

# Immigrant students in Europe suffer from lower grades: some social and scholastic features are the key to explain it



POLITECNICO  
MILANO 1863

## ABSTRACT

High School years are a fundamental stage of development for everyone, and it is in the interest of every country to ensure that all students have access to the best possible education and are well integrated into the social system. We analyzed data related to students of 15 years of age coming from European countries which have a significant number of immigrant students. We observe that immigration is a huge factor limiting foreign students from achieving the same results of their native peers. This trend is common to most countries across Europe, but for some worse than others. In this study we aimed at investigating quantitatively the reasons behind these differences.

## INTRODUCTION

Our dataset is based on some questionnaires' answers of students, their parents, and their school's staff, regarding both their scholastic knowledge and social and psychological conditions. After exploring the dataset and analyzing it through MANOVA tests and Clustering methods, we focused on students' scores in Math and Reading. Indeed, native and immigrant students show consistent differences in terms of their results. Then through Linear Models, we identified the main covariates responsible of the students scores to understand where to act to help struggling students, often immigrant, in the most effective way. Finally, through Linear Mixed Models we clustered schools based on their contribution to the scores and using Multinomial Logistic Regression we identified the key characteristics which allow the “better” schools to help their students.

## MATERIALS & METHODS

### Data Selection

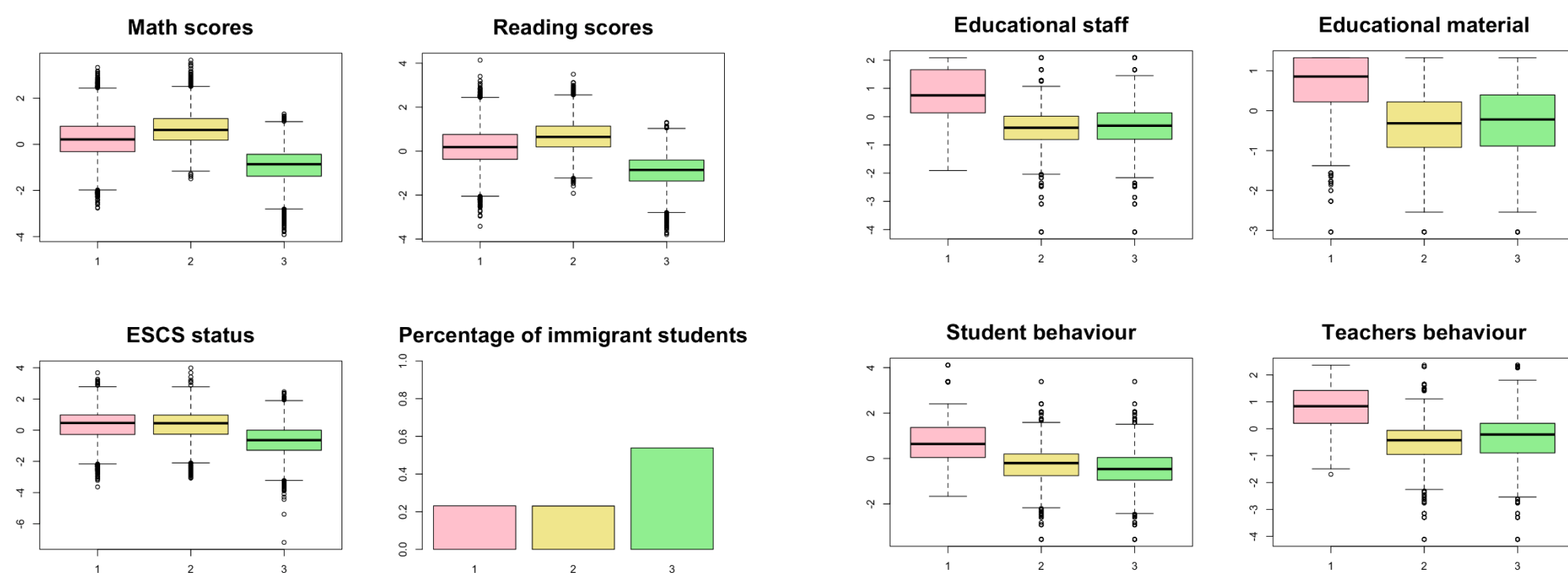
Starting from the data of Pisa' OECD program of 2018, which contains student and school answers to standardized questionnaires, we restricted our analysis to 10 selected countries which had a sufficient sample of immigrant students: Austria, Belgium, Switzerland, Germany, Denmark, Spain, Great Britain, Italy, Luxemburg, Sweden. Some questionnaires' answers were already grouped in aggregated features. The features we selected range over many fields: ESCS status (index of economic, social, and cultural status), immigration status, teacher support, sense of belonging, class size, at home weekly learning time, etc.



### Clustering

Investigating the dataset through k-means we identified 3 clusters of students.

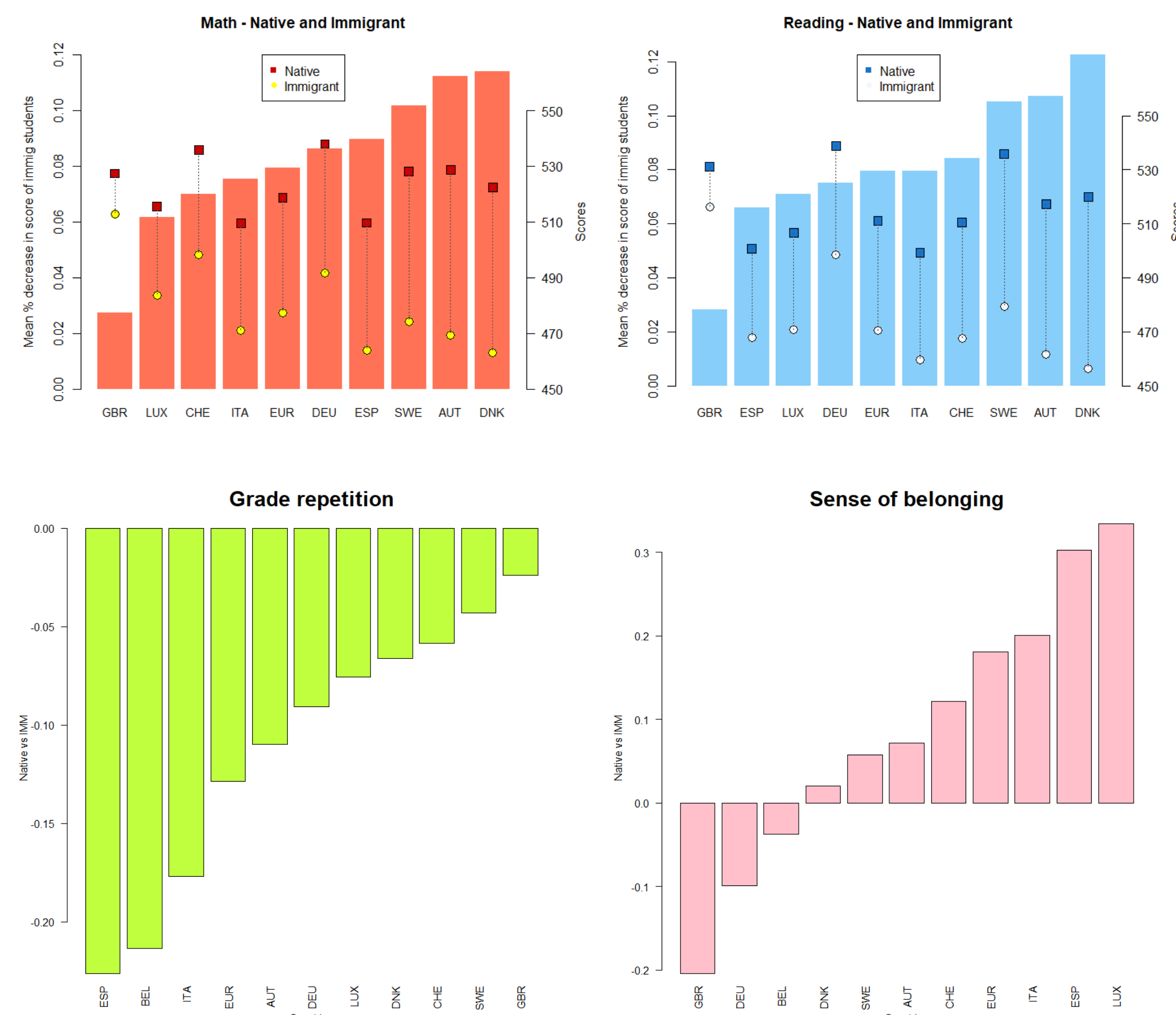
*The cluster with the worst math and reading scores contains 54% of the total number of immigrants, while the best contains only 23% of them. Moreover, the clusters show that most immigrant students attend poorer schools with a shortage of material and staff, and a school climate that hinders learning.*



### MANOVA

To confirm the qualitative results observed through clustering we performed MANOVA tests on the main features of interest.

*For all countries (except Great Britain) we found statistical evidence at level 95% that immigrant students have lower mean scores in both Math and Reading. By ranking the differences in scores, we see that Great Britain is first while Denmark is last. Similar differences are found also for other features such as ESCS status, sense of belonging in school, grade repetition percentages. On the other hand, weekly times spent studying are consistently higher for immigrant students compared to native, which excludes lack of commitment as the motivation behind lower scores.*



### Linear Models

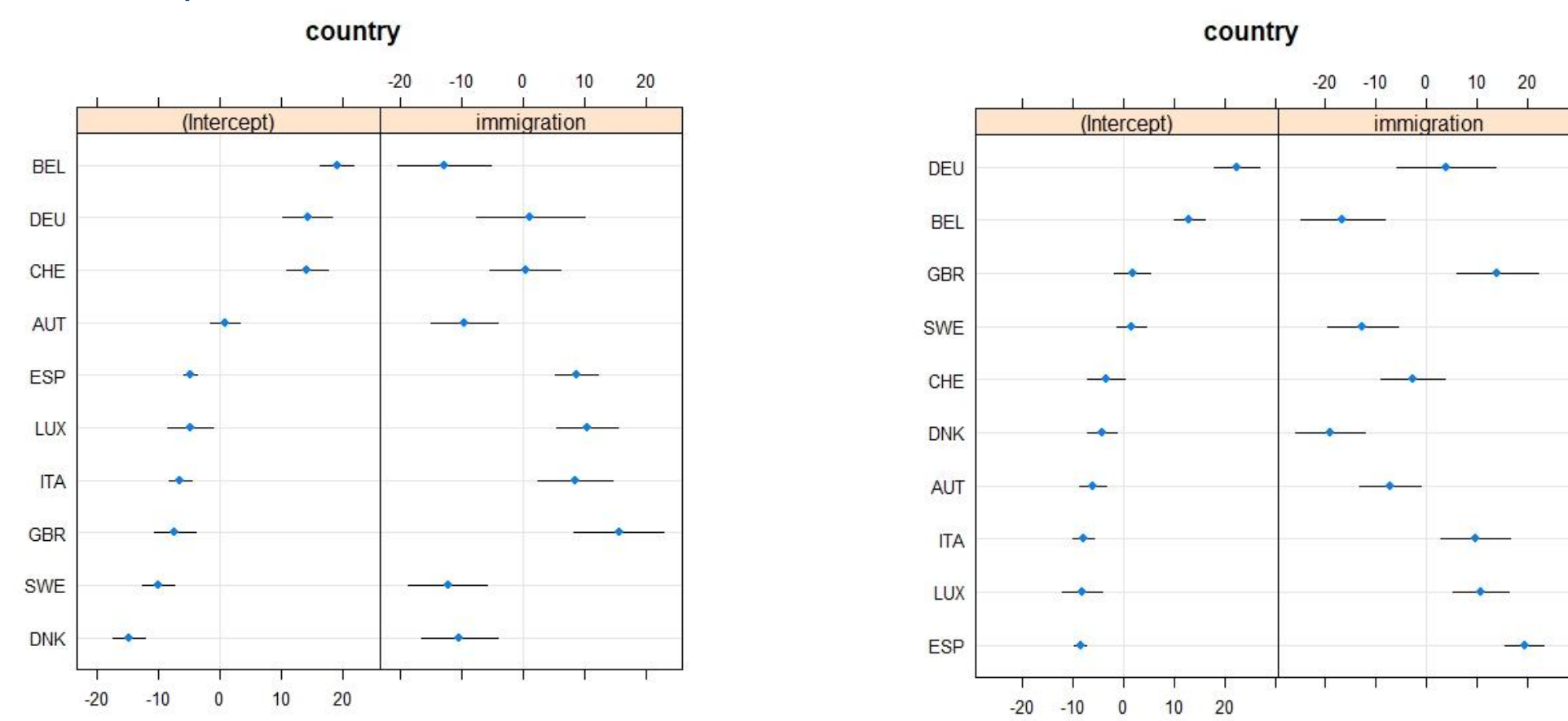
To find the features mainly responsible of scholastic success we focused on three datasets: our complete dataset, Great Britain as an example of a country with good integration, and Denmark as one with more integration issues.

*For immigrant students some of the main negative regressors are: not speaking the country's language at home, having parents who are not highly educated and being bullied at school. Moreover, schools with a shortage of educational material and staff influences their students' achievements, especially if they are immigrant since they might need additional attention from teachers. From the separate analysis of Great Britain, we noticed that 'immigration' and most of its interaction effects were not significant anymore, as expected. The key factors are instead schools' resources and ESCS status. On the contrary, in Denmark being an immigrant has a strong negative effect, worsened by the interaction with other covariates such as the student-teacher ratio in schools and the emotional status of the students.*

### Linear Mixed Models

Since our data offers some grouping possibilities (by country and by schools) we extended our Linear Models into Linear Mixed Models aggregating the observations firstly by countries and adding a random slope associated with the variable immigration. Secondly, we grouped the datasets of Great Britain and Denmark by schools; to observe what schools in these countries do differently to help their students we used Multinomial Logistic Regression, as explained in the next section.

*The random effect given by the country grouping is significant and adding the immigration random slope increases its relevance. The Percentage of Variance explained by the Random Effect (PVRE) goes from 2.3% to 4.4% for math and from 1.5% to 4.3% for reading. By plotting the random coefficients of the two models, it's clear how being an immigrant living in Great Britain has a positive effect on the school performances while living in Denmark has a negative one with respect to the mean.*



### Multinomial Logistic Regression

We implemented two mixed models for the schools of Great Britain and Denmark (see previous section), then for each we divided the schools in three clusters: those with a positive random intercept, those with no significant effect, and those with negative intercept. We then identified the different characteristics of the “better” and “worse” schools through Multinomial Logistic Regression. Indeed, the outputs of these models assign at each covariate a coefficient representing their contribution in increasing the probability of being assigned to a better or worse school.

*We notice that in Great Britain the better and worse schools have similar characteristics, except for higher ESCS status of the students and larger educational staff, which might give more attention to students' individual issues. This is also true in Denmark, but in the worse schools there is also a relevant worsening of the school climate and, as expected, being an immigrant student increments the probabilities of being assigned to the worse schools. Indeed, in Denmark the worse schools have a higher percentage of immigrant students.*



DNK math	Worse Schools	Better Schools	GBR math	Worse Schools	Better Schools
emo_sup	-0,2137	-0,2131 *	fear_failure	-0,1023	0,1595 *
class_size	0,1340 ***	0,4796 ***	stud_teach_ratio	-0,2209 ***	-0,1460 ***
stud_teach_ratio	0,0065 ***	0,1527 ***	short_edu_mat	0,5528 ***	0,4548 ***
short_edu_mat	-1,1037 ***	-0,4795 ***	short_edu_staff	-0,0284	-0,9470 ***
short_edu_staff	0,0698	-0,6047 ***	stu_behav	0,3217 **	-1,0387 ***
stu_behav	0,3716 *	-1,5763 ***	teach_behav	-0,4717 ***	0,7049 ***
teach_behav	0,3021	0,5376 ***	ESCS_status	-0,3464 ***	0,8281 ***
ESCS_status	-0,2458	0,5188 ***			
immigration	0,5500 *	-0,3291			

DNK read	Worse Schools	Better Schools	GBR read	Worse Schools	Better Schools
belonging	0,2816 *	0,1314	fear_failure	-0,0092	0,1815 *
teacher_support	-0,3892 *	-0,0440	belonging	0,0571	0,2045 *
stud_teach_ratio	0,0208 ***	0,0552 ***	bullied	0,2552 *	0,0101
short_edu_mat	-0,8306 ***	-1,3913 ***	teacher_support	0,3546 **	0,0312
short_edu_staff	0,5502 ***	-0,2738	class_size	0,1162 ***	-0,0728 ***
teach_behav	0,0440	-0,6213 **	stud_teach_ratio	-0,3541 ***	-0,1035 ***
ESCS_status	0,4883 *	0,3351	short_edu_mat	0,2069 ***	0,6265 ***
			short_edu_staff	-0,0264	-1,0375 ***
			stu_behav	0,8385 ***	-1,2998 ***
			teach_behav	-0,3180	1,3167 ***

## CONCLUSION

Through our analysis we highlighted the differences between immigrant students and native students and provided the main factors which contribute to their scholastic success. The main findings were that immigrant students have lower scores even though they study significantly more. They often have a lower social status, lower academic support, higher rates of grade repetition and lower sense of belonging to their schools. These results are aligned with the main studies on the subject and highlight a problem in integration of many countries in the European area.

What can schools do to improve?

- Encourage teachers to identify students who need language training.
- Retain and attract more advantaged students in schools that also host immigrant students. For example, schools in disadvantaged areas can make their curricula more appealing to students from across the socio-economic spectrum by offering special mathematics, science and/or art courses.
- Reduce the use of grade repetition. Instead, identify struggling students early and offer them extra support.

What can countries do?

- Integrate language and subject learning from the earliest grades.
- Provide information to immigrant parents on the schooling options available for their children and help parents to overcome financial and/or logistical barriers to access the school of their choice. Limit the extent to which advantaged schools can select students based on socio-economic status.

## REFERENCES

- OECD PISA Database, <https://www.oecd.org/pisa/data/>
- Helping immigrant students to succeed at school – and beyond, OECD 2015

### Group members

Giulia Bergonzoli  
Ettore Busani  
Sebastian Castellano  
Lucia Gregorini

### Tutor

Chiara Masci

### Professor

Piercesare Secchi