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- R: Document, report (excluding the periodic and final reports)
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Cross-national differences in intersectional inequalities along educational trajectories

Irena Kogan[a], Irem Karacay[b], Aigul Alieva[c], Taylor Kroezen[d], Auli Toom[e], Katri Kleemola[f]

Abstract

The report explores intersectional inequalities along dimensions of migration background, gender, and socioeconomic status (SES) in two key scholastic competences (reading and mathematics) and subjective perception of school belonging. We pursue the question of whether and to what extent such inequalities vary across various stages within the education system (at primary, secondary and tertiary levels) and across countries. Our analyses based on the PIRLS/TIMMS, PISA, and EUROSTUDENT data confirm distinct intersectional inequalities across dimensions of gender, SES, and migration background. The intersection of the aspects of inequality matters in almost all outcomes, at all stages within the education system and in almost all countries, but to a varying degree. The country differences, explored in the two-step multilevel framework, point to the particular importance of tracking at the secondary level, countries' female graduation rates, and the extent to which the countries approach the inclusion of immigrant students at school.

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1 Introduction

Research on inequalities in the education system is traditionally centred along dimensions of social origin, gender, and migration background. Pertinent studies repeatedly show that patterns of gender inequality (Ayalon and Livneh 2013, Ahonen 2021), ethnic inequality (Dronkers and Fleischmann 2010, Verwiebe and Riederer 2013, Riederer and Verwiebe 2015a, Dollmann 2017, Volante *et al.* 2018, Dicks *et al.* 2019a, van de Werfhorst and Heath 2019) and inequalities by socioeconomic status (hereafter, SES) (Strand 2014, Passaretta and Skopek 2020) persist at various stages in education systems and across multiple countries.

A relatively new line of research highlights the multidimensional nature or, in other words, the intersectionality of educational inequalities, leading to the intensification of educational (dis)advantages (Gross *et al.* 2016, Codiroli Mcmaster and Cook 2019). While the separate effects of SES, gender, and migration status on educational outcomes, as well as their binary combinations, are well-documented (Gottburgsen and Gross 2012, Dronkers and Kornder 2014, 2015, Zimmermann and Seiler 2019), research on intersectional inequalities along all three dimensions together is rather scarce (Strand 2014). Furthermore, we know little about the cross-national variation with regard to intersectional inequalities.

This report seeks to fill the gap in the existing research by providing a systematic assessment of (a) intersectionality between gender, SES, and migration background, (b) along various stages within the education system (i.e., primary, secondary, and tertiary levels) (c) in various educational outcomes (competences and sense of belonging to school) and (d) across countries. Analytically, we aim to explain the extent of country variation in intersectional inequalities by the countries' structural and institutional characteristics relevant for or specifically targeting single inequality dimensions as well as their intersectionalities.

The report is structured as follows. We start with the presentation of the overarching theoretical background for the effects of SES, gender, and migration status and their intersectionalities on educational inequalities in scholastic competences and the sense of belonging to school.

Further, we address potential cross-national variation in the patterns of association between the above-mentioned dimensions of inequalities and the selected educational outcomes. We

formulate a number of theoretically informed expectations as to the extent to which countries' structural characteristics might account for the cross-national variation. Then we present the research methodology, data, and variables used in the study. In the presentation of results, we first discuss differences across educational outcomes at various educational stages. Then we compare the patterns of intersectional inequalities across educational stages and countries. Finally, we relate the cross-national variation in patterns of intersectional inequalities to the countries' structural characteristics in a bivariate and a multivariate framework. We conclude by summarizing the established patterns and discussing their broader implications.

2 Theoretical background and state-of-the-art research

2.1 Inequalities in scholastic achievement: The role of social origin, gender, and migration background

A micro-sociological foundation of the current study is centred around the concepts of primary and secondary effects of social origin (Boudon 1974). Primary effects refer to differences in scholastic achievement structured by social origin primarily with respect to social class, whereas secondary effects relate to social background-specific educational decision-making at certain points of educational transitions given a certain level of scholastic performance. Both learning and educational decision-making can be modelled with the rational choice theory based on cost-benefit evaluations against a background of individual resources and constraints (Erikson and Jonsson 1996, Breen and Goldthorpe 1997, Esser 2002, Becker 2003). As a consequence, the overall lower educational attainment of disadvantaged social origin groups could be explained by their lower achievement (primary effects), their lower educational aspirations and decisions in favour of less demanding educational pathways (secondary effects). Individuals originating from disadvantaged backgrounds possess fewer financial resources to compensate for disadvantages in the school system via, for example, private tutoring, have fewer social network resources in terms of educational role models or fewer cultural resources (e.g., books, cultural activities) to ensure an environment that facilitates learning. This lack of resources is accompanied by a lower perception of the benefit of higher educational tracks and a higher anticipation of failure.

Although originally adopted to explain the effects of social origin, the concept of primary and secondary effects has been extended to explain gender differences (Becker 2014, Hadjar *et al.* 2014), ethnic inequalities (van de Werfhorst and van Tubergen 2007, Kristen *et al.* 2008), or gender-specific ethnic penalties (Fleischmann *et al.* 2014, Dollmann 2017). Studies confirm that family SES, gender, and migration background are the most prominent determinants of educational inequalities at various stages of educational pathways (Bodovski *et al.* 2020).

Children from low-SES parents are shown to be disadvantaged from early childhood onwards in many countries (Strand 2014, Passaretta and Skopek 2020). They display lower academic test results (Becker and Hecken 2009, Biedinger 2011, Becker 2012, Heath and Brinbaum 2014, Schulz *et al.* 2017, Dräger and Pforr 2020), are more often channeled to educational tracks likely to lead to vocational training rather than academic education, have lower chances of upgrading to upper secondary academic tracks (Kristen *et al.* 2008, Reimer and Pollak 2010, Schneider and Tieben 2011, Schindler and Lörz 2012, Dollmann 2017, Dräger and Müller 2020) and are more likely to drop out from tertiary education (Müller and Schneider 2013).

Gender disparities in education are another well-documented phenomenon indicating—particularly in the past decades—female students' advantages within the education system in the bulk of Western societies (Fleischmann 2010, Prenzel *et al.* 2013, OECD 2021). Yet, patterns of gender inequality in education are not uniform. While girls' performance in language fields (e.g., reading) is superior to that of boys, male students show better scholastic results in mathematics and science in many countries (OECD 2016). Yet in some countries, for example, Finland, girls perform better than boys in reading, maths, and science (Ahonen 2021). Also, in Lithuania, girls perform better in maths compared to boys (OECD 2019).

Overall, young women and men tend to choose different majors at school, in their vocational training or higher education (Barone 2011, Destatis and WZB 2016). A considerable under-representation of women in science, technology, engineering, and mathematics (STEM) has been reported in most developed countries (Lissitsa and Chachashvili-Bolotin 2019). This often occurs despite girls' satisfactory scholastic achievements in the above-mentioned subjects. Gender differences in STEM participation seem to be primarily related to gender-

specific socialization, preferences, and orientations (Dasgupta *et al.* 2015, Mishkin *et al.* 2016, Wang and Degol 2017) and less to gender differences in actual or perceived abilities (Friedman-Sokuler and Justman 2016, Isphording and Qendrai 2019).

Finally, migration background is shown to be another significant correlate of educational disadvantages. A large body of literature contends that migration-related disadvantages persist at all stages of the education system (Levels and Dronkers 2008, Levels *et al.* 2008, Dronkers and Fleischmann 2010, Verwiebe and Riederer 2013, Schnell 2014, Riederer and Verwiebe 2015b, Dollmann 2016, 2017, Rözer and van de Werfhorst 2017, Volante *et al.* 2018, Dicks *et al.* 2019b, van de Werfhorst and Heath 2019, Ahonen 2021). Often a disadvantaged socioeconomic background coupled with less knowledge about different educational options and lower proficiency in the host-country language among ethnic minorities negatively affect educational performance and increases their risk of leaving the education system without any qualification (Kristen and Granato 2007, Bessey and Backes-Gellner 2015, Beicht and Walden 2019, Dollmann and Weißmann 2019, Kretschmer 2019). However, once taking social origin and school performance into account, migrant children are shown to choose considerably more demanding educational options at most stages of the system (Kristen *et al.* 2008, Dollmann 2010, 2017, Tjaden 2017, Tjaden and Hunkler 2017, Beicht and Walden 2019, Mentges 2019). Higher educational and occupational aspirations among immigrants and their descendants (Kao and Tienda 1995, Raleigh and Kao 2010, Salikutluk 2016, Wicht 2016), less informed decision-making or expected discrimination on the labour market (Dollmann 2010, Tjaden 2017, Beicht and Walden 2019) are the main determinants of 'ambitious' choices among immigrants and their and their descendants (Fernández-Reino 2016, Tjaden and Hunkler 2017, Dollmann 2021).

2.2 Intersectional inequalities along the dimensions of social origin, gender, and migration background

A relatively new line of research documents the multidimensional nature of educational inequalities, meaning that once multiple individual characteristics constitute dimensions of inequality, they are likely to intersect leading to intensification of educational (dis)advantages (McCall 2005, Gross *et al.* 2016, Codiroli Mcmaster and Cook 2019). Of various approaches to the study of intersectionality, which address the anticategorical, intrarcategorical and intercategorical complexities of the phenomenon (for exact definitions

see McCall 2005), the current study adopts an intercategorical approach. This approach, which is also labelled as a categorical approach, "focuses on the complexity of relationships among multiple social groups within and across analytical categories" (McCall 2005: 1786), thus creating so-called multigroups. Instead of studying inequalities separately by gender, SES or migration status, such research is engaged in examining inequalities in groups cross-classified by the categories of gender, social origin, and migration status.

Some classical studies have already considered such groups cross-classifications – such as Dahrendorf (1965), who revealed Catholic working-class girls originating from a rural area as being the most disadvantaged regarding educational attainment in Germany, or Willis (1977), who analysed working-class boys in UK as a vulnerable group in the education system. The intersectional inequalities along the dimensions of gender and social origin seem to be mostly investigated. Thus, Breen *et al.* (2010) find significant interaction effects between class and gender regarding the link between the class of origin and class of destination in Poland and Italy from a cohort perspective. Becker (2014) and Blossfeld *et al.* (2015) demonstrate that the educational participation of women of working-class origins increased during the educational expansion more than among any other group. Further studies emphasize particularly pronounced disadvantages among male students from low-SES families compared to female students from low-SES backgrounds (Mensah and Kiernan 2010, Lühe *et al.* 2017, Zimmermann and Seiler 2019).

Another combination of individual characteristics potentially leading to disadvantages within the education system is gender and migration status. Some studies show that girls and young women with a migration background enjoy more favourable outcomes within the education system, such as, for example, lower dropout (Fielding *et al.* 2008), while others find no gender differences among ethnic minority students (Dekkers *et al.* 2000). Lörz (2020) reports, for example, that men with a migration background are more likely to enrol in a university than women without migration background in Germany. Overall, the gender-ethnicity intersection does not operate uniformly and seems to depend on the characteristics of female immigrants' country of origin (Dronkers and Kornder 2014, 2015, Fleischmann *et al.* 2014).

Studies focusing on the intersection of the dimensions of social origin and migration

background reveal that disadvantageous educational outcomes among low-SES migrants can be attributed to both the overlap and the intersection of the dimensions of low-SES and migration background (Ammermueller 2007, Kristen and Granato 2007, Lüdemann and Schwerdt 2013, Dollmann 2017).

While the separate effects of SES, gender, and migration status on educational outcomes as well as their binary combinations are well-documented, research on intersectional inequalities along all three dimensions together is rather scarce. In a study focusing on the UK, Strand (2014) explores the intersectional inequalities among ethnicity, SES, and gender on educational attainment, demonstrating that compared to other ethnic groups and female students, the educational attainment difference between low- and high-SES white male students is distinctively large. In their cross-national comparative study, Gottburgsen and Gross (2012) detect a three-way interaction of social origin, gender and migration background on reading and mathematics skills of adolescents with the interaction between gender and migration background playing a subordinate role. Overall, in this study, the effects of gender, social origin and migration status hardly varied across education systems. In another study, Dekkers *et al.* (2000) examines educational attainment in the Netherlands by social origin, gender, and migration background and report significant main effects for all three dimensions as well as two-way interaction effects. The three-way interactions were shown to be statistically insignificant in this study. For the UK, on the other hand, researchers find the highest educational aspirations for non-White girls originating from families of professional and managerial backgrounds (Berrington *et al.* 2016, p.749).

2.3 Sense of belonging at school and educational institutions

Whereas inequalities in scholastic achievements have attracted wide scholarly attention (as it becomes obvious from the summary of research above), students' perceptions of school of other educational institution and their place in it has been studied far more seldom. Yet, in addition to educational achievements, students' sense of identification with the place where knowledge acquisition takes place is essential for students' overall success within the education system.

Earlier research has differentiated academic and social aspects related to sense of belonging to school (cf. Korhonen *et al.* 2019). On the one hand, sense of belonging to school is

associated with the study progress and success, overall educational attainment and well-being related to studies (Finn and Zimmer 2012, Ulmanen *et al.* 2016, Pedler *et al.* 2022). On the other hand, sense of belonging is one of the individual's basic psychological needs capturing experiences of acceptance, being connected with others, being supported, and being safe (Maslow 1943, Wenger 1998, Ryan and Deci 2000). Students' sense of belonging is linked to their identity development, and engagement with study communities (Korhonen *et al.* 2019). It is constructed through various experiences in studies, and multiple interactions with other students and teachers over a long period of time, so it is regulated by various factors (Korhonen *et al.* 2019). The role of students' friendly, close relationships with teachers has been highlighted by Chiu *et al.* (2016) and Ulmanen *et al.* (2016).

The interrelation between scholastic achievements and students' well-being is reciprocal. To the extent a larger educational success is associated with a boost in the sense of belonging to school, the feeling of being in the right place in school is also likely to affect educational outcomes. Current research has found that alienation at school may lead to challenges in academic success and well-being, and this vicious circle can continue into the next phases in the educational path (Salmela-Aro *et al.* 2018). Positive experiences in school, on the other hand, might lead to better academic achievements and social acceptance and as a result, an increase the sense of belonging to school (e.g., Wentzel 1998). An important result from the life course perspective is that students with a weak sense of belonging at school are the ones who are disinterested in pursuing further education (OECD 2017). For these reasons, studying academic achievement alongside the sense of belonging as well as exploring the interrelationships between the two is of great importance.

Earlier studies have noticed certain variations in students with various socio-demographic characteristics in sense of belonging to school (OECD 2017), although research is far from being systematic or conclusive. Firstly, academically advanced students and students with higher socio-economic status are shown to feel stronger belonging to school compared to disadvantaged students (OECD 2017). Secondly, boys seem to be more likely than girls to report a greater sense of belonging to school in the bulk of OECD countries (OECD 2017). Thirdly, students without an immigrant background report a stronger sense of belonging to school than immigrant students with similar socio-economic status. Particularly, boys with migration or lower SES background tend to be disengaged in the educational system (cf.

Salmela-Aro *et al.* 2018).

The patterns in students' sense of belonging also vary cross-nationally. While in most Western countries, boys tend to feel stronger belonging at school than girls (e.g., Australia, Denmark, Finland, Ireland, Norway, UK, US), the opposite is true in some other countries, e.g., Turkey (OECD 2017). Furthermore, earlier studies have found contradictory results regarding the sense of belonging among students with migration background: In most countries, students with migration background report a stronger sense of belonging at school than students without migration background, but in some other countries, e.g., Australia, the situation is reversed (OECD 2017). It is still unclear whether the cross-national variation in the sense of belonging to school is somehow related to the countries' institutional characteristics with regard to the organisation of the education system and the way countries treat their ethnic minority population.

2.4 Educational inequalities from a cross-national perspective

Countries' institutions are likely to play a crucial role in educational outcomes in direct and indirect ways and hence mitigate the effects of gender, SES, and migration status on educational attainment. By shaping the school system, immigrants' integration process, and gender-based inequalities in society, countries' institutional settings contribute to the narrowing or widening of gaps among children with different ascriptive characteristics in scholastic attainment and sense of belonging to the educational institution (Choi and Cha 2021). A large body of literature displays cross-national differences in educational inequalities along the dimensions of SES, gender, and migration background as a result of institutional variability at the country level (Crul *et al.* 2012, Woessmann 2016, Ham *et al.* 2017, Ahonen 2021).

There is a cross-country variation in student achievement stemming from students' social origin, which is often found to be attributable to different characteristics of countries' school systems (Woessmann 2016). Educational systems offer different opportunity structures (e.g., inclusive learning settings versus segmented learning settings) for heterogeneous groups of children (e.g., with a foreign background and with a lower socio-economic background) to catch up with their peers during primary school, and they might not reach these milestones by the end of primary school, when (early) tracking (differentiation) takes place in some

countries. Early tracking, in particular, is shown to be associated with larger educational inequality (Piopiunik 2014, Contini and Cugnata 2020). Research shows that there is a larger reading achievement gap between high- and low-SES students in secondary education in countries that practice early tracking compared to those with later tracking (Contini and Cugnata 2020). Crucially, it is argued that highly stratified educational systems yield systematical disadvantages among lower-achieving groups due to constant unequal and separate learning environments and sorting of low-SES students into a dead-end or less advantageous educational tracks (Woessmann 2009, 2016, Gebel and Noelke 2020). We do not know whether and how tracking in educational systems is related to students' identification with their school and whether students' sense of belonging varies across countries with more comprehensive versus more tracked education system.

Patterns of gender inequality in education and employment opportunities are not consistent across countries either (OECD 2011, Ayalon and Livneh 2013, Ahonen 2021). Institutional and sociocultural factors shape cross-national differences in gendered patterns of educational outcomes (McLanahan and Percheski 2008). Studies confirm that prevailing gender norms, gender-role attitudes, and countries' labor market structures affect the educational attainment and success of female students (Buchmann and DiPrete 2006, Buchmann *et al.* 2008). Especially female participation in higher education is closely related to the countries' institutional and sociocultural settings (Diprete and Buchmann 2006). For instance, research shows that women's rising median age of first marriage as well as expectations for future employment contribute to women's college participation and completion in the United States (Goldin 2006). Crucially, gendered patterns in educational outcomes result in lowered human capital of next generations and continued gender inequality in education (Klasen 2002, Lagerlöf 2003).

There are also cross-national differences in native-immigrant gaps in educational outcomes. A number of studies ascertain that governments' efforts in immigrant integration explain a part of the cross-country differences (van de Werfhorst and Heath 2019, Arikan *et al.* 2020). Inclusive immigrant integration policies are found to be associated with a smaller migrant-native gap in educational outcomes (Solano *et al.* 2022). Policies that specifically target migrant children's access to educational systems and language-learning as well as support migrant parents are positively associated with migrant children's educational outcomes

(Cebolla-Boado and Finotelli 2015). Research finds that educational attainment is higher among students with immigrant background in countries with overall better-developed integration policies (Kislev 2016). Furthermore, in their cross-country study, Ham *et al.* (2017) show that states' policies for immigrant integration help to reduce the gap in sense of belonging to school between native and immigrant students.

In this study, we envisage to find variation in intersectional inequalities by SES, gender and migration background depending on countries' structural characteristics. We expect SES-related inequalities in scholastic achievement, including all intersectional inequalities with the SES dimension, to be higher in countries with pronounced tracking. Since tracking is a characteristic of the secondary level of education, we expect tracking effects to be particularly pronounced at this level. An expectation for the students' sense of belonging in countries with pronounced tracking is ambiguous. On the one hand, the sheer prospect of being assigned to educational tracks based on scholastic achievements might create additional pressure on more vulnerable students and affect their identification with school. Further, students in low-tier tracks, particularly those who perceive themselves as being unjustly allocated to such tracks or those who realize that some of future educational and professional choices are no longer accessible to them, might feel estranged from the educational process. On the other hand, a more homogeneous student body in terms of scholastic achievements and educational aspirations, which emerges as a result of early tracking, might lead to students' stronger identification with school.

We further expect intersectional inequalities along the gender dimension in all three outcomes to be lower in countries with a stronger representation of women in higher education. Finally, we expect migration-related (intersectional) inequalities to be lower within educational systems that are more inclusive towards immigrants. However, it is likely that signals or even stigmatization associated with participation in programs targeting vulnerable or academically weaker students could lead to the respective students' lower levels of school belonging. Before presenting our empirical results in the next section, we discuss the research methodology and the data.

3 Data

To assess intersectional inequalities in educational outcomes, we draw on four sources of

individual data pertaining to students of the primary, secondary, and tertiary school levels. We include European, Nort American and Oceania countries in our analyses (*See Appedix – Data Information Table A).*

At the primary level, we use data from The Trends in International Mathematics and Science Study (TIMSS)[1] and the Progress in International Reading Literacy Study (PIRLS)[2] (Mullis *et al.* 2002, 2016, Kennedy *et al.* 2007, Kelly *et al.* 2020, IEA 2001, 2006, 2015, 2019). Both studies are carried out by the International Association for the Evaluation of Educational Achievement (IEA) and provide internationally comparative data on how fourth-grade students perform in different school subjects[3] TIMSS evaluates mathematics and science competences, and PIRLS evaluates reading competences. Moreover, the data contains information on students' migration and linguistic background, home, and school circumstances as well as school curriculum and teachers. TIMSS also contains information on students' sense of belonging in school. TIMSS started in 1995 and it continues to assess students' math and science achievement trends every four years. PIRLS, on the other hand, started in 2001 and takes place every five years. We draw our analyses on TIMSS 2015 and 2019, and PIRLS 2001 and 2006 (*See Appendix – Data Information Table B*), due to the lack of information on migration background, parental education, and sense of belonging to school in the remaining waves of the survey.

To analyse inequalities in secondary education, we use cross-sectional data from the Programme for International Assessment (PISA)[4](OECD 2000, 2003, 2006, 2009, 2012, 2015, 2018). PISA is a large-scale international assessment by the Organisation for Economic Cooperation and Development (OECD) that assesses reading, math, and science knowledge of 15-year-old students. It is administered every three years starting from 2000. Our study utilises the PISA data from 2000 to 2018 *(See Appendix – Data Information Table C)*, for the exception of the analysis on student's *sense of belonging*, which excludes PISA 2006 and 2009, as these waves did not administer questions related to the students' feeling of belonging in school. Only the countries with complete data required for the analysis in the

[1] https://www.iea.nl/studies/iea/timss
[2] https://www.iea.nl/studies/iea/pirls
[3] TIMSS data also exists for students in their eighth grade assessing their knowledge in math and science
[4] https://www.oecd.org/pisa/

respective years are included in the analysis.

PISA, PIRLS and TIMSS surveys were not originally designed to be directly comparable between each other, but to collect and provide reliable measures of students' performances in key subjects of interest. Nevertheless, the surveys have similar features, both in their design and response items that allowed many scholars analyse them next to each other (Schnepf 2007, Woessmann 2016). For example, the analysis of the equivalence of item difficulty showed 80% commonality of the total variance in item difficulties in PIRLS and PISA, as well as a high correlation between national results (Grisay *et al.* 2007, 2009).

Finally, we use data from EUROSTUDENT[1] at the tertiary level (Cuppen *et al.* 2021). EUROSTUDENT is a self-report survey aimed at higher education students all around Europe. The aim of the survey is to explore social dimensions of European higher education, for example, access to higher education, study conditions, students' time management and financial issues, and produce internationally comparable data on higher education. The questionnaire is extensive, and thus, it allows investigating a variety of topics. The EuroStudent VII (2019) is used in our study to assess students' sense of belonging in tertiary education. The countries that did not offer this item in their local survey are excluded from analyses (*See Appendix: Data Information Table D*).

We complement the individual-level data with the aggregated data at the country level to test whether macro-level variables can explain the educational outcome gaps between different intersectional groups. To this end, we use data from UNESCO, Migrant Integration and Policy Index (MIPEX), and Educational System Database (Bol and van de Werfhorst 2013, Solano and Huddleston 2020, UNESCO/OECD/EUROSTAT 2020). We include the average value for each country across the years for which the macro-data was collected into our analysis[2].

4 Method

In the following, we investigate intersectional inequalities along dimensions of social origin,

[1] https://www.eurostudent.eu/

[2] Considerable variation in the availability of country-year information in macro-level datasets prevented us from taking countries' macro-level values of the same year as the respective micro-level data when running the second step of our analysis. Therefore, the second-step analyses were based on the mean value of the macro-data for each country across all available years. Since the cross-national variation in macro-level indicators is larger than within-country fluctuations, we consider our approach justifiable. It is up for the future research to clarify the extent of the bias resulting from the adopted approach.

gender, and migration background in three educational outcomes—mathematics and reading competences as well as students' sense of belonging to school—and the role of country-level characteristics in this regard. To do so, we apply two-step multilevel modelling. Two-step multilevel modelling implies, first, estimating coefficients for the micro-level predictors separately for each macro-level unit, and then estimating the macro-level effects by regressing the coefficients estimated in the first step on macro-level predictors (Achen 2005). In cross- country analyses where the sample size is small, which is the case in our study, a two-step approach is often preferred to the one-step approach, in which micro- and macro-level analyses are conducted simultaneously (Bryan and Jenkins 2016, Kohler and Giesecke 2021). By applying a two-step procedure, we are also better able to visualize micro-level outcomes graphically (Gebel and Giesecke 2016).

In our study, the micro-level pertains to the students and the macro-level refers to the countries. The first step of our analysis involves regressing individual educational outcome variables on student-level variables for each country separately using ordinary least squares (OLS) regression analyses. By doing so, we estimate the gaps between students with different intersections of social origin, gender, and migration background in three educational outcomes.

In the second step, each regression coefficient from the first step of the analysis, that is the net difference in either math, reading or sense of belonging scores between the reference intersectional category and each of the other intersectional categories, is regressed on the relevant country-level variables (for the list of the variables see below). Therefore, in the second step of the analysis, each coefficient estimated in the first step of the analysis is a dependent variable, and each country-level variable is an independent variable. Since we use estimated dependent variables (EDV) in the second step, we implement an EDV-correction by a feasible generalized least square as suggested by Lewis and Linzer (2005) to obtain consistent standard error estimates. To do so, we use the twostep ado in Stata (see Kohler and Giesecke (2021) for further information).

5 Variables

5.1 Micro level (First step of the two-step multilevel modelling)

5.1.1 Outcome variables

Our dependent variables are students' results from standardized tests in *math* and *reading*, and their *sense of belonging* in school. The sense of belonging variable is harmonised to allow better comparability across the primary, secondary and tertiary levels of education and the different datasets used to evaluate each level. All individual-level variables are harmonised using the PIONEERED project Harmonisation Guidelines, details of the variables included in the analysis follow (Kroezen and Alieva 2022).

The *math* and *reading assessment scores* in TIMSS, PIRLS, and PISA are reported as plausible values (PVs). Plausible values show the likely proficiencies of a student and are scaled to have a mean of 500 and a standard deviation of 100. In TIMSS, PIRLS, and PISA 2000-2012 each student has five PVs, while from PISA 2015 onward, each student has ten PVs for each subject evaluated. In our study, we define the math and reading assessment scores as originally reported in the TIMSS, PIRLS, and PISA data and run the analyses using one PV. Given the quantity of regressions run (for each country, separate estimates were run for each dataset), using one PV was the most feasible option. In our analysis, we properly account for the sampling design of each large-scale assessment using both sample and replicate weights, but we opt to use only the first PV (i.e., not properly controlling for the imputation error). We acknowledge that this strategy, while allowing to greatly reduce the computation time for generating such a large number of estimates, deviates from the recommendations provided by the OECD and the IEA. As a robustness check, we estimated the gaps using the five plausible values on a subsample of students (the secondary-level PISA sample) in order to check the relative robustness of our estimates. The estimates computed using the 5 PVs remain largely similar to the recorded estimates from the first PV and do not lead to any substantially different conclusions in the first step of the analysis[1].

In all the datasets, the variable pertaining to the sense of belonging is derived from a single question, which asks students to rate their overall agreement to a statement about their sense of belonging in school or higher education. The PIRLS, TIMSS and PISA responses are directly comparable with the possible responses ranging from "strongly agree/agree a lot" – "agree/agree a little" – "disagree/disagree a little" – "strongly disagree/disagree a lot". The EUROSTUDENT responses are a list of 5 points between strongly agree and do not agree at

[1] In our ongoing and future research, we will apply the analytical strategy recommended for PISA, PIRLS and TIMSS.

all. The *sense of belonging* variable originally reported on a 4-point Likert scale in the primary and secondary level datasets is rescaled using a linear transformation to make comparisons easier with the 5-point Likert scale used in the EUROSTUDENT data. Additionally, the scale was reversed (when necessary) so that in all the datasets, the values range from 1 (strongly disagree) to 5 (strongly agree) in response to the statement regarding whether the student feels they belong in school. The harmonisation of sense of belonging follows the PIONEERED project recommendations (Kroezen and Alieva 2022).

5.1.2 Key independent variables

The main independent variables included in the analysis are *gender*, *migration status and socio-economic status (SES)*. Based on these three inequality dimensions, we generated 8 distinct combination of gender, migration status and SES, which we transformed into a set of dummy variables in our analyses.

For *gender*, a binary variable (female/male) was used. We define *migration background* into two categories. Students are considered as having a migration background if they themselves were born abroad or if one of their parents was born abroad (first- or second-generation migrants). Students with no migration background are thus students born in the country of the test, whose both parents were also born in that country. *Socio-economic status* is defined using information on the highest level of education of the student's parents. We include two different specifications for SES, where the first specification of SES emphasizes the differences between highly educated parents and the rest, and the second specification juxtaposes the least educated with the rest. The first specification of SES defines *High SES students as* those whose parents have completed tertiary education at the ISCED 5-level or above, and *Low SES* as those whose parents have completed post-secondary/non-tertiary (ISCED 4) or below. The second specification of SES differentiates between the *High SES*, i.e., parents' highest level of education being upper secondary (ISCED 3) and above, and *Low SES*, i.e., parents' highest level of education being lower secondary (ISCED 2) and below[1]. We introduce two different operationalizations of SES to account for the variation in socioeconomic profiles of immigrants across countries. Crucially, due to the factors such as immigrant-receiving countries' selection through immigration control or self-selection of

[1] Using only the information from the parent with the highest education (dominance approach) is common but might lead to biases in the research on SES-related gender differences (Beller 2000).

immigrants because of the geographical distance between the origin country and emigrated country, SES dispersion of immigrants varies across countries (Schnepf 2006, Geis *et al.* 2011, Kogan 2015, van de Werfhorst and Heath 2019). While in countries that aim to attract highly skilled immigrants, high SES is largely observed among immigrants and, therefore, their children, in countries where immigrants fill vacancies in low-skilled occupations, low SES is predominantly observed among immigrants and their children. It can be expected that having a migration background and low SES overlaps in countries where low-skilled immigrants are predominant, whereas having a migration background and high SES overlaps in countries where immigrants are mostly highly educated. We speculate that this leads to an uneven distribution of migration background and SES among the intersectional groups that we generate in our analysis. To account for such variation in the socioeconomic profiles of immigrants across countries and to avoid biased results, we have introduced two SES specifications in which high-SES and low-SES are operationalized differently in our analyses.

To reduce the amount of missing data in our analysis, we used diverse imputations techniques. To impute missing values in the migration variable, we used proxy variables in the data. In order to generate information regarding the migration status, we relied on variables related to the students' and parents' country of birth. If the student's country of birth was missing, we proxied it through first, the mother's and, second, the father's country of birth. If both parents' country of birth were missing, then we relied on the variable pertaining to the language spoken at home (national language = born in county of test, other language = born abroad). Missing values in the mother and father's country of birth were substituted with each other if the information on the other parent was available. Missing values in gender and parents' highest education (used for the SES specifications) were imputed using the school median value. If all values were missing at the school level, we imputed missing values using the country median. In the case that the median fell directly between two categorical values (i.e., a median value of 2.5, which has no meaning for a categorical variable), we randomly assigned the observation to the category either directly above or below the median. We did not impute missing values in the dependent variables.

5.1.3 Control variables

The control variables include *language spoken at home*, *degree of urbanisation and survey year dummy variables*. Controlling for language spoken at home allows taking into account

cross-national differences with regard to the extent students are proficient in the host-country language. For example, immigrant students arriving in the English-speaking countries might be better equipped in the host-country language due to the fact that English is spoken and learnt in many countries in the world. Furthermore, accounting for this variable enables us to proxy the first and the second-generation immigrants. The variable "degree of urbanisation" takes into account differences in the academic achievement and the students' sense of belonging to school existing across schools situated in rural and urban regions, which are likely to differ in terms of resources and quality of teaching.

Language spoken at home is defined in two categories, either the student speaks the language of the test (or another national language of the country if it has more than one national language/dialect) at home (=0) or they do not (=1). Missing values in the language spoken at home were substituted with information on the country of birth of the student, where students born in the test country were considered as speakers of the national language, and those born abroad were considered as speakers of another language. Due to data availability, we included language spoken at home only in the analyses at the primary and secondary levels of education.

For the degree of urbanisation, we define three dummy variables of a city, a town/suburb or a rural area depending on the location of his/her school. In PISA, which provides further details about the location of the school, we grouped together students attending schools in rural areas and small towns, as well as students attending schools in the city or a large city. In TIMSS, we grouped together students attending schools in rural areas and small towns, as well as students attending schools in the suburban and large towns. In the case of the EUROSTUDENT data, the degree of urbanization of the institution originated from the binary item "Where are you studying?" where options were based on the population size: "Less than 300,000" and "More than 300,000". The former was recoded as town and the latter as city. Missing values in the degree of urbanisation are imputed using the modal category at the country level.

Finally, to account for the temporal variation in dependent and independent variables, we control for the survey-year fixed effects. These are represented by a set of dummy-coded variables, which differ in number depending on the data source.

The descriptive information for the variables used in the study can be found in Appendix *Data Information Table H*. Apart from several country cases and selected specifications of the SES-variable, we observe sufficient distribution of the variables across the cells. We explicitly mention if analyses are based in the sparse data in the results section. Thus, for example, the groups most prone to a small sample size are MLNN and FLNN in the SES2 specification. The following countries had group sizes less than 30 in SES2 in PIRLS data: Bulgaria, Czech Republic, Latvia, Lithuania, Norway, Poland, Romania, Slovakia, and Slovenia. In SES1, only Czech Republic, Poland and Romania have groups with less than 30 observations. In TIMSS, Only Poland had group sizes less than 30 in SES2. In SES1, all countries had groups sizes more than 95 observations (with Poland having the 95 observations in low SES female migrants). In PISA, only Poland and Romania had groups sizes with less than 30 observations in SES1 and SES2. Taking the sampling design of PIRLS, TIMSS, and PISA into account, we were able to run our regression analyses including the countries with such small group sizes, except for Poland SES2, which we had to exclude from our TIMSS sample.

For the majority of the variables used in our analysis we observe less than 10% missings by country. The exceptions are parental education in the PIRLS and TIMMS data with the proportion of missing cases between 10-40%. The control variable degree of urbanisation is most prone to missingness in PISA data with the share of missing values for this variable oscillating between 15-30% in some countries. The variable language spoken at home is particularly prone to missing data in the EUROSTUDENT data.

5.2 Macro level (Second step of the two-step multilevel modelling)

5.2.1 Outcome variables

The outcome variables at the macro level are the educational outcome gaps between Male, High SES, Native students (reference category), and the seven other categories (Male, Low SES, Native; Male, High SES, Migrant; Male, Low SES, Migrant; Female, High SES, Native; Female, Low SES Native; Female, High SES, Migrant; and Female, Low SES, Migrant students). These seven gaps (*b*-coefficients) are estimated from the OLS regressions in the first step, once controlling for the language spoken and home and the degree of urbanisation.

5.2.2 Key independent variables

UNESCO: Female percentage of the graduation ratio from ISCED 6/7 in tertiary education

UNESCO Institute for Statistics collects data on education from official responses to its annual education survey (UNESCO-UIS/OECD/EUROSTAT 2020). This variable indicates the simple percentage of female students calculated for the sample of the population that is filtered by the gross graduation ratio in tertiary education. The gross graduation ratio in tertiary education is calculated by dividing the number of graduates from first-degree programmes (at ISCED 6 - *Bachelor's or equivalent level* and ISCED 7 - *Postgraduate degree: Master's*) by the population of the theoretical graduation age of the most common first-degree programme and multiplying by 100 (UNESCO-UIS/OECD/EUROSTAT 2020). We have calculated the average value for each country across the years for which data was collected for our analysis *(See Appendix: Data Information Table E)*. We centred this variable around its mean for ease of interpretation.

MIPEX Education: Are education systems responsive to the needs of immigrant children?

In the Migrant Integration and Policy Index, countries are evaluated based on their policies that affect immigrants. MIPEX is an index ranging from 0 to 100 in which 100 is awarded if a country meets the highest possible standard for equal treatment of immigrants (Solano and Huddleston 2020). The MIPEX education index reflects the responsiveness of policies and educational systems to the needs of immigrant children are evaluated (Solano and Huddleston 2020).

Several dimensions are taken into consideration for the computation of the index, such as access to compulsory and non-compulsory education, access to tertiary education, educational guidance at all levels, language instruction, measures to address the educational needs of migrant groups, diversity at school, measures to bring migrants into the teacher workforce, teacher training to reflect diversity etc. We have calculated the average value for each country across the years for which data was collected for our analysis *(See Appendix: Data Information Table F)*. We centred this variable around its country mean for ease of interpretation.

Educational System Database: Tracking index

The tracking index developed by Bol and van de Werfhorst (2013) is built based on a principal factor analysis of three country-level indicators. These indicators are the age of first

selection, the percentage of the total curriculum that is tracked, and the number of tracks that are available for 15-year-old students. The data used for this factor analysis is from the OECD (Bol and van de Werfhorst 2013, p.293). The result of the principal factor analysis is a numeric value which can be interpreted in the following way: A value of 0 indicates that the amount of tracking in the country's educational system is average. A value larger than 0 indicates that there is more educational tracking than average and a value smaller than 0 indicates that there is less educational tracking in the country. Additionally, the further the index deviates from 0, implies a larger/smaller amount of education tracking compared to the average (Bol and van de Werfhorst 2016) *(See Appendix: Data Information Table G for available countries)*. Obviously, the extent to which educational system is tracked should primarily affect the scholastic achievements at the secondary level. Yet, we might observe some anticipation effects already at the primary level and some longer-lasting effects at the tertiary level.

6 Results

In the first part of the results section, we establish patterns of inequalities with regard to objective indicators of student performance in the key school subjects, mathematics and reading, as well as students' perceptions of school belonging based on the results of the first step of the two-step multilevel modelling. The presentation of the descriptive results is organized in the following way. First, we will describe patterns of inequalities by instersectional categories of gender, SES, and migration background in each outcome and in each stage of the education system (primary, secondary, and tertiary). The aim is to establish whether some intersectional groups are particularly prone to lower school performance and school estrangement. For the simplicity of the interpretation, the results are averaged across all analysed countries; further details across individual countries can be found in the Appendix. Second, we compare whether intersectional inequalities are similar or vary across the educational stages. In doing so, we pay particular attention to the particularly pronounced intersectional inequalities and the cross-national differences in the intersectional inequalities.

In the second part of the findings section, we focus on the results of the second step of the multilevel analyses, both in terms of bivariate correlations between the macro-level

indicators and the outcome variables as well as multivariate results. Our overall aim is to present patterns of associations between trends in intersectional inequalities and the selected characteristics of the analysed countries.

To be able to follow the numerous figures, the reader must be aware of the following abbreviations:

(1) MLN = Male, Low-SES, Native,

(2) MHNN = Male, High-SES, Migrant (Non-Native),

(3) MLNN = Male, Low-SES, Migrant (Non-Native),

(4) FHN = Female, High-SES, Native,

(5) FLN = Female, Low-SES, Native,

(6) FHNN = Female, High-SES, Migrant (Non-Native),

(7) FLNN = Female, Low-SES, Migrant (Non-Native)

All the above-described groups are compared to high-SES boys/young men without migration background (MHN – Male, High SES, Native), a group likely to have on average the least difficulties in the school context. The category of low-SES boys/young men without migration background (MLN) and the benchmark group of high-SES boys/young men without migration background (MHN) differs from one another in just one dimensions – **SES**. The juxtaposition of the group of high-SES girls/young women without migration background (FHN) and the benchmark group of high-SES boys/young men without migration background (MHN) enables us to single out the effect of **gender**, as both groups differ just in this one dimension. The juxtaposition of the group of high-SES boys/young men with migration background (MHNN) and the benchmark group of high-SES boys/young men without migration background (MHN) allows us to detect the effect of **the migration status**, as both groups differ just in one dimension – migration background.

The following contrasts address intersectional inequalities in two dimensions. The juxtaposition of a group of low SES boys/young men with migration background (MLNN) and the benchmark group of boys/young men without migration background and high SES (MHN) enables us to detect **the intersectionality of SES and migration status**, the two

characteristics, which differentiate both groups. The juxtaposition of the category of low-SES girls/young women without migration background (FLN) and the benchmark group of high-SES boys/young men without migration background (MHN) allows us to detect **the intersectionality of gender and SES**. The contrast of the category of high-SES girls/young women with migration background (FHNN) and the benchmark group of high-SES boys/young men without migration background (MHN) allows us to detect **the intersectionality of gender and migration status**.

Finally, the **intersectionality of gender, SES and migration status** is captured by the contrast of the category of low-SES girls/young women with migration background (FLNN) and the benchmark group of high-SES boys/young men without migration background (MHN). The two intersectional groups differ in all three dimensions – gender, SES and migration background.

The results are based both on the estimates using the first specification of the SES, in which individuals with tertiary educated parents are contrasted with the rest, and the alternative specification of SES (second specification), in which we contrast individuals with education below the secondary level and the rest.

6.1 First-step results

6.1.1 Comparisons across the intersectional groups

At the primary stage of the educational system, all focal intersectional groups have lower test results in **mathematics** compared to the reference group of high-SES boys without migration background (see upper panel of Figure 1, for cross-sectional differences in math performance at the primary level of education see Figures A1.1a in Appendix). The gap is particularly large for low-SES girls and boys with migration background. Low-SES native-born boys and girls also have considerably lower performance levels in math. The math performance of high-SES boys with migration background and high-SES girls without migration background is much closer to that of the reference population.

Patterns of inequality with regard to **math performance** at the **secondary level** of education largely resemble those we reported for the primary level of education (for cross-sectional differences in math performance at the secondary level of education see Figures A1.1b in

Appendix). The gap is the largest for low-SES young women and men with migration background, followed by low-SES girls/young women without migration background. The math performance of high SES girls/young women without migration background hardly differs from that of the reference population. Math performance of high-SES boys/young men and girls/young women with migration background is also rather close to the reference group. It is interesting to note that the extent of intersectional inequalities in mathematics is on average somewhat smaller at the secondary than the primary level of education. This finding should be considered with caution as it emerges from the analyses of various datasets, not identical selection of countries in each dataset and different time ranges of each dataset.

Results of the analyses for **reading** competences in the **primary school** differ from those reported for mathematics (see middle panel of Figure 1, for cross-sectional differences in reading performance at the primary level of education see Figures A1.2a in Appendix). A reference group of high-SES boys without migration background is not the best performing group in the language domain. Instead, our findings indicate that high-SES girls without migration background are the best performing group, whereas the text performance of the high-SES girls with migration background is practically no different from that of the reference population. This indicates that female gender and high-SES are indicators of better performance in reading. Low-SES male students with migration background have the lowest performance in the reading test, followed by low-SES female students with migration background and low-SES male students without migration background.

Patterns of intersectional inequalities in **reading** competences at the **secondary level** largely mimic patterns observed at the primary level (for cross-sectional differences in reading performance at the secondary level of education see Figures A1.2b in Appendix). Also at the secondary level, high-SES girls/young women with and without migration background are the best-performing groups. These are followed by low-SES girls/young women without migration background, whose reading performance at the secondary level is on average equivalent to that of the high-SES boys/young men without migration background. This indicates that young women do better in reading largely irrespective of their migration background and SES. The worst performers in reading at the secondary levels are low-SES boys/young men with and without migration background. Our results suggest that among

male students, low SES background is a more significant risk factor than migration background for reading performance in secondary school. Also, regarding reading performance, we observe, on average, significantly lower intersectional inequalities at the secondary level as compared to the primary level of education, which are indicative of a progress (*catching-up*) being made by other groups throughout their educational career.

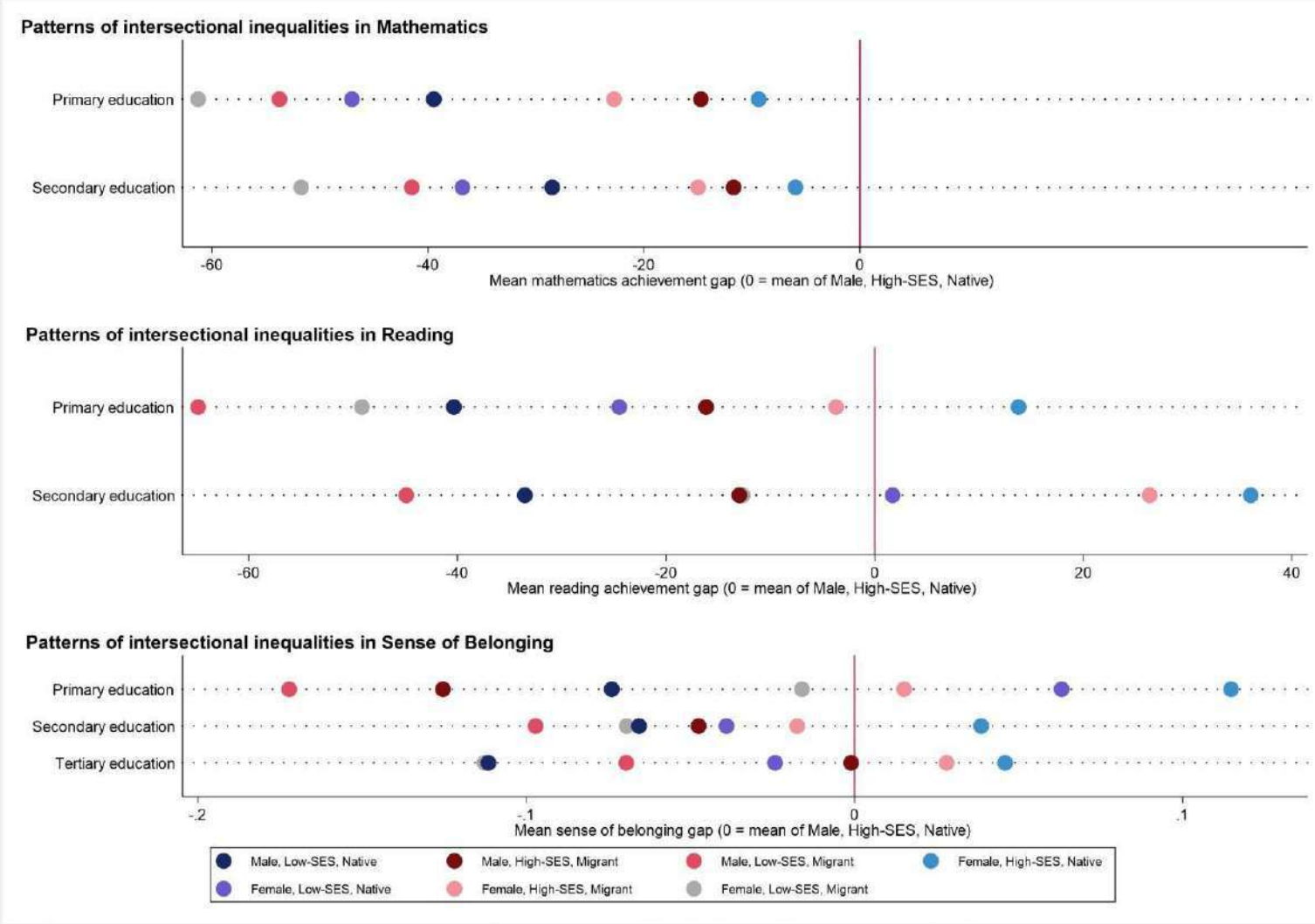
Addressing the **sense of belonging** to school among **primary-school** students, we observe clear patterns with female students expressing the strongest sense of identification with school (see lower panel of Figure 1, for cross-sectional differences in sense of belonging at the primary level of education see Figures A1.3a in Appendix). Native-born girls with high SES express the strongest belonging to school, followed by native-born girls with low SES and then followed by high-SES migrant girls. All these girls identify themselves with school stronger than the benchmark of high-SES native-born boys. In contrast, low-SES boys with migration background feel the lowest levels of school belonging, followed by high-SES boys with migration background and low-SES boys without migration background.

Patterns of intersectional inequalities in the **sense of belonging** to school among **secondary-school students** somewhat deviate from those reported among primary-school students (for cross-sectional differences in sense of belonging at the secondary level of education see Figures A1.3b in Appendix). On average, high-SES girls/young women without migration background report the highest levels of school belonging, much higher than high-SES boys without migration background. The rest of the intersectional groups feel less belonging to school than the benchmark group. The lowest levels of school belonging are observed for low-SES boys/young men with migration background.

The analysis of the **sense of belonging** among students at the **tertiary level** detects the very same group of high-SES young women without migration background who display the highest level of school identification, followed by high-SES young women with migration background (for cross-sectional differences in sense of belonging at the tertiary level of education see Figures A1.3c in Appendix). In contrast to the findings for primary and secondary education levels, low-SES young women with migration background, on average, feel the strongest estrangement from higher education, quite similar to that among low-SES young men without migration background.

Overall, the differences in the levels of school belonging across intersectional groups are most pronounced at the primary level, somewhat larger than they are at the secondary and tertiary levels of education. These comparison patterns should be taken with caution as they might not only reflect meaningful differences, but also be an artifact of the variation in the data sources, differences in the country selection and temporal variation across the datasets.

Figure 1: Intersectional inequalities in mathematics, reading and sense of belonging (SES specification 1)



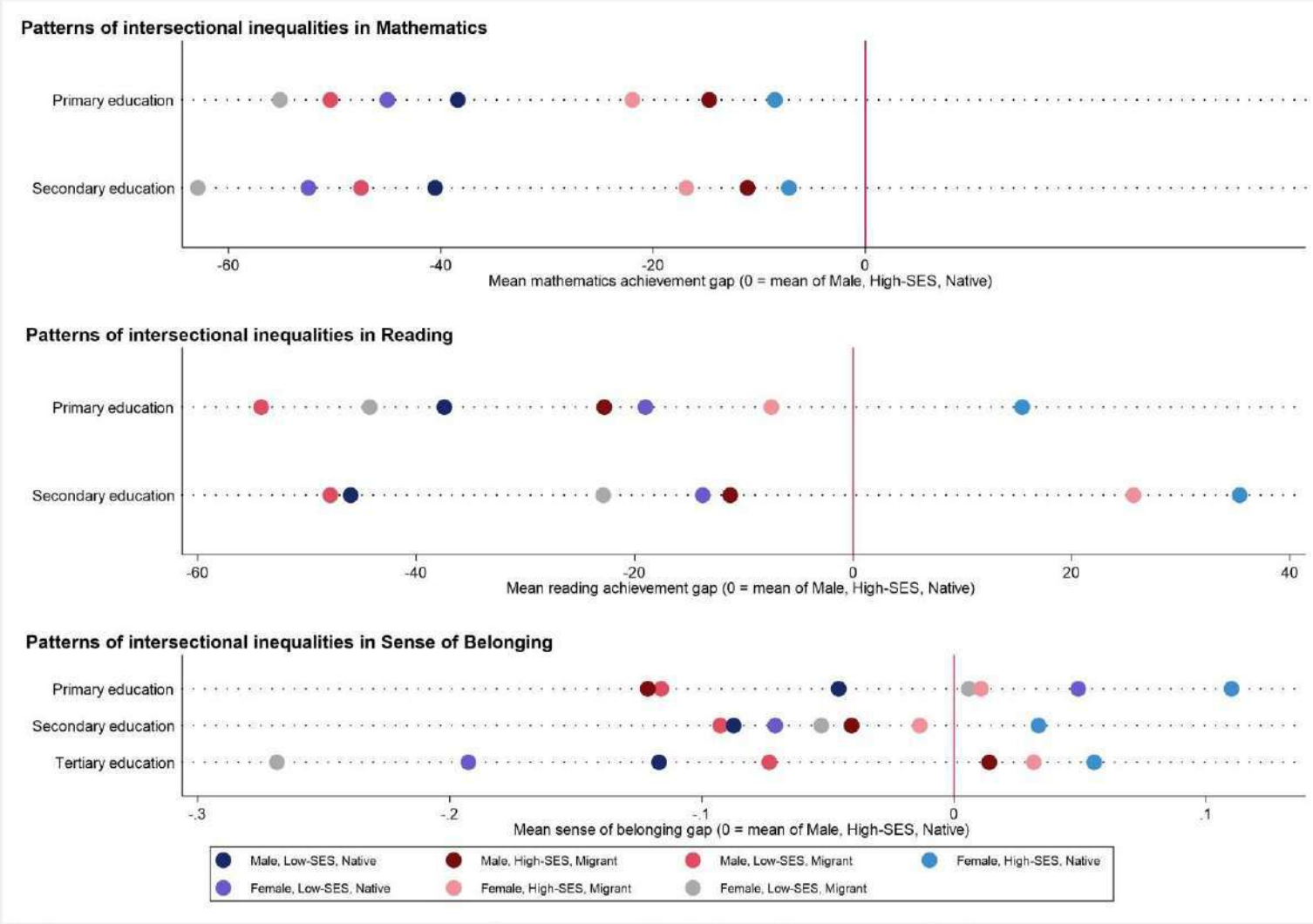
Note: Mean outcome gaps are calculated as an average of estimated country coefficients. For country specific coefficients and significance levels, see the Appendix.

Data sources: https://www.iea.nl/studies/iea/pirls; https://www.iea.nl/studies/iea/timss; https://www.oecd.org/pisa/; https://www.eurostudent.eu/

Up until now, we discussed the findings of the analyses, in which SES was defined through the contrast of the tertiary educated and the rest. In the next step, we compare the findings to ones from an alternative specification, in which the least educated are compared to the rest (see Figure 2, for cross-sectional differences in math and reading performance as well as the sense of belonging to school see Figures A2.1a-b, A2.2a-b and A2.3a-c respectively in Appendix). The patterns of intersectional inequalities regarding the scholastic competences and largely also the sense of belonging to school remain rather similar to the ones reported above. Yet, results for reading competences at the secondary level based on the second specification of SES slightly differ from the ones based on the first specification of SES (for cross-sectional differences compare Figures A2.2b and A2.2a in Appendix). The disadvantages of low-SES students become more pronounced. The low-SES girls without migration background, who seem to demonstrate similar reading competences as the high-SES native-born boys, appear to have larger gaps to the benchmark group in the second specification. Among non-native groups we observe less pronounced differences compared to the references group, particularly in Eastern European countries where the number of immigrants, particularly low-SES immigrants, is potentially considerably lower.

The most pronounced deviations are observed with regard to the patterns in the sense of belonging to school at the primary and the tertiary levels (for cross-sectional differences compare Figures A2.3a-c in Appendix). Results based on the second specification of SES indicate stronger estrangement among low-SES girls with and without migration background from higher education (compared to the first specification of SES). The intersectional differences in the sense of belonging at the primary level of education, largely pertaining to boys with migration background, become smaller in the second specification of SES.

Figure 2: Intersectional inequalities in mathematics, reading and sense of belonging (SES specification 2)



Note: Mean outcome gaps are calculated as an average of estimated country coefficients. For country specific coefficients and significance levels, see the Appendix.

Data sources: https://www.iea.nl/studies/iea/pirls; https://www.iea.nl/studies/iea/timss; https://www.oecd.org/pisa/; https://www.eurostudent.eu/

Summing up all the results, we can conclude that regarding **math performance**, high-SES native boys demonstrate the best results, whereas low-SES migrant girls and boys (the groups that represent intersectional inequalities in the dimensions of SES and migration status) have the weakest performance. In terms of **reading skills**, high-SES native girls perform the best, whereas low- SES migrants, particularly boys, (a group that captures the intersectionality in all three dimensions) are the weakest students. Regarding **the sense of belonging**, natives (particularly girls) report higher scores, low-SES students (particularly migrants) have the lowest scores. The patterns of intersectional inequalities are particularly mixed with respect to the indicator of students' belonging to school

6.1.2 Comparisons across educational stages and countries

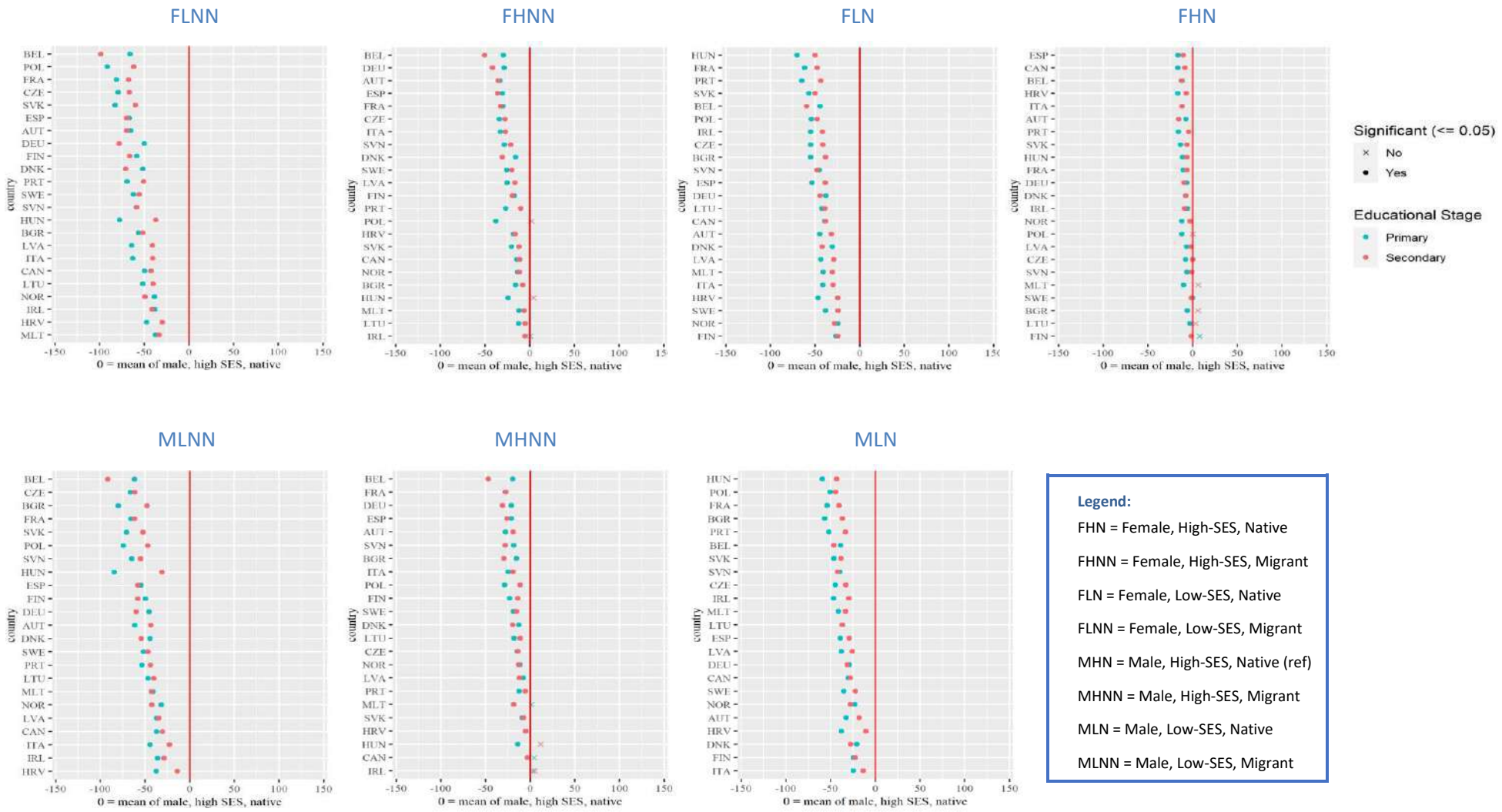
In the next step, we compare the extent of intersectional inequalities across educational stages and across countries. The gaps in student performance in mathematics and reading are compared across the primary and secondary levels of education, whereas sense of belonging to school/institution of higher education is traced across all three educational levels. As in the analyses above, we ran models with two SES specifications presenting contrasts of the tertiary-educated and the rest (first specification) and contrasts of the least educated and the rest (second specification). While discussing the patterns of intersectional inequalities, we pay particular attention to the cross-national variation in the outcomes.

Analyses of the math competences (see Figures 3a and 3b) indicate higher levels of inequalities at the primary stage compared to the secondary stage of the education system in the bulk of the countries. Yet, there are a number of countries in which inequalities, particularly among vulnerable groups, such as low-SES boys and young men with migration background, low-SES girls and young women with migration background, are higher in secondary compared to primary. These countries are Germany, Belgium, Denmark as well as Finland and Norway. Germany is known for its highly stratified secondary education system, which could explain larger penalties for the vulnerable groups at the secondary stage of the education system when consequences of early tracking become more visible in terms of systematic competence differences. Why the inequalities at the secondary stage are higher in Nordic countries is less clear. It remains to be explored in future research to what extent such inequalities might be related to migrant population composition (e.g. predominance of

humanitarian vs. economic migrants), ethnic residential and/or school segregation, or the side effects of the availability of special needs classes and schools for children with migration background.

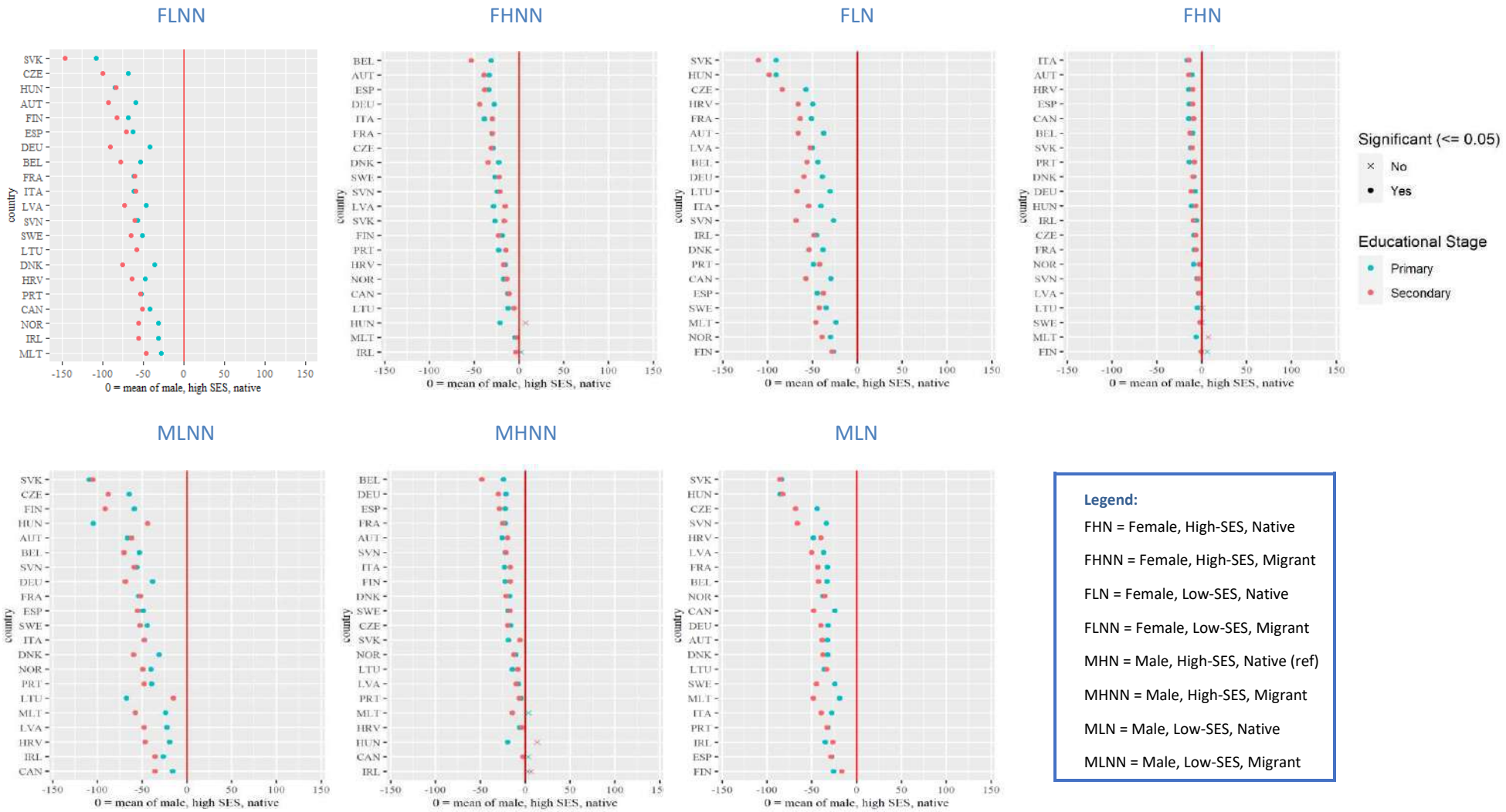
Regarding the reading competences (see Figures 4a and 4b), the patterns of inequalities across various stages of education and countries deviate from those reported for math competences particularly in one key dimension — gender. Furthermore, gender-related intersectional inequalities seem to be larger at the secondary level compared to the primary level. The pattern is different in respect to intersectional inequalities related to SES and migration status — these tend to decrease from primary to secondary education in the majority of countries. Yet, competence deficits are not reduced or even increased in Belgium, the Netherlands, Denmark, or Germany, which are largely countries with more stratified education systems. Among the two most vulnerable groups—low-SES young men and women with migration background—we observe particularly large disparities across the countries in the reading competence gaps at both primary and secondary levels of education.

Figure 3a: Patterns of intersectional inequalities in mathematics across primary and secondary stages of education system (first specification of SES)



Data sources: https://www.iea.nl/studies/iea/timss; https://www.oecd.org/pisa/

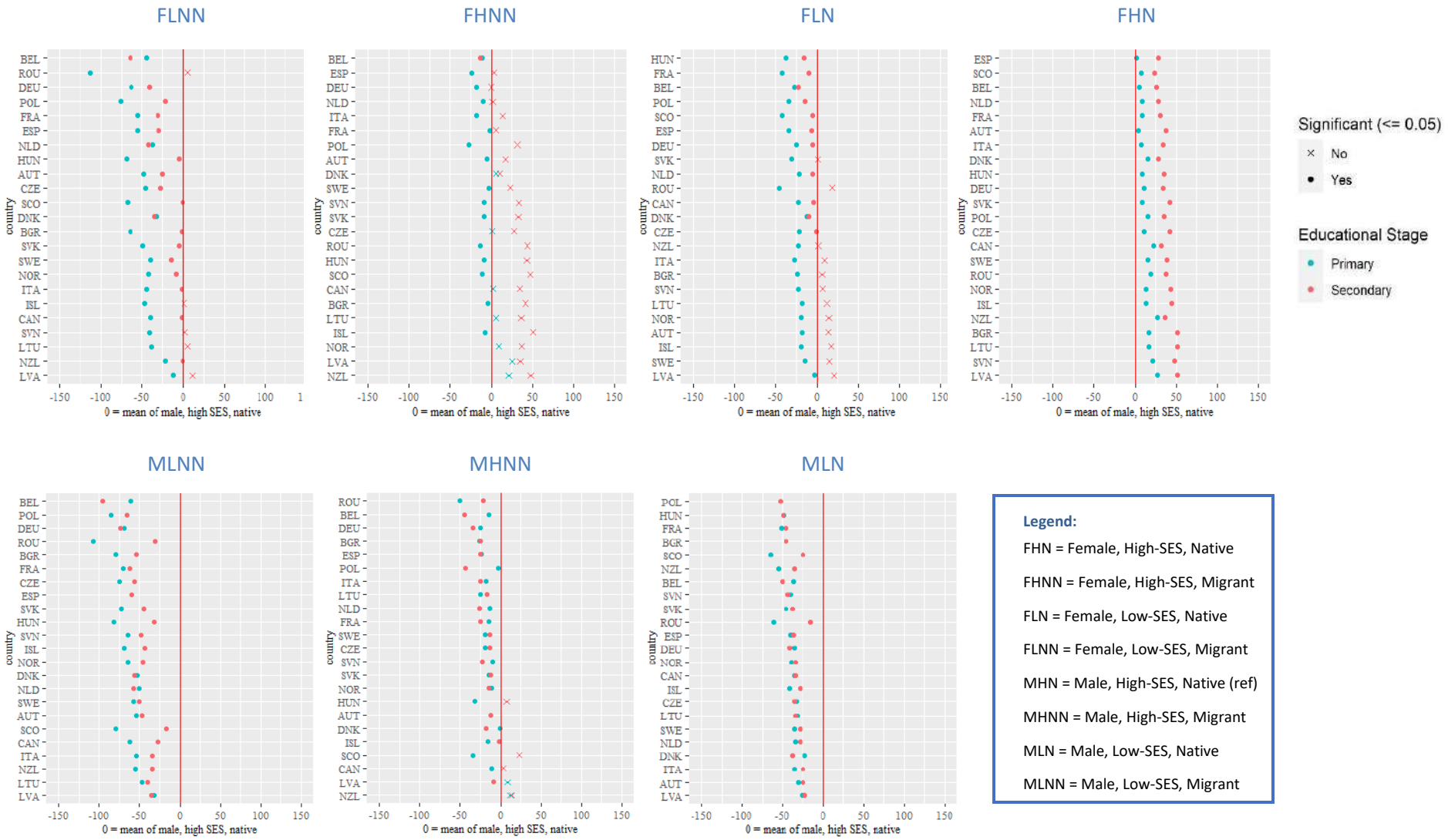
Figure 3b: Patterns of intersectional inequalities in mathematics across primary and secondary stages of education system (second specification of SES)



Data sources: https://www.iea.nl/studies/iea/timss; https://www.oecd.org/pisa/

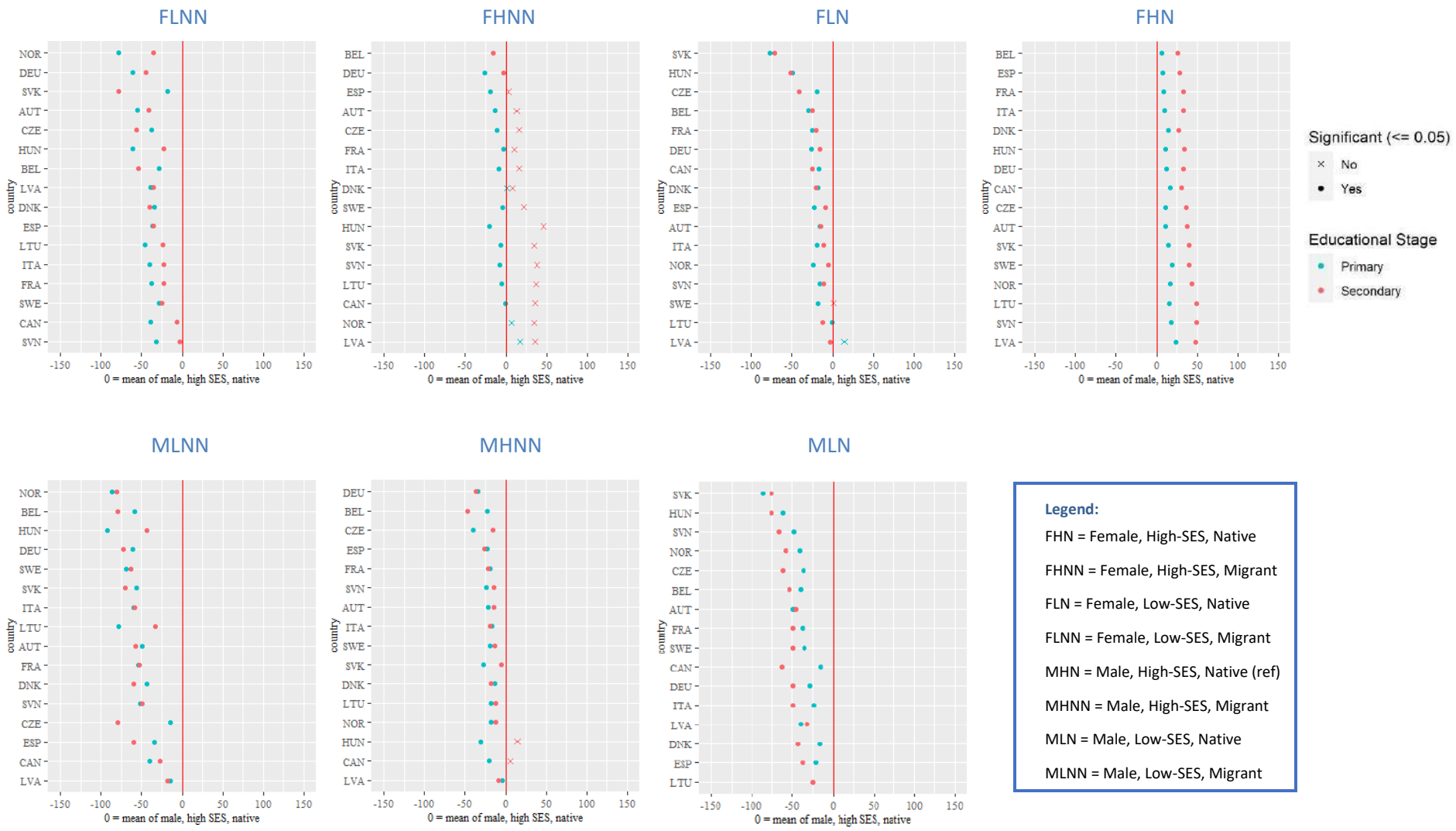
Turning to the differences across the groups in the sense of belonging to school or higher education (see Figures 5a and 5b), patterns are less systematic and much less clear-cut. Still, some countries, e.g., Denmark and Finland, have considerably higher gaps in sense of belonging across the more vulnerable groups of girls/young women with migration background or majority low-SES male and female students (in Denmark). In Ireland, on the other hand, boys and young men with migration background appear mostly estranged from schools, particularly at the primary level.

Figure 4a: Patterns of intersectional inequalities in reading across primary and secondary stages of education system (first specification of SES)



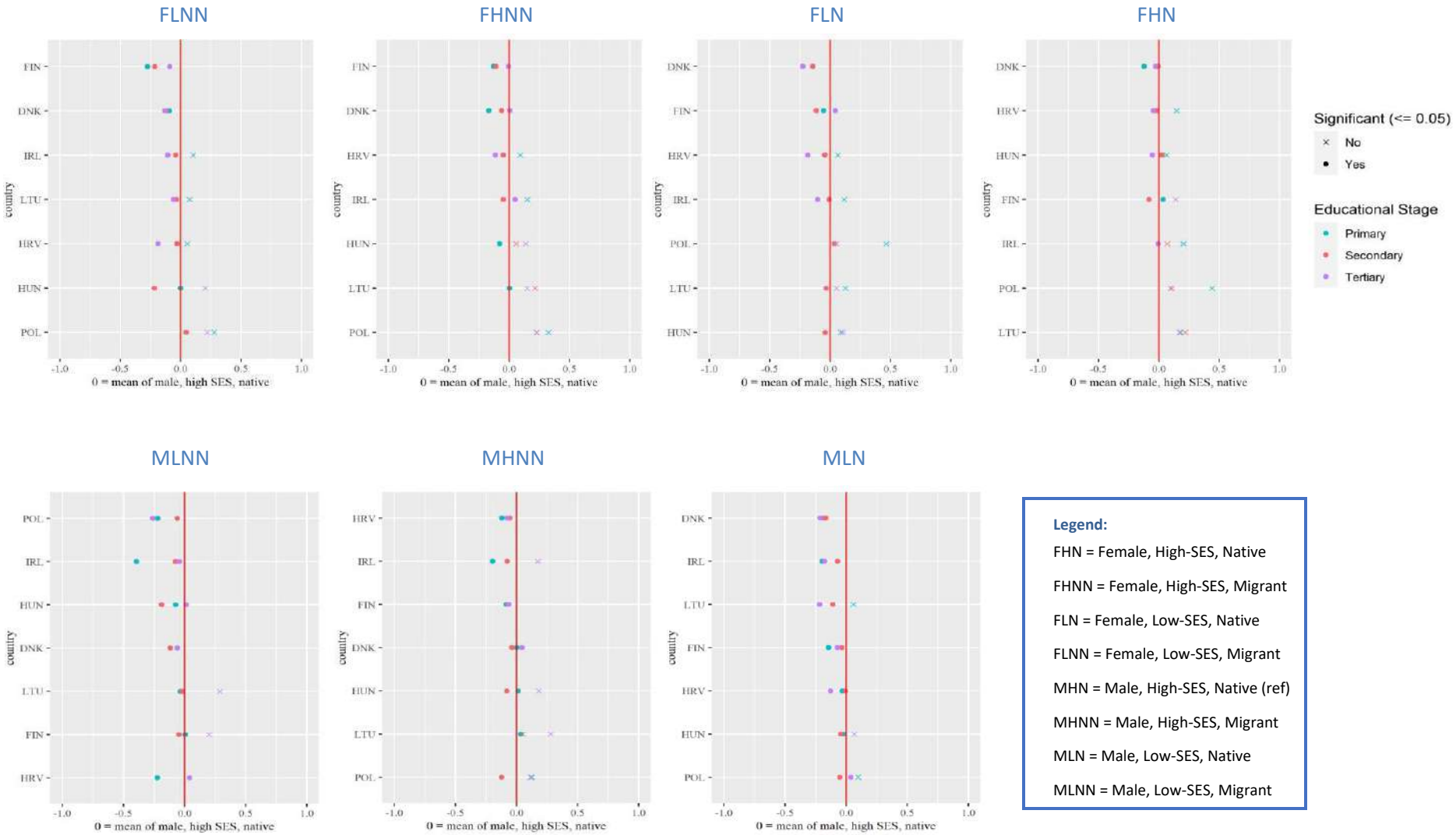
Data sources: https://www.iea.nl/studies/iea/pirls; https://www.oecd.org/pisa/

Figure 4b: Patterns of intersectional inequalities in reading across primary and secondary stages of education system (second specification of SES)



Data sources: https://www.iea.nl/studies/iea/pirls; https://www.oecd.org/pisa/

Figure 5a: Patterns of intersectional inequalities in the sense of belonging across primary, secondary, and tertiary stages of education system (first specification of SES)



Legend:

FHN = Female, High-SES, Native

FHNN = Female, High-SES, Migrant

FLN = Female, Low-SES, Native

FLNN = Female, Low-SES, Migrant

MHN = Male, High-SES, Native (ref)

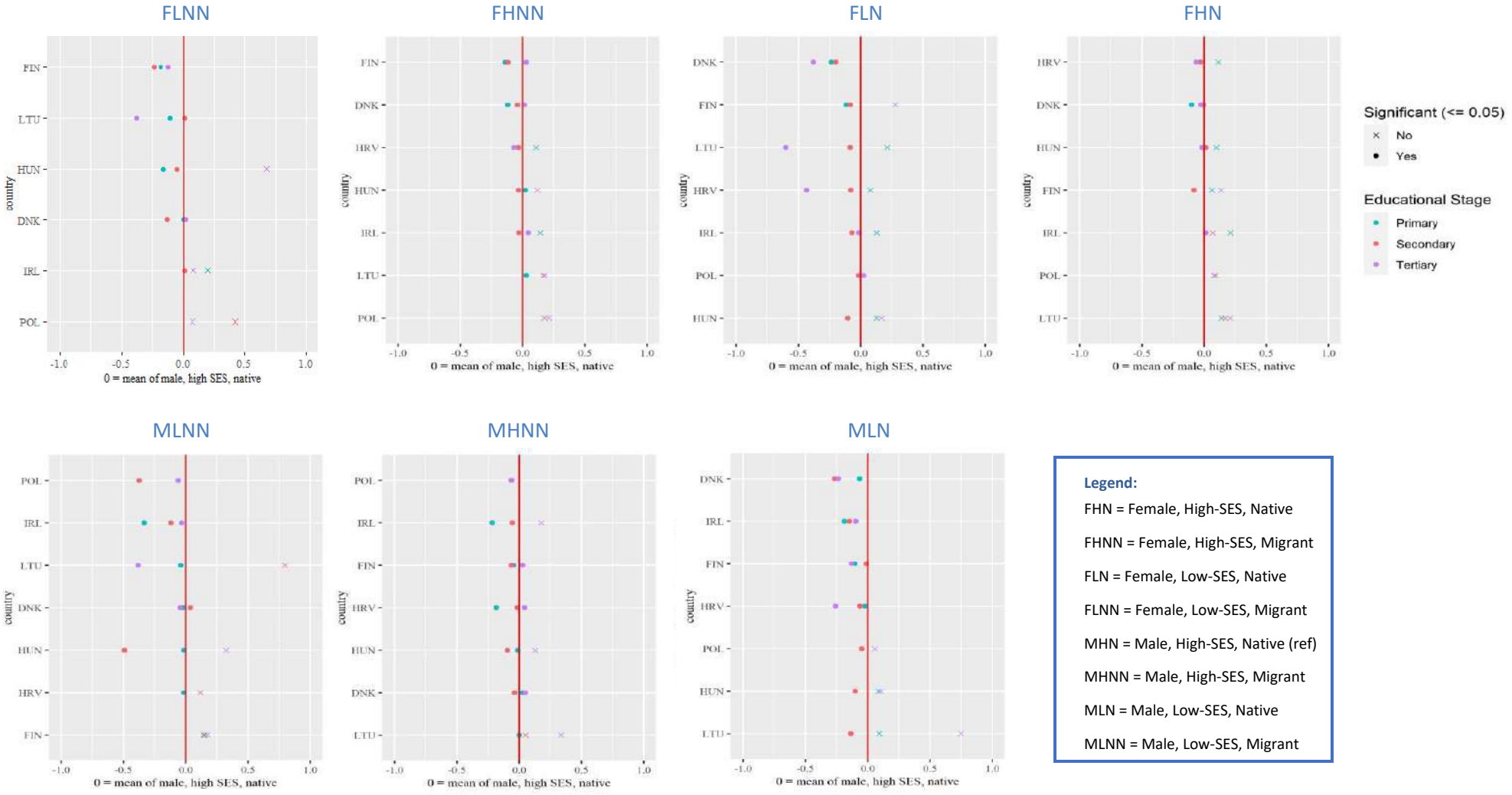
MHNN = Male, High-SES, Migrant

MLN = Male, Low-SES, Native

MLNN = Male, Low-SES, Migrant

Data sources: https://www.iea.nl/studies/iea/timss; https://www.oecd.org/pisa/; https://www.eurostudent.eu/

Figure 5b: Patterns of intersectional inequalities in the sense of belonging across primary, secondary, and tertiary stages of education system (second specification of SES)



Data sources: https://www.iea.nl/studies/iea/timss; https://www.oecd.org/pisa/; https://www.eurostudent.eu/

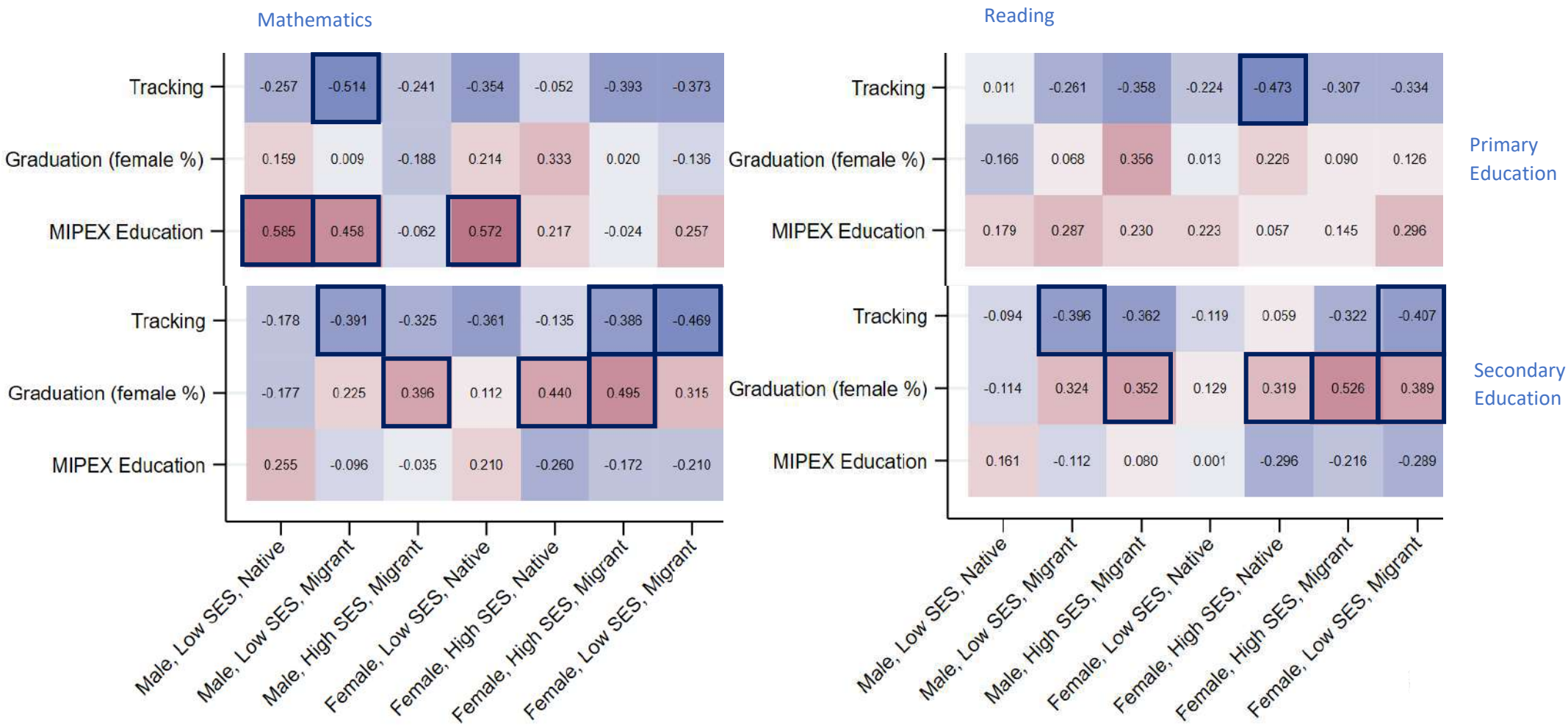
6.2 Second-step results: Explanations for cross-national differences in intersectional inequalities

In the next step, we seek to explain the variation in the extent of intersectional inequalities across the countries through a number of country-level characteristics. These are the extent to which the secondary education in a country is stratified, the extent to which countries' tertiary education is open to women and finally the extent to which countries are responsive to the need of immigrant children.

Results of the bivariate correlations between the intersectional inequalities in math, reading and the sense of belonging can be found in Figures 6-8, which are organized in a form of heat plots. Heat plots visualize stronger correlations in brighter colors, where positive correlations are depicted by reddish colors and negative correlations by bluish ones. Statistically significant correlations are highlighted in yellow squared. Figure 6 indicates a particular importance of tracking in amplification of inequalities in scholastic achievement (both math and reading). Apparently, in more stratified education systems, the disadvantages of more vulnerable groups (e.g., low-SES boys/young men with migration background) become more salient, whereas advantages of more privileged groups (e.g., high-SES young women/girls without migration background), particularly in mathematics, are reduced. Tracking seems to be strongly associated with intersectional inequalities at the secondary level of education (as compared to the primary level) and when applying the second SES specification.

The picture is more ambiguous when it comes to the indicator pertaining to female representation in tertiary education (Figure 7). The openness of tertiary education for women seems to matter for the reduction of the gender-related intersectional inequalities in scholastic achievements, more so at the secondary level and in the second SES specification. However, the patterns of correlation are mixed when it comes to students' sense of belonging to school or educational institutions.

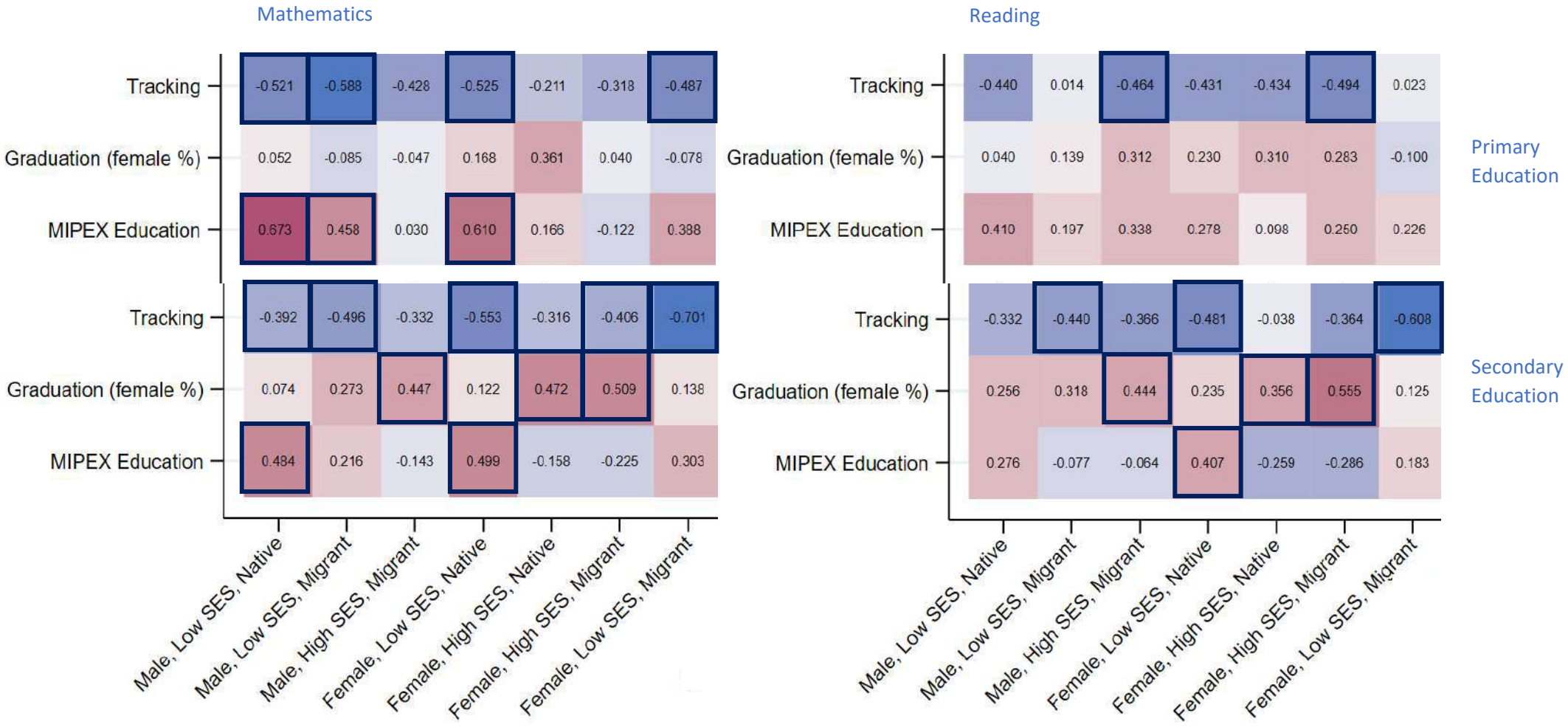
Figure 6: Bivariate correlations between the intersectional inequalities and the macro-level indicators in scholastic achievements (first specification of SES)



Note: Correlation coefficients in dark blue box are statistically significant ($p < .05$).

Data sources: https://www.iea.nl/studies/iea/pirls; https://www.iea.nl/studies/iea/timss; https://www.oecd.org/pisa/; https://thijsbol.com/data/; https://mipex.eu/; http://data.uis.unesco.org/

Figure 7: Bivariate correlations between the intersectional inequalities and the macro-level indicators in scholastic achievements (second specification of SES)



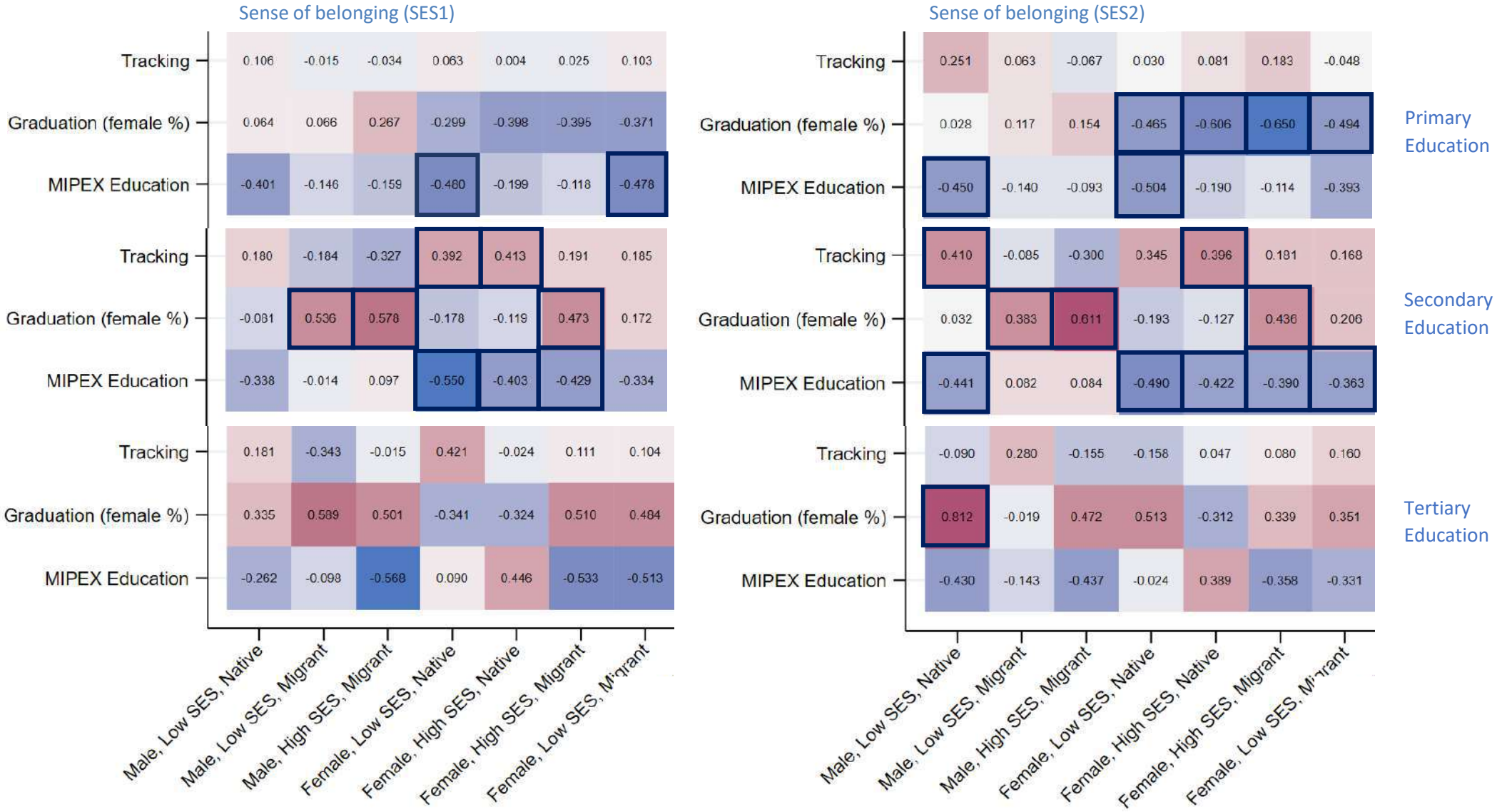
Note: Correlation coefficients in dark blue box are statistically significant ($p < .05$).

Data sources: https://www.iea.nl/studies/iea/pirls; https://www.iea.nl/studies/iea/timss; https://www.oecd.org/pisa/; https://thijsbol.com/data/; https://mipex.eu/; http://data.uis.unesco.org/

Finally, the bivariate correlation analyses with the indicator related to the responsiveness of education systems towards the needs of immigrant students produce mixed results (see Figure 8). In countries with more responsive education systems, immigrant status-related intersectional inequalities appear to be smaller in math at the primary level, but the indicator of responsiveness of host-countries' education systems seems to matter less at the secondary level. In terms of the sense of belonging, the patterns of correlations are counterintuitive: in countries with more responsive education systems, intersectional inequalities in terms of students' sense of belonging are larger.

So far, we explored the bivariate correlations between all macro-level indicators and all intersectional inequalities. Since some macro-level indicators capture structures and policies catering to specific intersectional groups, a more targeted modelling approach seems to be more appropriate. Therefore, in the multivariate analyses (second step of the multilevel modelling), we adopt a strategy in which the macro-level indicators are used as predictors in the models, in which an intersectional group, targeted by the policies/structures represented by the indicator, is present. For example, when analysing gender-related intersectional inequalities, i.e., the gaps between the benchmark of high-status young men/boys without a migration background and (1) high-SES females without migration background, (2) high-SES females with migration background, (3) low-SES females without migration background or (4) low-SES females with migration background, we introduce the female percentage of the graduation ratio from ISCED 6/7 in tertiary education. This predictor is introduced only into the regression equations containing the above-mentioned contrasts as dependent variables. Following a similar logic, the variable capturing the responsiveness of the country's education system towards the need of immigrants' children (a MIPEX score) enters regressions, in which all intersectional inequalities containing migration status are present. Finally, the index of tracking at the secondary level of education is included into the regressions focusing on the intersectional inequalities along the dimension of SES.

Figure 8: Bivariate correlations between the intersectional inequalities and the macro-level indicators in sense of belonging



Note: Correlation coefficients in dark blue box are statistically significant ($p < .05$).

Data sources: https://www.iea.nl/studies/iea/timss; https://www.oecd.org/pisa/; https://www.eurostudent.eu/; https://thijsbol.com/data/; https://mipex.eu/; http://data.uis.unesco.org/

When interpreting the results of the macro-level predictors, we should first pay attention to the intercept of each model. It reflects the size of the gap between the intersectional group in question and the benchmark of the high-SES native-born boys/young men in an average country (average with respect to the macro-level characteristics included in the model). Negative values of the constant signify that a group in question is disadvantaged compared to the benchmark regarding the dependent variable, whereas positive values pertain to the group's advantageous outcomes.

Turning to the results of the multivariate results, we notice the following trends. For the first SES specification (Table 1a), we observe that **immigrant inclusion practices** in school are positively correlated with the math gap for low-SES young men with migration background in primary school. In other words, a large negative gap between low-SES migrant males and the benchmark of high-SES native males tends to narrow in countries with more developed policies targeting ethnic minority inclusion at school. In the secondary school, the cross-national variation in mathematics score gaps between intersectional groups and high-SES native young men are primarily explained by the extent to which secondary school is tracked: in countries with more **pronounced tracking**, evident math score gaps to the disadvantage of low-SES young men and women with migration background become even larger, hence further increasing the disadvantage of these groups. In addition, we observe a reduction of the gap in math scores for high-SES young women with and without migration background in countries with **higher female graduation rates**. In countries with female-inclusive tertiary education, girls and young women from high-SES families seem to perform better in mathematics.

Table 1a: Mathematics score gap between intersectional groups and High SES Native Male (ref.) in primary and secondary education (SES Specification 1)

	(1) MLN	(2) MHNN	(3) FHN	(4) MLNN	(5) FLN	(6) FHNN	(7) FLNN
Primary level							
Tracking	-2.668			-4.815	-3.641		-4.724
	(2.47)			(2.68)	(3.48)		(4.02)
MIPEX		-0.024		0.242*		-0.016	0.130
Education		(0.09)		(0.11)		(0.08)	(0.13)
Graduation			0.195		0.036	0.049	-0.431
(female %)			(0.11)		(0.37)	(0.17)	(0.41)
Constant	-39.134***	-14.093***	-9.268***	-54.687***	-47.012***	-21.824***	-62.137***
	(2.60)	(2.03)	(1.21)	(2.66)	(2.91)	(2.00)	(2.93)
N	20	24	23	20	19	23	19
Secondary level							
Tracking	-1.530			-7.033*	-3.324		-7.732*
	(1.58)			(2.84)	(2.02)		(3.44)
MIPEX		-0.013		-0.123		-0.103	-0.203
Education		(0.11)		(0.12)		(0.10)	(0.12)
Graduation			0.209**		0.033	0.587**	0.262
(female %)			(0.07)		(0.15)	(0.18)	(0.23)
Constant	-30.344***	-13.939***	-5.910***	-46.745***	-39.048***	-17.424***	-57.217***
	(1.57)	(2.41)	(0.84)	(2.63)	(1.71)	(2.36)	(2.62)
N	29	34	33	29	27	32	27

* p<.05, ** p<.01, *** p<.001
Standard errors in parentheses
Model abbreviations: M = Male, F = Female, H = High SES, L = Low SES, N = Native, NN = Non-native High SES = ISCED level 5+, Low SES = ISCED level 0-4

The results for math score gaps based on the second SES specification (see Table 1b) mimic the results based on the first SES specification in all macro-level indicators. In addition, it is noticeable that applying this SES-specification produces more significant correlations between the intersectional inequalities and macro-level indicators. In particular, the extent to which secondary education is tracked is associated with increasing disadvantages among low-SES native-born students of both genders in math performance both at the primary and secondary levels. Furthermore, in this specification, MIPEX score is positively—albeit not strongly—associated with the gap in math at the secondary level among low-SES young women with migration background, thus contributing to the reduction of the gap for this group compared to the benchmark population of high-SES native young men.

Table 1b: Mathematics score gap between intersectional groups and High SES Native Male (ref.) in primary and secondary education (SES Specification 2)

	(1) MLN	(2) MHNN	(3) FHN	(4) MLNN	(5) FLN	(6) FHNN	(7) FLNN
Primary level							
Tracking	-8.991*			-8.927	-11.159*		-7.596
	(3.38)			(4.28)	(4.61)		(5.01)
MIPEX		0.012		0.404*		-0.048	0.190
Education		(0.08)		(0.18)		(0.09)	(0.17)
Graduation			0.188		-0.470	0.051	-0.666
(female %)			(0.10)		(0.52)	(0.21)	(0.53)
Constant	-37.567***	-14.599***	-8.345***	-51.598***	-46.087***	-21.806***	-55.954***
	(3.60)	(2.02)	(1.15)	(4.31)	(3.85)	(2.31)	(3.80)
N	19	23	22	19	18	22	18
Secondary level							
Tracking	-6.341*			-8.517**	-10.119*		-8.094**
	(2.99)			(2.67)	(3.81)		(2.80)
MIPEX		-0.080		0.184		-0.157	0.280*
Education		(0.11)		(0.14)		(0.11)	(0.12)
Graduation			0.213**		-0.083	0.664**	0.142
(female %)			(0.06)		(0.27)	(0.19)	(0.15)
Constant	-42.851***	-13.533***	-7.089***	-53.423***	-54.632***	-19.078***	-68.490***
	(2.91)	(2.41)	(0.80)	(2.75)	(3.16)	(2.48)	(2.52)
N	29	34	33	29	27	32	27

* p<.05, ** p<.01, *** p<.001
Standard errors in parentheses
Model abbreviations: M = Male, F = Female, H = High SES, L = Low SES, N = Native, NN = Non-native High SES = ISCED level 3+, Low SES = ISCED level 0

Table 2a: Reading score gap between intersectional groups and High SES Native Male (ref.) in primary and secondary education (SES Specification 1)

	(1) MLN	(2) MHNN	(3) FHN	(4) MLNN	(5) FLN	(6) FHNN	(7) FLNN
Primary level							
Tracking	0.114			-2.092	-1.249		0.080
	(1.80)			(2.59)	(2.57)		(3.87)
MIPEX		0.089		0.134		0.052	0.229
Education		(0.10)		(0.11)		(0.13)	(0.13)
Graduation			0.192		0.199	0.211	0.677
(female %)			(0.12)		(0.25)	(0.25)	(0.37)
Constant	-39.070***	-13.529***	13.288***	-61.976***	-24.270***	-2.166	-45.872***
	(1.95)	(2.37)	(1.42)	(2.67)	(2.27)	(3.06)	(3.07)
N	20	23	22	20	19	22	19
Secondary level							
Tracking	-0.769			-7.974*	-1.125		-8.075
	(1.58)			(3.05)	(2.67)		(3.97)
MIPEX		0.041		-0.149		-0.147	-0.304*
Education		(0.12)		(0.13)		(0.11)	(0.14)
Graduation			0.221		0.137	0.702***	0.452
(female %)			(0.11)		(0.19)	(0.19)	(0.26)
Constant	-36.308***	-14.293***	37.053***	-49.667***	0.343	24.893***	-16.479***
	(1.57)	(2.64)	(1.39)	(2.82)	(2.26)	(2.48)	(3.02)
N	29	34	33	29	27	32	27

* p<.05, ** p<.01, *** p<.001
Standard errors in parentheses
Model abbreviations: M = Male, F = Female, H = High SES, L = Low SES, N = Native, NN = Non-native High SES = ISCED level 5+, Low SES = ISCED level 0-4

Regarding the reading competence gaps between intersectional groups and the benchmark of high-SES native boys, we observe no significant associations with the macro-level variables at the primary level in both SES specifications. At the secondary level, results demonstrate that tracking plays a significant role in increasing disadvantages of low-SES male migrants (as indicated by the significantly negative intercept) (with the first SES specification, see Table 2a) and additionally among low-SES female migrants (with the second SES specification, see Table 2b).

We further learn that in countries with higher female graduation rates, high-SES female immigrants (according to the first SES specification) and high-SES native young women (according to the second SES specification)—the two groups, which are either no different or perform better compared to the benchmark—increase their advantages over high-SES young men without migration background in their reading competences.

Table 2b: Reading score gap between intersectional groups and High SES Native Male (ref.) in primary and secondary education (SES Specification 2)

	(1) MLN	(2) MHNN	(3) FHN	(4) MLNN	(5) FLN	(6) FHNN	(7) FLNN
Primary level							
Tracking	-5.672			0.798	-7.985		0.226
	(3.30)			(4.64)	(4.54)		(4.97)
MIPEX		0.146		0.178		0.160	0.282
Education		(0.09)		(0.21)		(0.13)	(0.18)
Graduation			0.153		0.009	0.424	0.324
(female %)			(0.10)		(0.41)	(0.26)	(0.47)
Constant	-35.731***	-21.117***	15.110***	-53.189***	-20.994***	-6.097	-41.953***
	(3.44)	(2.25)	(1.17)	(4.98)	(3.80)	(3.13)	(4.02)
N	20	23	22	20	19	22	19
Secondary level							
Tracking	-4.680			-9.826**	-7.371		-9.652*
	(2.53)			(3.45)	(3.77)		(3.87)
MIPEX		-0.045		0.022		-0.221	0.020
Education		(0.12)		(0.18)		(0.11)	(0.15)
Graduation			0.233*		0.128	0.803***	0.310
(female %)			(0.11)		(0.26)	(0.20)	(0.24)
Constant	-47.755***	-13.024***	36.700***	-54.903***	-14.494***	24.833***	-26.511***
	(2.43)	(2.72)	(1.34)	(3.46)	(3.11)	(2.57)	(3.24)
N	29	34	33	29	27	32	27

* p<.05, ** p<.01, *** p<.001
Standard errors in parentheses
Model abbreviations: M = Male, F = Female, H = High SES, L = Low SES, N = Native, NN = Non-native High SES = ISCED level 3+, Low SES = ISCED level 0-2

Table 3a: Sense of belonging gap between intersectional groups and High SES Native Male (ref.) in primary, secondary and tertiary education (SES Specification 1)

	(1) MLN	(2) MHNN	(3) FHN	(4) MLNN	(5) FLN	(6) FHNN	(7) FLNN
Primary level							
Tracking	0.012			-0.025	0.029		-0.009
	(0.03)			(0.04)	(0.05)		(0.03)
MIPEX		-0.001		-0.002		-0.000	-0.002*
Education		(0.00)		(0.00)		(0.00)	(0.00)
Graduation			-0.005		0.000	-0.006*	-0.003
(female %)			(0.00)		(0.01)	(0.00)	(0.00)
Constant	-0.082**	-0.122***	0.119***	-0.167***	0.037	0.003	-0.035
	(0.03)	(0.02)	(0.03)	(0.04)	(0.04)	(0.03)	(0.03)
N	19	23	22	19	18	22	18
Secondary level							
Tracking	0.010			-0.030	0.042		0.034
	(0.01)			(0.02)	(0.02)		(0.03)
MIPEX		0.000		-0.001		-0.002*	-0.001
Education		(0.00)		(0.00)		(0.00)	(0.00)
Graduation			-0.001		-0.000	0.004**	0.004
(female %)			(0.00)		(0.00)	(0.00)	(0.00)
Constant	-0.069***	-0.055**	0.035*	-0.110***	-0.042*	-0.035*	-0.087**
	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)	(0.03)
N	29	34	33	29	27	32	27
Tertiary level							
Tracking	0.038			-0.038	0.049		0.031
	(0.05)			(0.06)	(0.07)		(0.09)
MIPEX		-0.004*		0.001		-0.003*	-0.004
Education		(0.00)		(0.00)		(0.00)	(0.00)
Graduation			0.003		0.001	0.002	0.006
(female %)			(0.00)		(0.01)	(0.00)	(0.01)
Constant	-0.089	0.009	0.011	-0.064	-0.052	0.015	-0.135
	(0.04)	(0.04)	(0.03)	(0.05)	(0.06)	(0.02)	(0.07)
Observations	8	11	11	8	8	11	8

* p<.05, ** p<.01, *** p<.001
Standard errors in parentheses
Model abbreviations: M = Male, F = Female, H = High SES, L = Low SES, N = Native, NN = Non-native
High SES = ISCED level 5+, Low SES = ISCED level 0-4

Table 3b: Sense of belonging gap between intersectional groups and High SES Native Male (ref.) in primary, secondary and tertiary education (SES Specification 2)

	(1) MLN	(2) MHNN	(3) FHN	(4) MLNN	(5) FLN	(6) FHNN	(7) FLNN
Primary level							
Tracking	0.046			-0.012	0.009		-0.031
	(0.03)			(0.03)	(0.04)		(0.04)
MIPEX		-0.001		-0.001		-0.000	-0.003
Education		(0.00)		(0.00)		(0.00)	(0.00)
Graduation			-0.007**		-0.007	-0.007**	-0.003
(female %)			(0.00)		(0.00)	(0.00)	(0.00)
Constant	-0.017	-0.114***	0.106***	-0.115**	0.043	0.008	0.031
	(0.03)	(0.02)	(0.02)	(0.03)	(0.04)	(0.02)	(0.03)
N	18	22	21	18	17	21	17
Secondary level							
Tracking	0.026			-0.038	0.034		0.055
	(0.02)			(0.04)	(0.03)		(0.04)
MIPEX		0.000		-0.001		-0.002*	-0.003
Education		(0.00)		(0.00)		(0.00)	(0.00)
Graduation			-0.001		-0.003	0.003**	0.010***
(female %)			(0.00)		(0.00)	(0.00)	(0.00)
Constant	-0.044*	-0.050**	0.032*	-0.112**	-0.063*	-0.027	-0.039
	(0.02)	(0.02)	(0.01)	(0.04)	(0.02)	(0.02)	(0.04)
N	29	34	33	29	27	32	27
Tertiary level							
Tracking	0.020			0.064	-0.002		0.009
	(0.18)			(0.05)	(0.10)		(0.08)
MIPEX		-0.003		-0.001		-0.002	-0.013*
Education		(0.00)		(0.00)		(0.00)	(0.00)
Graduation			0.001		0.002	0.003	0.010
(female %)			(0.00)		(0.01)	(0.00)	(0.00)
Constant	-0.114	0.008	0.037	-0.015	-0.011	0.016	-0.061
	(0.14)	(0.04)	(0.03)	(0.03)	(0.09)	(0.03)	(0.06)
Observations	8	11	11	8	8	11	8

* p<.05, ** p<.01, *** p<.001
Standard errors in parentheses
Model abbreviations: M = Male, F = Female, H = High SES, L = Low SES, N = Native, NN = Non-native
High SES = ISCED level 3+, Low SES = ISCED level 0-2

Results of the analyses pertaining to the sense of belonging in school or higher education, which are found in Tables 3a and 3b, remain rather surprising, as it has already been noticeable from the bivariate correlations. First, we observe significant correlations between the percentage of females among higher education graduates and the gap in sense of belonging between the intersectional group of high-SES young women with migration background and the high-SES young men without migration background at the primary and secondary levels. At the primary level, high-SES girls with migration background do not, on average, differ from the benchmark group in the sense of belonging. In countries with a higher proportion of women among tertiary graduates, the level of estrangement from school among high-SES immigrant girls goes up compared to the benchmark group of high-SES young men without migration background. At the secondary level, on the contrary, in countries with higher representation at the tertiary level, high-SES immigrant girls improve the sense of belonging to school compared to the benchmark group.

In countries, which are more inclusive towards immigrant children, high-SES female immigrants express a considerably lower sense of belonging to the education system at the secondary and tertiary levels of education compared to high-SES native-born men. In addition, low-SES girls with migration background experience stronger estrangement from school in countries with more inclusive education policies towards minorities.

Finally, similar effects for the openness of tertiary education towards women and inclusiveness of education system towards minorities are observed for low-SES female immigrants in secondary education and higher-SES male immigrants in tertiary education, respectively (according to the second SES specification, see Table 3a).

7 Discussion and conclusion

Contributing to the relatively new but growing body of research on intersectionality of educational inequalities, the current study examined intersectional inequalities along dimensions of migration background, gender, and SES. On the one hand, we focused on students competences in two key school subjects (mathematics and reading). On the other hand, we explored students' subjective feeling of belonging to school or university, a relatively underexplored dimension of educational inequality. We pursued three key descriptive research questions on (1) how intersectional inequalities vary in the analysed

outcomes, (2) across various stages in an educational career (at primary, secondary and tertiary levels) and (3) across countries. Analytically, the study engaged in providing explanations to the cross-national variation in intersectional inequalities in terms of countries' structural characteristics in the area of organization of secondary education (the extent of tracking at the secondary level), in the area of immigrants' inclusion (MIPEX educational inclusion score) and women's empowerment in terms of higher education (female representation among the tertiary education graduates). We analysed the best available standardized comparative datasets, such as PIRLS/TIMSS (for the primary level), PISA (for the secondary level) and EUROSTUDENT (for the tertiary level) and applied two-step multilevel modelling techniques.

Our key finding is that intersectional inequalities are quite pronounced both in scholastic competences and regarding the subjective perceptions of the school belonging. On average, intersectional inequalities in school subjects are larger at the secondary than the primary level, but there is considerable variation in this regard. Whereas in many countries, intersectional inequalities are larger at the primary level, in a number of countries, particularly the ones with more stratified education systems, intersectional inequalities appear to be higher at the secondary level of education. Our multivariate results confirm the role of tracking at the secondary level in exacerbating gaps in scholastic achievement among vulnerable intersectional groups. Noteworthy results could also be reported for the indicator related to the openness of the country's tertiary education for female students. In countries with a larger representation of female students at the tertiary level, girls and young women from high-SES families—both with and without migration background—tend to perform better in math. Seemingly, high-SES families in such countries are able to adopt viable strategies for their daughters to perform better in mathematics. Furthermore, we notice that in countries with more inclusive education policies, low-SES boys and young men with migration backgrounds manage to narrow the gap to the benchmark of high-SES boys/young men without migration background in mathematic competences. Overall, the macro-level indicators appear to be less powerful in explaining the intersectional inequalities in reading competences than in mathematics.

In terms of the sense of belonging, we observe pronounced school estrangement among vulnerable female intersectional groups. Policies directed to migrant educational inclusion in

school appear to play a minor (in terms of the effect size), but consistently contrary role: in countries with more inclusive education systems, a group of immigrant girls/young women still feels less belonging to school. It could be, that due to countries' pronounced inclusion policies, vulnerable intersectional groups might have a better access to higher levels of education, but due to insufficient scholastic achievements feel less belonging to school. Alternatively, such policies might be originally installed in reaction to weak scholastic performance and not in reaction to school estrangement among the disadvantaged students, even though both outcomes are correlated. As a consequence, those policies, which might be effective in improving the students' achievement, appear not well-suited to address the issue of school disengagement. Moreover, such programmes could even increase stigmatization among the affected groups, the stigmatization which is likely to get translated into students' lower sense of identification with school. Finally, such effects might concern predominantly foreign students in tertiary education institutions, who might have initial challenges getting adjusted to a new setting, given a certain likelihood of them arriving alone without any prior experiences in the host society, facing financial constraints, or being the first person in their family to ever pursue tertiary education, hence finding it difficult to navigate their way. Yet, the negative MIPEX effect is present at all levels of education and not only at the tertiary level. An exact mechanism cannot be established with the existing data and research design. To this end, panel data analyses trying to examine the cause and effect of the policies and their potential outcomes is are needed. We leave it to the future research to provide a more definitive explanation for the unexpected result regarding school belonging we encountered in our study.

These unexpected findings advise us to pay attention also to the meso-level: the quality of classroom interaction, personal guidance and pedagogical practices enacted in schools and higher education institutions. A key question is how sensitive teachers and broader educational communities are towards female and migrant students' needs and how they are able to support and guide them both in social and academic matters in schools and higher education. There might be further need to investigate the quality of classroom interaction between teachers and students as well as pedagogies and practices utilised in teaching and guidance. Also, the (female and migrant) students' own motivation and personal goal orientations play an important role in the construction of sense of belonging, and thus, it

would be important to explore them more thoroughly. In addition, it would be worthwhile to investigate students' broader social support networks to find out, how they may encourage schooling and education, and thus, contribute to the development of their sense of belonging in school and higher education. There might be a need to investigate both social and academic aspects related to sense of belonging, how they are constructed and how they are related to each other.

We further noticed that it matters for the results how student SES is operationalized. If the SES operationalization is skewed towards higher levels of education (i.e., tertiary-educated vs. rest) we are likely to detect somewhat smaller intersectional inequalities and less cross-national variation in patterns of such inequalities. Once SES is operationalized through the contrast of low-educated parents and the rest, the variation in intersectional inequalities becomes more pronounced and the macro-level variables contribute more to its explanation. Hence, our report empirically demonstrates the importance of operationalization choices in the study of social inequalities.

Our study is obviously not without limitations. Our analyses relied on the dichotomy of students with and without migration background without differentiating between those students who migrated themselves and those whose parents were immigrants. Further, we do not take into account cross-national differences in the composition of immigrants by their country of origin, ethnic or racial background or legal status (e.g., refugee or economic migrant), differences, which were shown to matter for academic achievements (Levels and Dronkers 2008). The comparability of the results across the datasets and therefore across the levels of education remains an issue. Particularly important would be to explore the degree of student selectivity by the SES, migration background and gender across the educational stages. It could be expected that students who endured (intersectional) educational inequalities during compulsory education are less likely to enter tertiary education. This makes the student body a rather select group and masks the true extent of intersectional inequality. Future research should apply appropriate modelling techniques to deal with this issue. Further improvement of the methodology in needed as well as extensive sensitivity and robustness checks with regard to various plausible values of the test scores, alternative multilevel modelling strategies, and research designs. Furthermore, taking into account the cross-

national variation in the macro-level variables would improve the estimates – a task, which we leave for future research.

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9 Appendix

Data Information Table A: Available countries across educational stages

Country	Primary Education	Secondary Education	Tertiary Education
Australia	-	✓	-
Austria	✓	✓	-
Bulgaria	✓	✓	-
Canada	✓	✓	-
Croatia	✓	✓	✓
Cyprus	✓	-	-
Czech Republic	✓	✓	-
Denmark	✓	✓	✓
Estonia	-	✓	✓
Finland	✓	✓	✓
France	✓	✓	-
Germany	✓	✓	-
Greece	-	✓	-
Hungary	✓	✓	✓
Iceland	✓	✓	-
Ireland	✓	✓	✓
Italy	✓	✓	-
Liechtenstein	-	✓	-
Latvia	✓	✓	-
Lithuania	✓	✓	✓
Luxembourg	-	✓	✓
Malta	✓	✓	-
Netherlands	✓	✓	✓
New Zealand	✓	✓	-
Norway	✓	✓	-
Poland	✓	✓	✓
Portugal	✓	✓	-
Romania	✓	✓	-
Slovakia	✓	✓	-
Slovenia	✓	✓	✓
Spain	✓	✓	-
Sweden	✓	✓	-
Switzerland	-	✓	-