17 in Sweden). This indicates that Denmark has a larger share of students with migrant backgrounds in its schools. This suggests that Denmark experiences more ethnic segregation in schools than Sweden based on these measurements. The percentage of students speaking the language of the test at home is similar in both countries with 85.26% in Denmark and 84.45% in Sweden.

Table 1. Summary Statistics

Denmark:

	Mean	SD	Min	Max
Averaged Reading Score (Composite PVREAD)	487.26	85.32	195.43	730.09

ESCS	.45	.95	-6.36	3.45
Ethnic segregation				
_Proportion of first- & second-generation migrants	.25	.23	0.00	1
Gender (% female)	50.30			
Language at home (language of test %)	85.26			

Sweden:

	Mean	SD	Min	Max
Averaged Reading Score (Composite PVREAD)	500.19	94.94	152.21	826.61
ESCS	.34	.82	-3.96	3.06
Ethnic segregation				
_Proportion of first- & second-generation migrants	.17	.19	0.00	1
Gender (% female)	50.04			
Language at home (language of test %)	84.45			

Source: Programme for International Student Assessment (PISA) 2015

Notes: SD: standard deviation, ESCS: Index of economic, social and cultural status

In both countries in table 2, native students outperform second-generation migrants in reading, but the performance gap is more pronounced in Denmark (68.29 points) than in Sweden (40.73 points). From table 3, it can be noticed that the socioeconomic disparity between native and second-generation migrant students is larger in Denmark.

Table 2. Average Reading Scores: Natives vs. Second-Generation Migrant Students in Denmark and Sweden

	Denmark	Sweden
Natives	505.84	513.84
Second-generation migrants	437.55	473.11

Source: Programme for International Student Assessment (PISA) 2015

Table 3. ESCS Comparison: Natives vs. Second-Generation Migrant Students in Denmark and Sweden

	Denmark	Sweden
Natives	0.626	0.425
Second-generation migrants	-.173	-.021

Source: Programme for International Student Assessment (PISA) 2015

6 Methods

6.1 The Methodological Approach

6.1.1 Methodology to analyse the PISA database

Sampling weights for unbiased estimates and standard errors

As highlighted in OEC's data analysis manual (2009), PISA collects data from a sample, rather than the entire population of 15-year-old students. Given the resources available, when conducting the survey, the sample was carefully selected to minimize bias in the selection process and to obtain the highest level of precision. Consequently, to estimate a population parameter accurately, it is necessary to: (1) apply sampling-related weights, and (2) compute sampling-related uncertainty (i.e., the parameter's standard error).

Using final student weights for unbiased parameter estimates

While PISA recommends certain weighting procedures for pooled multi-country analyses, these were not applicable to the current study as Sweden and Denmark were analyzed separately. Instead, this study utilized the original weights (`w_schgrnrabwt`) for each country's individual analysis, ensuring accurate representation of each nation's 15-year-old student population without the need for between-country adjustments.

Using replicate weights for obtaining unbiased standard errors.

As the results are based on a sample, an estimate of the population true parameter is provided. One should thus compute the standard error to determine how close the sample statistics are to the true statistics for the overall population. Since the sample design of the PISA is complex, standard statistical approaches typically yield biased standard-error estimates. Due to this reason, we use balanced repeated replication (BRR) to estimate unbiased variances for the estimates (OECD, 2009). The replication technique that is used is Bootstrap Replication with Fay's modification. In order to estimate the sampling error, the main premise of these methods is to use several replicates of the original sample. The relevant statistic is calculated once for

the entire sample and once more for each replication. To determine the sampling variance, the replicate estimates are compared to the full sample estimate.

In PISA, 80 repeated samples are calculated, and a set of weights are generated for each sample. This means that one should estimate the relevant statistic once using the replicate weights and once using the final weight as previously mentioned. The standard error is determined by averaging the squared differences between the primary estimate derived from the original samples and the estimates derived from the replicated samples.

Using plausible values for pupil proficiency estimates

As highlighted in the PISA dataset manual (OECD, 2009), the use of PVs has important implications for PISA data analysis and needs to be treated as instructed. Firstly, plausible values should not be averaged at the student level. Instead, estimates should be computed separately for each plausible value. Then, the final estimate should be obtained by averaging all estimates obtained from the first step. As for the sampling variance estimate, it is provided using only one PV. The imputation variance is measured for each PV and then averaged over the set of PVs. The final standard error is computed by combining the last two steps.

6.1.2 Empirical model

The analysis consists of an OLS regression model. We have a multilevel research design which combines a two-level structure since the individual students (level 1) are clustered in schools (level 2). The baseline model consists of the following equation:

$$y_{ij} = \beta_0 + \beta_1 x_{ij} + \beta_2 s_j + e_{ij} + u_j \quad (\text{eq. 2})$$

Where the dependent variable y_{ij} is the reading score of a student i in school j , x_{ij} represents the individual-level variables (i.e. gender, language spoken at home and socioeconomic status), s_j depicts school-level variables such as the proportion of first- and second-generation immigrants in school j , e_{ij} is the student-level error and u_j is the school-level error.

As mentioned previously, since this study is about differences between native and second-generation migrant students, we opt for including an interaction term, with the students' migration background to describe how the association between the proportion of first- and second-generation and the reading score changes depending on the immigration background of

the student (native, first-generation & second-generation), using the native immigration status as reference. This leads to the following equation with the included interaction term:

$$y_{ij} = \beta_0 + \beta_1 x_{ij} + \beta_2 s_j + \beta_3 m_{ij} + \beta_4 m_{ij} * s_j + e_{ij} + u_j \quad (\text{eq. 3})$$

Where m_{ij} represents the migration background of the student and the interaction term represents the interaction between the migration background of the student and the school-level proportion of migrant students.

6.1.3 OLS

The linear model is estimated using OLS, which produces unbiased estimates, if there is no endogeneity. The error term must not be associated with the explanatory variables in order to satisfy the assumption of no endogeneity (Wooldridge, 2003). Any variables not explicitly included as explanatory variables will be captured in the error term. This means that there could be omitted variable bias that needs to be taken into account since it is impossible to account for every variable affecting children's educational performance and that are correlated with one or more explanatory variables in the model. The child's unobservable abilities, which are included in the error term, could provide a primary endogeneity issue. Since parent's education and occupational status is included in the SES of the student, those serve as proxies for the parents' abilities. There is likely a correlation between a parent's abilities and those of their child. Therefore, the coefficient of the SES measure may be overestimated, as it also reflects the child's abilities. Despite accounting for the parents' abilities, one way to proxy directly for the student's abilities would be to incorporate grades from earlier school years, however, this can be challenging because PISA is a cross-sectional survey conducted every three years, and it does not track the same students over time. One way to address this would be to include a composite measure of scores from other subjects like mathematics and science as proxies for cognitive abilities. This is done in the robustness checks and discussed in section 7.1.1.

Another issue when estimating the linear model using OLS is the problem of heteroskedasticity, which affects the standard errors and corresponding t-statistics. The assumption of homoskedasticity implies that the variance of the error term remains constant across all levels of the explanatory variables (Wooldridge, 2003). A way to deal with heteroskedasticity in OLS estimation is to use heteroskedasticity-robust standard errors (Wooldridge, 2010). Therefore, the empirical analysis in Section 7 reports results with heteroskedasticity-robust standard errors

to account for any potential variance in the error term that may not be constant across different values of the explanatory variables.

7 Empirical Analysis

7.1 Results

Table 4 and 5 presents the results for Denmark and Sweden, respectively, using the proportion of first- and second-generation migrant students per school as a measure of ethnic segregation. Model 1 presents the results of the first model, which simply illustrates the relationship between the proportion of first- and second migrant students per school and the reading test scores of all students. It shows that there is a statistically significant negative association between the proportion of first- and second-generation migrant students in a school and the average reading scores of students in that school for both countries. In both Denmark and Sweden, there is a negative correlation between the proportion of first- and second-generation migrant students and average reading scores. The data shows that for each unit increase in the proportion of migrant students, the average reading score decreases by approximately 78.5 points in Denmark and 72.7 points in Sweden. This indicates that in both countries, as the percentage of migrant students increases, there tends to be a decline in average reading performance, with the effect being slightly more pronounced in Denmark compared to Sweden.

Model 2 introduces individual-level control variables: sex, foreign language spoken at home, and the socioeconomic status accounted by the Index of economic, social and cultural status (ESCS). It shows that the association between the proportion of first- and second-generation migrants and the reading test scores has weakened for both Denmark and Sweden when including controls. The coefficient is still statistically significant at the 1% level for Denmark and for each unit increase in the proportion of first- and second-generation migrant students, the average reading score decreases by approximately 33.18 points, whereas the proportion is not statistically significant for Sweden anymore. The significance has been carried over to the other individual-level variables. Female students show higher reading performance than male students, by approximately 21.7 and 36.7 points for Denmark and Sweden, respectively. Speaking a foreign language at home is associated with a lower performance in reading compared to those who spoke the language of the test at home by 43.9 and 37.0 points for Denmark and Sweden, accordingly. Additionally, students from higher socioeconomic backgrounds tend to perform better in reading tests in both Denmark and Sweden. Specifically,

for each unit increase in the ESCS, reading scores improve by 29.30 points in Denmark and 37.9 points in Sweden. This suggests that socioeconomic status has a slightly stronger positive influence on reading performance in Sweden compared to Denmark.

Model 3 adds the student’s migration background to the previous model. The proportion of migrant students per school is significant for Denmark at the 10% level. The level of significance has been carried over to the variable *immigrant background*, since results show that first- and second-generation migrant students are associated with lower reading scores compared to natives in Denmark. As for Sweden, the proportion of migrant students is insignificant in model 3 just as in the previous model. We also notice that first-generation students are associated with lower reading performance than natives. Second-generation migrant students, however, do not show any differences in reading scores compared natives.

Model 4 introduces an interaction effect to measure whether the association between the school proportion of first- and second-generation migrant students and the reading test scores changes depending on the immigration background of the pupil, using the native background as reference. For Denmark, the interaction term is statistically significant for second-generation migrants, showing that the relationship between the proportion of migrants in the school and reading performance differs between second-generation migrants and natives. The results show that as the school proportion of first- and second- generation migrant students increases, the negative association between second-generation migrant students and their reading test scores becomes more pronounced. More specifically, the total effect of the interaction is the sum of the main coefficient and the interaction term coefficient which results in $-9.97 + (-54.02) = -63.99$. This does not apply to first-generation migrants as the interaction term is not statistically significant. As for Sweden (table 5), none of the interaction terms are statistically significant, meaning that the relationship between the proportion of first- and second-generation migrant students and reading scores is constant across the different immigrant backgrounds.

Table 4: Models Predicting Reading Scores in Denmark Based on Proportion of First- and Second-Generation Migrant Students per School

Dependent variable: Reading test scores				
VARIABLES	(1)	(2)	(3)	(4)
Proportion of migrants	-78.50*** (12.03)	-33.18*** (12.05)	-21.91* (11.34)	-9.97 (15.10)

Sex (Ref. Males)		21.74*** (3.63)	21.87*** (3.63)	21.96*** (3.60)
Foreign language at home		-43.85*** (6.31)	-33.41*** (7.18)	-33.49*** (7.03)
ESCS		29.30*** (1.70)	28.59*** (1.73)	28.61*** (1.72)
Immigrant background (Ref. Natives)				
First-generation			-20.73** (8.99)	-26.23* (15.73)
Second-generation			-19.16*** (6.56)	-1.07 (8.34)
First-generation*proportion of migrants				13.14 (46.50)
Second-generation*proportion of migrants				-54.02** (25.60)
Constant	511.55*** (3.68)	480.98*** (3.54)	480.92*** (3.56)	479.40*** (3.89)
N students	7,161	6,985	6,985	6,985
R-squared	0.02	0.14	0.15	0.15

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

Table 5: Models Predicting Reading Scores in Sweden Based on Proportion of First- and Second-Generation Migrant Students per School

VARIABLES	Dependent variable: Reading test scores			
	(1)	(2)	(3)	(4)
Proportion of migrants	-77.51*** (17.31)	-18.44 (16.08)	-6.65 (15.35)	0.29 (19.47)
Sex (Ref. Males)		36.71*** (3.16)	36.63*** (3.18)	36.62*** (3.18)
Foreign language at home		-36.95*** (6.59)	-21.17*** (6.88)	-21.34*** (6.89)
ESCS		37.89*** (2.37)	36.70*** (2.31)	36.75*** (2.31)
Immigrant background (Ref. Natives)				
First-generation			-44.87*** (8.62)	-35.63*** (12.41)
Second-generation			-6.91	-6.87

			(5.77)	(9.67)
First-generation*proportion of migrants				-27.89 (33.41)
Second-generation*proportion of migrants				-4.37 (26.94)
Constant	507.61*** (3.51)	480.95*** (4.29)	480.80*** (4.23)	479.89*** (4.50)
<i>N</i> students	5,458	5,313	5,313	4,992
R-squared	0.03	0.16	0.17	0.18

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

7.1.1 Robustness checks

To ensure the robustness of the findings, a few additional analyses are performed using alternative model specifications. The first robustness test involves using different educational outcomes (e.g. math and science scores) to see if the relationship is consistent across various academic subjects. The first thing to be noticed is that for the math and science scores, female students have lower performance than male students in Denmark (table A2 and A4 in the appendix). This is in line with previous findings in the literature (Else-Quest, Hyde & Linn, 2010). As for Sweden, there seems to be no significant difference in performance between male and female students in mathematics and science (table A3 and A5 in the appendix). Most importantly, we notice also that the interaction terms for both countries are insignificant. This differs from the reading scores, where there is a significant interaction for second-generation immigrants in Denmark, where the negative effect of being a second-generation immigrant student becomes more pronounced as the proportion of migrants in the school increases. The lack of significance could suggest that subjects like mathematics and science might be less influenced by linguistic or cultural factors that vary with school composition compared to reading. This might indicate that the relationship investigated is subject-specific.

The second robustness check explored is using the school's SES instead of the individual-level socioeconomic status. According to Rumberger and Palardy's research, across various academic subjects including mathematics, science, reading and history, the impact of a school's socioeconomic status on student performance was observed to be nearly as significant as, and

sometimes greater than the effect of individual SES. This is confirmed in table A6 and A7 in the appendix. We see that the coefficient of the school's SES on student performance is greater across all models compared to the individual SES (28.59 to 29.30 point increase per unit vs. 52.15 to 52.36). Overall, the proportion of migrants becomes insignificant for Denmark once school SES is included across all models. This indicates that the impact faced by schools with a high proportion of migrants might be more related to socioeconomic factors than the presence of migrants. We notice, however, that both tables (A6 and 4) for Denmark show a significant negative interaction for second-generation immigrants with proportion of migrants, with the interaction being slightly weaker in the school SES model, with school's SES absorbing some of the significance. We can also see that in the tables with school SES, the R-squared is slightly smaller, indicating that accounting for individual SES explains slightly more variance.

The last additional specification added to the model is accounting for the student's abilities, which may be unobservable and drive potential endogeneity. As mentioned earlier, a way to account for this is to include test scores from another subject. To account for it, we create a composite measure by taking the mean of all ten plausible values for mathematics. Since test scores for science and mathematics are highly correlated with each other, we decide to account for one of them only, as the model would have high multicollinearity otherwise. Based on tables A8 and A9 in the appendix, the first thing to be noticed is that they have a much higher R-squared than tables 4 and 5, suggesting a better fit. This is logical as ability must explain a large part of the variance in reading performance. We see that speaking a foreign language at home becomes insignificant in both countries after accounting for ability. As for the interaction term between second-generation migrant students and the proportion of migrants, we see a similar outcome for both countries. However, the level of significance has dropped to 10% in Denmark. The additional control could be absorbing some of the variance that was previously attributed to the interaction terms in table 4.

7.2 Discussion

This study aimed to explore the relationship between the degree of ethnic school segregation and reading performance among second-generation migrant students compared to native

students in Denmark and Sweden, while considering the influence of integration policies using data from PISA 2015.

The first hypothesis stated that higher levels of ethnic school segregation, as measured by the proportion of first- and second-generation migrants per school, are negatively correlated with test scores, so that the larger the school proportion of first- and second-generation immigrants, the lower the performance of students overall. We see that this is the case in model one for both countries. This reflects Szulkin and Jonsson's (2007) findings that a higher proportion of first-generation immigrant students in school is associated with lower grades overall.

The second hypothesis states that this correlation is dependent on the socioeconomic background and depending on policies, it might affect test scores differently in Sweden and Denmark. Findings from model two show that the relationship between the proportion of migrants in school is statistically significant in Denmark when including socioeconomic controls. The relationship becomes statistically insignificant for Sweden indicating that the individual-level controls account fully for the difference in test scores between students. The case of Denmark reflects findings from Portes and Macleod (1999), whose findings show that nationality distinctions persist even after accounting for factors such as parental socioeconomic status and other human capital variables. This is also in line with Roscigno's research, whose findings show that while a major factor contributing to the poor academic performance in minority schools is the high concentration of low SES students, ethnic segregation continues to affect academic achievement independently of the school's socioeconomic status. This reflects a socioeconomic and socioethnic issue present in Denmark. Conversely, findings for Sweden reflect Van der Slik's (2006) results, who finds that when the variation in parental income was included, the effect of ethnic concentration either became insignificant or was mitigated. This reveals a rather socioeconomic issue, rather than socioethnic for Sweden.

The third hypothesis states that higher levels of ethnic school segregation, as measured by the proportion of first- and second-generation migrants per school, will be associated with lower reading performance among second-generation migrant students compared to native students in Denmark. This association may be weaker in Sweden, potentially due to the influence of inclusive integration policies. The last model introduced an interaction effect to determine if the relationship between the proportion of migrant students in a school and reading performance varies depending on the student's immigration background (first-generation, second-generation, or native). Based on this, the significant interaction for second-generation migrants

suggests that ethnic school segregation exacerbates the reading performance gap between second-generation migrants and native students. This finding underscores the idea that in Denmark, second-generation migrants are particularly vulnerable to the negative effects of attending schools with higher concentrations of migrant students. The opposite is observed for Sweden. There is no evidence of a differential performance gap in Sweden between second-generation migrant students and native students that is associated with the proportion of migrant students in a school. The lack of significant interaction term for Sweden suggests that the proportion of migrant students in a school does not differentially impact the reading performance of second-generation migrants compared to natives. This implies that the performance gap between those groups does not appear to be exacerbated by the proportion of migrant students in the school. This could mean that Sweden's integration policies might be more effective in mitigating the negative impacts of ethnic school segregation on academic performance, leading to more uniform outcomes across different groups.

Denmark's results are in accordance with Van Ewijk and Slegers (2010) whose findings indicate that ethnic concentration in schools negatively impacts academic outcomes for minority students, particularly in reading. This is the case for Denmark since the second-generation minority group's performance is impacted by the school's migrant proportion. The findings also reflect Szulkin and Jonsson's (2007) results. Not only do they find that a higher proportion of first-generation migrant students at school is associated with lower grades overall, but they also find that first-generation migrant students are mostly affected, reflecting similar findings to ours.

Returning to the segmented assimilation theory, it suggests that second-generation students from similar ethnic backgrounds might experience different educational outcomes due to varying adaptation patterns, even when exposed to similar levels of school segregation. For instance, in Denmark, the significant negative association between the proportion of migrants in schools and the reading performance of second-generation students could be influenced by how these students are integrating into the educational system, possibly by different integration strategies compared to their counterparts in Sweden. In contrast, the absence of a significant interaction effect in Sweden might indicate more effective integration policies or different modes of adaptation that buffer against the negative impacts of ethnic school segregation. This aligns with the theory's emphasis on the importance of the broader social context in shaping

immigrant outcomes, highlighting that even within the same ethnic group, outcomes can vary significantly depending on the integration context and other socio-cultural factors.

These results may be further explained by the differing integration policies in each country. Sweden's approach is more inclusive of cultural diversity, aiming to integrate immigrants into society without requiring them to abandon their cultural identities. Consequently, Sweden's integration policies are less likely to lead to ethnic segregation, as they emphasize equality and inclusion over cultural conformity. Thus, while both countries aim to maintain social cohesion within their welfare states, Denmark's focus on cultural homogeneity and civic integration may inadvertently contribute to ethnic segregation, whereas Sweden's inclusive approach seeks to minimize it.

The comparative integration context theory proposed by Crul and Schneider (2010) underscores the importance of institutional arrangements—such as those in education, the labor market, and housing—in shaping integration outcomes. Their findings from the TIES survey suggest that second-generation migrants' social and cultural participation is strongly influenced by these contexts, with less emphasis on single ethnic identities over time. Moreover, Dronkers et al. (2011) demonstrate that the effects of immigrant composition in schools on educational outcomes are influenced by educational institutions and policies, highlighting the importance of the broader integration framework in shaping student performance.

Denmark's relatively low score on the MIPeX scale and its emphasis on temporary integration could contribute to the more pronounced negative association between the proportion of migrant students and reading performance among second-generation migrants. The barriers to long-term settlement and the lack of strong anti-discrimination policies at the national level might exacerbate challenges for migrant students, leading to lower educational outcomes. In contrast, Sweden's high MIPeX score and robust integration policies, which ensure equal rights and opportunities for migrants, might help mitigate the negative effects of school segregation. The strong anti-discrimination laws in Sweden, particularly in the educational sector, could contribute to the more stable reading performance of second-generation migrants. The strong integration framework in Sweden likely helps second-generation students achieve more equitable educational outcomes despite school segregation, whereas Denmark's more restrictive and temporary approach might be a factor in the observed educational disparities despite its more recent efforts.

An additional observation is that anti-segregation efforts are implemented on a local level in Denmark, particularly in cities like Aarhus and Copenhagen. National policies, however, do not strongly support migrant integration. For instance, anti-discrimination policies have been implemented in Copenhagen and Aarhus, whereas these policies are relatively weak on a national level. This localized focus also implies a potential inconsistency in how migrant students experience integration and support across Denmark. In areas without strong local initiatives, migrant students might face more significant educational challenges, which could contribute to the more pronounced negative association between the proportion of migrant students and reading performance observed in your study driving these effects.

7.3 Limitations

This research faces potential limitations. The first limitation is related to the data. The study could benefit from a more nuanced approach to account for ethnic diversity. It would have been interesting to implement a measure of ethnic segregation that provides a more detailed analysis by grouping parental countries of birth into specific subgroups, allowing for a more precise analysis by nationality/ethnicity background of the student. The main issue with this is that the countries of birth of the mother and father are not specified into different countries for Sweden, i.e. the only information provided by PISA is if the country of birth was Sweden or another country (see table A1 in the appendix). Therefore, a point of further research would be to look into other datasets or methods that provide more detailed information on ethnic and national backgrounds.

Another limitation in the data is the lack of geographical context in the study. Since PISA does not provide regional information on the schools, the research cannot account for geographical variations in the relationship studied. The association may differ among regions and larger/small cities, as integration policies are not implemented equally on a national level in Denmark, but on a local level. Future research could incorporate regional data or include regional indicators in the analysis to capture geographic variations.

Another significant limitation of this research is the inability to account for variations in educational systems, such as stratification, tracking due to data constraints. Previous studies, such as those by Van de Werfhorst and Mijs (2010), and Riederer and Verwiebe (2015), have demonstrated that these structural differences can significantly influence educational outcomes,

particularly for immigrant students. For instance, stratified educational systems tend to increase inequality, while standardized systems may mitigate these effects. Moreover, research has shown that vocational tracks can provide alternative pathways for students from lower socioeconomic backgrounds, yet they may also limit access to higher education. The variation in educational systems across Denmark and Sweden, as well as within regions, could have affected the reading performance of second-generation migrant students, yet this research does not fully account for these differences. Future research should explore these educational system variables to better understand their impact on migrant student outcomes.

Lastly, there is no information on how long the parents of second-generation students have been in the country. Comparing second-generation migrants whose parents arrived just before their birth with those whose parents settled years earlier could significantly impact the socioeconomic background and integration of these students.

8 Conclusion

This study provides valuable insights into the complex relationship between ethnic school segregation, integration policies, and the reading performance of second-generation migrant students in Denmark and Sweden. By comparing these two Scandinavian countries with similar welfare state models but divergent approaches to immigrant integration, we have shed light on how varying integration policies influence educational outcomes in the context of ethnic segregation. The aim of this study was to explore the relationship between ethnic school segregation and the reading performance of second-generation migrant students compared to natives in Denmark and Sweden for the year 2015, highlighting the significant role that integration policies play in shaping educational outcomes.

Our findings reveal several key points. Ethnic school segregation, measured by the proportion of first- and second-generation migrant students per school, is negatively associated with reading test scores in both countries. However, this relationship is more pronounced and persistent in Denmark compared to Sweden when controlling for individual-level factors. The impact of ethnic school segregation on reading performance differs between Denmark and Sweden, particularly for second-generation migrant students. In Denmark, there is a significant interaction effect, indicating that as the proportion of migrant students in a school increases, the negative association with reading scores becomes more pronounced for second-generation migrants. This interaction effect is not observed in Sweden, suggesting that the proportion of migrant students in Swedish schools does not differentially impact the reading performance of second-generation migrants compared to natives.

Socioeconomic factors play a crucial role in both countries. In Sweden, controlling for individual-level socioeconomic status fully accounts for the differences in test scores between students, indicating a predominantly socioeconomic issue. In Denmark, however, ethnic distinctions persist even after accounting for socioeconomic factors, suggesting both socioeconomic and socioethnic challenges.

The differing integration policies of the two countries appear to influence these outcomes. Sweden's more inclusive approach to cultural diversity and strong anti-discrimination laws may

help mitigate the negative effects of school segregation on second-generation migrants' performance. In contrast, Denmark's emphasis on cultural homogeneity and civic integration, coupled with its lower MIPEX score and focus on temporary integration, may contribute to the more pronounced negative association between school segregation and reading performance among second-generation migrants.

Additional analyses using math science test score as dependent variables, as well as accounting for school-level SES, provide further nuance to these findings. The subject-specific nature of the relationship and the importance of school-level socioeconomic factors are highlighted, emphasizing the complex interplay between various factors affecting student performance.

The study's results have important policy implications. They suggest that more inclusive integration policies, strong anti-discrimination laws, and efforts to address both socioeconomic and ethnic segregation in schools may be beneficial in promoting equitable educational outcomes for migrant students. The contrast between Denmark and Sweden highlights how national integration approaches can significantly influence the impact of school segregation on student performance.

In conclusion, this research contributes to the growing body of literature on ethnic school segregation and migrant integration, offering important comparative insights into how different policy approaches can shape educational outcomes. It underscores the need for nuanced, context-specific policies that address both socioeconomic and ethnic dimensions of integration to promote equitable educational opportunities for all students, regardless of their migration background.

Several points for future research can be drawn after this study. As said in the limitations, an important weak point remains that of data sample. As mentioned earlier, an interesting addition to this study would be to provide a more in-depth analysis of the different country of origin of second-generation migrant students to see whether some specific sub-groups are more affected than others. By disaggregating the data based on specific ethnic or national backgrounds, we could investigate whether certain subgroups of second-generation migrants experience more pronounced effects from school segregation or integration policies. This nuanced approach might reveal varying patterns of educational outcomes among different immigrant communities, potentially uncovering unique challenges or advantages faced by specific ethnic groups. Such insights could uncover more targeted and effective interventions, tailored to the

different needs of a diverse migrant population. Additionally, another type of dependent variable could be used such as educational attainment, which could offer insights into long-term educational outcomes and integration policies. Lastly, incorporating data on how long the parents of second-generation students have been in the country can also be valuable as children of long-term resident parents may have better educational outcomes due to their parents' greater familiarity with the host country's systems and potentially improved socioeconomic status over time.

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10 Appendix A

Table A1. Countries of birth of the mother/father of the student

DENMARK:

COUNTRIES OF BIRTH MOTHER/FATHER
AFGHANISTAN
DENMARK
FINLAND
GREENLAND
ICELAND
IRAQ
LEBANON
NORWAY
FORMER YUGOSLAVIC COUNTRIES
OTHER EUROPEAN COUNTRY (DNK)
PAKISTAN
SOMALIA
SWEDEN
THE FAROE ISLANDS
TURKEY
OTHER NON-EUROPEAN COUNTRY

SWEDEN:

COUNTRIES OF BIRTH MOTHER/FATHER

SWEDEN

ANOTHER COUNTRY (SWE)

Table A2: Models Predicting Math Scores in Denmark Based on Proportion of First- and Second-Generation Migrant Students per School

Dependent variable: Math test scores				
VARIABLES	(1)	(2)	(3)	(4)
Proportion of migrants	-85.22*** (10.28)	-42.87*** (10.53)	-31.01* (10.13)	-23.22 (13.08)
Sex (Ref. males)		-10.34*** (2.99)	-10.19*** (2.99)	-10.13*** (2.98)
Foreign language at home		-41.16*** (5.56)	-29.62*** (6.80)	-29.65*** (6.78)
ESCS		27.56*** (1.72)	26.82*** (1.74)	26.80*** (1.74)
Immigrant background (Ref. Natives)				
First-generation			-24.49*** (8.90)	-21.01 (14.27)
Second-generation			-20.01*** (5.66)	-11.04 (7.16)
First-generation*proportion of migrants				-16.73 (35.82)
Second-generation*proportion of migrants				-28.12 (19.72)
Constant	523.83*** (3.08)	480.98*** (3.54)	480.92*** (3.56)	509.29*** (3.43)
<i>N</i> students	7,161	6,985	6,985	6,985
R-squared	0.03	0.14	0.15	0.15

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

Table A3: Models Predicting Math Scores in Sweden Based on Proportion of First- and Second-Generation Migrant Students per School

Dependent variable: Math test scores				
VARIABLES	(1)	(2)	(3)	(4)
Proportion of migrants	-72.66*** (18.51)	-32.14** (16.02)	-17.82 (15.51)	-14.91 (19.10)
Sex (Ref. Males)		0.10 (3.18)	0.13 (3.20)	0.09 (3.21)
Foreign language at home		-29.96*** (6.23)	-13.72* (7.08)	-13.86* (7.08)
ESCS		37.79*** (2.61)	36.55*** (2.49)	36.60*** (2.48)
Immigrant background (Ref. Natives)				
First-generation			-38.73*** (8.26)	-30.80*** (12.70)
Second-generation			-16.94** (6.92)	-20.62** (9.90)
First-generation*proportion of migrants				-21.93 (31.60)
Second-generation*proportion of migrants				7.98 (22.72)
Constant	512.99*** (4.33)	480.95*** (4.29)	493.25*** (3.85)	479.89*** (4.50)
N students	5,458	5,313	5,313	5,313
R-squared	0.02	0.16	0.17	0.17

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

Table A4: Models Predicting Science Scores in Denmark Based on Proportion of First- and Second-Generation Migrant Students per School

Dependent variable: Science test scores				
VARIABLES	(1)	(2)	(3)	(4)
Proportion of migrants	-97.51*** (12.13)	-51.31*** (12.58)	-35.47* (11.82)	-23.46 (14.92)

Sex (Ref. Males)		-7.07**	-6.87**	-6.77**
		(3.25)	(3.25)	(3.24)
Foreign language at home		-44.14***	-28.85***	-28.91***
		(5.55)	(6.33)	(6.22)
ESCS		30.15***	29.15***	29.14***
		(1.80)	(1.79)	(1.78)
Immigrant background (Ref. Natives)				
First-generation			-32.08***	-31.06*
			(8.90)	(15.23)
Second-generation			-26.75***	-11.18
			(5.68)	(7.45)
First-generation*proportion of migrants				-10.29
				(31.67)
Second-generation*proportion of migrants				-47.75
				(23.35)
Constant	516.51***	499.50***	499.43***	497.92***
	(3.55)	(3.42)	(3.43)	(3.77)
<i>N</i> students	7,161	6,985	6,985	6,985
R-squared	0.03	0.14	0.14	0.14

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

Table A5: Models Predicting Science Scores in Sweden Based on Proportion of First- and Second-Generation Migrant Students per School

VARIABLES	Dependent variable: Science test scores			
	(1)	(2)	(3)	(4)
Proportion of migrants	-90.63***	-39.00**	-20.76	-10.83
	(18.33)	(16.48)	(15.75)	(19.51)
Sex (Ref. Males)		2.17	2.23	2.19
		(2.93)	(2.94)	(2.94)
Foreign language at home		-35.29***	-15.01**	-15.32**
		(6.29)	(6.98)	(6.98)
ESCS		39.77***	38.22***	38.31***
		(2.48)	(2.44)	(2.44)
Immigrant background (Ref. Natives)				
First-generation			-47.14***	-30.84***
			(8.55)	(12.88)

Second-generation			-22.75*** (6.48)	-25.50** (9.78)
First-generation*proportion of migrants				-47.69 (35.60)
Second-generation*proportion of migrants				1.21 (25.21)
Constant	509.43*** (4.09)	493.50*** (4.02)	493.27*** (4.01)	491.97*** (4.27)
<i>N</i> students	5,458	5,313	5,313	5,313
R-squared	0.03	0.15	0.16	0.16

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

Table A6: Models Predicting Reading Scores in Denmark Based on Proportion of First- and Second-Generation Migrant Students per School, Controlling for School SES

Dependent variable: Reading test scores				
VARIABLES	(1)	(2)	(3)	(4)
Proportion of migrants	-78.50*** (12.03)	-7.11 (15.10)	12.98 (14.19)	23.31 (17.50)
Sex (Ref. Males)		20.27*** (3.68)	20.47*** (3.68)	20.56*** (3.66)
Foreign language at home		-51.54*** (6.19)	-34.72*** (7.11)	-34.72*** (7.00)
School SES		52.15*** (6.17)	52.36*** (6.14)	52.26*** (6.14)
Immigrant background (Ref. Natives)				
First-generation			-27.32*** (9.07)	-28.00* (15.89)
Second-generation			-33.63*** (5.98)	-19.28** (8.22)
First-generation*proportion of migrants				-3.42 (44.31)
Second-generation*proportion of migrants				-43.27* (26.02)
Constant	511.55*** (3.68)	465.18*** (5.64)	464.03*** (5.61)	462.77*** (5.88)

<i>N</i> students	7,161	7,161	7,161	7,161
R-squared	0.02	0.11	0.12	0.12

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

Table A7: Models Predicting Reading Scores in Sweden Based on Proportion of First- and Second-Generation Migrant Students per School, Controlling for School SES

Dependent variable: Reading test scores				
VARIABLES	(1)	(2)	(3)	(4)
Proportion of migrants	-77.51*** (17.31)	13.64 (16.49)	17.84 (16.28)	29.72 (20.83)
Sex (Ref. Males)		36.73*** (3.02)	36.83*** (3.04)	36.73*** (3.04)
Foreign language at home		-52.66*** (6.01)	-32.55*** (5.97)	-32.84*** (6.01)
School SES		90.95*** (7.51)	88.81*** (7.37)	89.44*** (7.35)
Immigrant background (Ref. Natives)				
First-generation			-51.45*** (9.10)	-39.37*** (13.48)
Second-generation			-13.25** (6.19)	-22.61** (9.32)
First-generation*proportion of migrants				-31.07 (32.35)
Second-generation*proportion of migrants				23.87 (27.90)
Constant	507.61*** (3.51)	457.67*** (5.10)	480.80*** (4.23)	457.31*** (5.35)
<i>N</i> students	5,458	5,458	5,458	5,458
R-squared	0.03	0.16	0.17	0.17

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

Table A8: Models Predicting Reading Scores in Denmark Based on Proportion of First- and Second-Generation Migrant Students per School, Controlling for Ability

Dependent variable: Reading test scores				
VARIABLES	(1)	(2)	(3)	(4)
Proportion of migrants	-78.50*** (12.03)	5.49 (6.99)	6.05 (6.92)	10.97 (8.89)
Sex (Ref. Males)		31.08*** (2.81)	31.07*** (2.80)	31.09*** (2.78)
Foreign language at home		-6.71 (4.54)	-6.69 (4.91)	-6.75 (4.46)
ESCS		4.43*** (1.19)	4.40*** (1.20)	4.46*** (1.21)
Math score		0.90*** (0.01)	0.90*** (0.01)	0.90*** (0.01)
Immigrant background (Ref. Natives)				
First-generation			1.36 (7.71)	-7.28 (14.28)
Second-generation			-1.12 (4.83)	8.88 (6.15)
First-generation*proportion of migrants				28.22 (54.46)
Second-generation*proportion of migrants				-28.67* (16.80)
Constant	511.55*** (3.68)	20.62*** (7.36)	20.65*** (7.43)	20.29*** (7.45)
<i>N</i> students	7,161	6,985	6,985	6,985
R-squared	0.02	0.65	0.65	0.70

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

Table A9: Models Predicting Reading Scores in Sweden Based on Proportion of First- and Second-Generation Migrant Students per School, Controlling for Ability

Dependent variable: Reading scores				
VARIABLES	(1)	(2)	(3)	(4)
Proportion of migrants	-77.51***	12.75	10.61	14.74

	(17.31)	(9.56)	(9.35)	(10.95)
Sex (Ref. Males)		36.62***	36.51***	36.54***
		(2.25)	(2.24)	(2.25)
Foreign language at home		-7.87	-7.87	-7.91
		(4.51)	(4.68)	(4.66)
ESCS		1.21	1.27	1.27***
		(1.62)	(1.58)	(1.58)
Math score		0.97***	0.97***	0.97***
		(0.02)	(0.02)	(0.02)
Immigration status (Ref. Natives)				
First-generation			-7.34	-6.64
			(6.25)	(18.58)
Second-generation			9.50**	13.11
			(4.57)	(10.19)
First-generation*proportion of migrants				-6.64
				(18.58)
Second-generation*proportion of migrants				-12.11
				(18.98)
Constant	507.61***	1.98	2.75	2.19
	(3.51)	(9.28)	(9.38)	(9.45)
<i>N</i> students	5,458	5,313	5,313	5,313
R-squared	0.03	0.69	0.69	0.69

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

