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Migrants in Education – what factors are important?

A study of European countries participating in TIMMS2007

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Executive summary

The present report is a study on migrant students' overall mathematical ability and on what factors are important for their achievement. The study is generally motivated by the increasing level of migration. This is a trend with implications for students, teachers, schools and educational systems in many countries worldwide. The general pattern of lower educational achievement for migrant students is another motive. The gap is considerable in many countries and there is a need to know which factors are important for migrant students' educational achievement. Achievement differences might be argued to be important predictors of the long-term mobility prospects of immigrants and their integration into the host society[1]. The focus on mathematical achievement is interesting also since migrant students' knowledge in this subject might be less depending on their proficiency in the language of the host country.

TIMSS2007[2] is used as an empirical base for this study. TIMSS is conducted by the IEA organization[3] and focuses on students in schools' grade four. An increasing number of researchers make use of these large-scale studies in education which reflects their general high quality in assessing student ability as well their richness in terms of background information to shed light on what matters for student achievement[4]. Researchers have used the comparative studies in education also for studying migrant students' achievement[5].

This report focuses on 12 European countries that participated in TIMSS2007. The criterion set for country inclusion was a minimum of 3 percent migrant students in the sample. The analysis performed involves a multilevel analytical approach, motivated by the design of TIMSS which involves factors at the different levels of individual students, teaching and classroom and school respectively. Considering the different levels the analyses performed in this report have demonstrated a comparably larger impact of the factors at the individual student level. However, there are as well factors of importance at both the level of classroom and teaching and at school.

The factors included at the individual student level reduce the initial average gap between native and migrant students overall mathematical achievement substantially. As well the initial difference between 1st and 2nd generation migrant students is affected. Assets at home, such as having access to a pc and internet, a dictionary, a study desk and a calculator are all important as is also the significance of having books at home. Especially pronounced is the negative effect of having few books at home. Language spoken at home does have an impact on students overall

1 Buchmann, C and Parrado, E (2006)
2 TIMSS: Trends in International Mathematics and Science Study, www.iea.nl/timss_2007.html
3 IEA: International Association for the Evaluation of Educational Achievement www.iea.nl
4 Rutkowski, L, Gonzalez, E, Joncas, M and von Davier, M (2010)
5 See for instance Schnepf, S (2008), OECD (2006), Schneeweis, N (2011)

mathematical achievement, and is especially important for 2nd generation migrant students.

At the level of classroom and teaching, teachers formal education and/or their specialization in math as well as their preparedness to teach are significantly affecting students overall mathematical achievement. Some teaching practices matters as well, as for example to use a book as main tool in teaching. The use of a book is of special significance for migrant students. An important factor is also the student composition in class, as part of the context for studying.

Teachers' higher expectations of students' achievement is an important factor at the level of school and so is also the school context in terms of student composition. Both of these factors are comparatively more important for migrant students. To be student in a school with a high proportion of students from economically disadvantaged family backgrounds has a negative effect which increases with a higher proportion of migrant students. This is an effect over and above students own social backgrounds. Schools characterized by teachers having high expectations on students' study performance, has a positive effect on students overall mathematical achievement. The practice of schools to group students according to ability levels as well as the use of remedial materials are however negatively related with students overall math achievement. Conversely the use of enrichment material is positive for students' achievement in math.

Introduction

Entering as an immigrant to live and study in another country puts special demands on families and students. The increasing level of migration is a trend experienced in many countries worldwide[6] which has general implications for educational systems. An immediate consequence of migration is an increasing ethnic and linguistic diversity represented in schools. Although immigration might be described as a local phenomenon with large variations between countries, teaching migrant students is becoming an important part of reality facing teachers every day[7]. A majority of schools have or will have a more mixed student population as opposed to only native students and many teachers teach or will teach in classrooms characterized by diversity. As the proportion of migrant students varies between countries it might also vary between regions and schools within a country. In particular schools in large cities might have a majority of students from other origins and backgrounds. All in all, these changes represent a major challenge for societies' educational systems, which both teachers and schools need to be prepared for[8].

It is fair to say that education plays an essential role in individual lives. Not only in terms of preparing individuals for society and labor market but in general, for developing, and perhaps partially determining individuals' life-courses. For students in families who migrated to a new country, education is of special significance. School represents for them what might be a main contact point with the surrounding society, including contacts with native peers and the possibility to learn a second language. The educational system for countries represents perhaps a main possibility to reach the goal of an integrated society, and there are research studies that suggest the design of educational systems to be important for migrant students[9]. To ensure that migrant students can fully develop their potential in education is vital, not only then for societies' level of social cohesion and the general economy, but also for individuals' further opportunities and life-chances[10]. Education might be argued as being the central resource for allowing participation in political, cultural, economic and social life and a main determinant of both achieved status and possibility for social mobility[11].

Considering student achievement however, general statistical patterns display a depressing image in this regard. Pronounced differences are visible for a majority of countries when comparing native and migrant students' educational outcomes. Comparing migrant and native students' achievement in this report's analyses focusing on mathematical literacy (TIMSS 2007) represents an on average difference of about 34 scale score points to the advantage of native students. Patterns of negative difference for migrant students are persistent and stable over time and are in common for most countries[12]. This is a pattern with far reaching consequences. It reaches over and beyond education and schooling and touches on potential questions of equity, democracy and citizenship. Altogether it motivates a need for solid knowledge on factors important for migrant students' achievement.

As the gap between native and migrant students presents a rationale and a first priority for this study, it should be noted that the pattern of difference is a pattern on average. More frequently the single category of migrant students is composed by substantial differences. As the migrant population might differ between countries, in many countries the migrant group is in itself heterogeneous. This study aims at taking into account this heterogeneity. Within the single category 'migrant students' are often included students from various geographical, cultural, ethnic and/or linguistic backgrounds[13], but also students with different immigration histories, reflecting 1st and 2nd generation migrants. Variation important to consider for the study on migrant students achievement is presented below.

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[6] See for instance, Lindsay Lowell, B (2007), Boswell, C (2005), Salt, J (2005)
[7] OECD (2010a)
[8] OECD (2010b)
[9] Schneeweis, N (2011)
[10] European Commission (2008)
[11] Fossati, F (2010)
[12] See European Commission (2011) progress report for a comparison between countries and over time - Progress towards the Common European Objectives in Education and Training. Indicators and Benchmarks 2010/2011. http://ec.europa.eu/education/lifelong-learning-policy/doc/report10/report_en.pdf
[13] Nusche (2009)

Migrant students – a heterogeneous group

A first difference of importance for considering migrant students education is their status as 1st and 2nd generation migrants, as referred to their country of birth. Being born in or migrating to the country of assessment makes a difference in terms of educational achievement. For 1st generation migrant students who immigrated to the country, the variation might be large in terms of when they immigrated. The group might include both students who entered in their early childhood and students who arrived after school started – a difference likely to matter for their educational achievement. For 2nd generation migrant students the difference to native students' performance should be less, if any, since these students are born in the country of assessment.

The question of the language spoken in the country of habitat is generally regarded important for integrating immigrants in society. It is often emphasized in discussion on migrant students (poorer) educational achievement. A proficient level of understanding of the language used in school is needed for students to be able to cope with their studies. As the level of language proficiency varies generally for migrants, part of this variation connects to their status being 1st and 2nd generation and it also depends on what language is spoken in their home[14].

How much language matters for students' mathematical achievement is however an open question. The coming analyses will shed some light on this. It might be argued not to matter as much as it possibly matters for learning other subject areas. This is because math at large represents a language with syntax and grammar in itself, used and understood internationally. As such it might be a subject more independent of national language proficiency. However, an analysis of PISA 2003 for 15 year old students did demonstrate the importance of language spoken at home for migrant students' mathematical literacy[15]. In some countries the relationship is quite strong. It concluded an average difference of about a year behind in schooling for migrant students, age 15, not speaking the language of instruction at home. It is possible that also mathematics as a subject in school is depending on students' language proficiency, given that teaching and assessment occurs in the language spoken in the country.

For students the question of language proficiency is defined at large in relation to what is demanded from school and 'academia'. The level of proficiency varies among students, not only in relation to other mother tongues but in relation to different social backgrounds, another important factor.

The importance of the family socio-economic status for student achievement has been empirically established in a number of studies[16]. It represents one of the more important background factors used to explain achievement. In terms of migrant students this is in particular important information since social background might be confounded with language ability and vice versa[17]. In many countries migrant students are overrepresented in the categories of families with lower socioeconomic backgrounds[18].

In this study which is focused on migrant students' mathematical achievement, however, there is no information in regard to parents' socio-economic status, including parents' level of education, or job-status. Cultural capital refers broadly to the family connection to the field of academics, education and schooling[19] and the norm is set by privileged families whose values at large are in congruence with symbolic and social expectation in education[20]. As family education is an important component, the concept cultural capital includes other indicators as well. A powerful proxy for students' educational, social and economic

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[14] It is as well related to how close or distant their first language is to their second language. The situation for an English speaking country which largely receives English speaking immigrants is much different compared to a country which receives a majority of immigrants coming from different cultures, and different linguistic backgrounds.
[15] OECD (2006)
[16] See for instance Sirin (2005) and Coleman et al (1966)
[17] Hansson & Gustafsson, (2010)
[18] A Swedish study, see Skolverket (2005), demonstrated for instance an almost disappearing 'negative effect' of being migrant student taking into account socioeconomic backgrounds. However, an analysis of PISA results, see OECD (2006), demonstrated for a number of countries that differences remained also after having accounted for students' socio-economic status.
[19] The terminology of different forms of capital refers to the sociological framework of Pierre Bourdieu. See for instance his work on Distinction, 1984) and for a special analysis of his concept of cultural capital, which is most widely used, see Robbins, D (2005)
[20] Hansson & Gustafsson (2010)

backgrounds is the number of books at home, an indicator included in TIMSS. In many countries number of books at home is the most important predictor of student performance[21]. An analysis of items used to measure family background found number of books at home and students own books to be powerful single indicators explaining student achievement[22]. Some caution is needed however, when using number of books as indicator for migrant students' family backgrounds[23]. For migrant families, this indicator is likely to be affected both by their time in the host country as well as their history of migration. Because for the TIMSS study IEA recommended to the countries to include students which lived in the country for at least one year, this could mean a possible large variation in the group of 1st generation migrant students. For families living no longer than a year in the country, the time for acquiring books was limited. In addition if migration was motivated by acute reasons this could mean that books were not a priority to bring along[24]. Altogether this indicates that few books at home in migrant students families might not work well as a general proxy for migrant students level of cultural capital at home.

In considering students home environment, economic and social capital is also potentially important for their achievement[25]. As economic capital is perhaps more obvious, social capital needs definition. In this context it represents the family possession of social contacts, and more specifically useful contacts in society or within the educational field. For students it matters to have parents who are well–informed about the general function of the educational system, on what it demands and how it relates to the surrounding society. If parents in addition have personal contacts in the educational field this improves chances to make more informed educational choices. It is likely that the social capital is lacking to a higher degree in migrant students' families[26], since it depends both on language proficiency and on time in the country. Language proficiency is a general prerequisite for being informed about the society and for building up social contacts. For schools and teachers it is important to be aware of the possibly more difficult situation for migrant students' parents. It presents an argument for schools to be more active as concerns general, or specific, information strategies and keeping in contact with students families.

TIMSS included questions on various assets in the home. In addition to number of books at home, the questions included the existence of calculators, computers and a connection to internet, dictionaries and study desk/table for the student. Home resources might also reflect the socio-economic family background for students, and is a way to conceptualize or complement the more traditional use of SES[27].

Summing up, studying student achievement it is essential to consider students' family context to the degree possible given the role of continuous socialization, transmission of educational aspirations and resources at home. All in all, different capitals at home defines at large the perspective on education and for students at large their possibilities of getting help and support in their studies[28].

The rational for using TIMSS2007 database

In general it is well motivated to make use of the international comparative studies in education, since for any researcher interested in the context and correlates of learning these databases provide an excellent resource[29]. The choice to use in particular the IEA TIMSS study as empirical base for this report has to do with its focus on younger students' achievement, on the one hand. The first years in school can be argued to largely set the frame for students' further education. To be knowledgeable in math means in many countries a door to a wider choice of further education.

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[21] Hanushek, E.A, Woessmann, L (2010),
[22] Brese, F, Mirazchiyski, P (2010) observed a median correlation for students own books to achievement of 0.21. In 'Measuring Students' Family Background in Large-scale Education Studies', A paper presented at the 4th IEA International Research Conference July 1-3, Gothenburg, Sweden
[23] Hansson & Gustafsson (2010)
[24] Such as for refugees, and asylum seekers
[25] The three capital forms are borrowed from Pierre Bourdieu
[26] NESSE (2008)
[27] Sirin (2005)
[28] Szulkin, R, Jonsson, J.O (2007), Lareau, A (1987)
[29] Rutkowski, L, Gonzalez, E, Joncas, M and von Davier, M (2010)

Assessing mathematical ability for migrant students is interesting also in the sense that the ability of migrant students might be less hampered by their eventual shortcomings in the language spoken. On the other hand, teaching and assessing also mathematical ability depend on language used. Hence, it might be that students' linguistic proficiency after all is important. As being literate in the language spoken sets the frame more generally for students' education, providing a tool for learning and studying, perhaps it also influences math as a subject. TIMSS include background questions on students' language situation at home, with particular relevance for migrant students.

TIMSS 2007 include information on different levels. In addition to the information based on the individual students there is information pertaining to both the level of classroom/teaching and to the level of school. In particular the level of teaching and classroom presents a rational for using TIMSS in the study on migrant students' mathematical achievement[30]. Teaching and the classroom is the closest level to students in school, and might be expected to influence their achievement more directly, although it might be hard to capture such effects[31]. It can be argued that many of the important contextual factors are in fact rooted in the classroom, not the school. For studies that have considered the variation in students' performance within the classroom, between classrooms within a school, and between schools respectively, results indicate that for both elementary and secondary schools there is a greater variation between classrooms than between schools[32].

Summing up, TIMSS include background questionnaires directed to students, students' teachers and to the school's principal. Information from all these levels will be used in the coming analyses. As a questionnaire to students' parents is not included, the effect of socio-economic relationships for mathematical ability is not possible to estimate more directly. Some indication on the socio-economic background might however be reflected in using the indicator number of books in the family.

Assessing mathematical literacy in TIMSS2007 – scales and plausible values

Mathematical literacy in TIMSS is assessed considering two dimensions. A content dimension specifies the domains of subject matter to be assessed. A cognitive dimension specifies the thinking processes to be assessed, and as such describe the sets of behaviors expected of students as they engage with the mathematic contents. For students in 4th grade the content dimension includes numbers, geometric shapes and data display. The cognitive dimension targets three domains, as represented by knowing, applying and reasoning. The domain of knowing includes the behaviors of recall, recognize, compute, retrieve, measure and classify/order. The domain of applying includes such behaviors as selecting, representing, modeling, implementing and solving routine problems. In the reasoning domain behaviors such as analyze, generalize, synthesize/integrate, justify and solve non-routine problems are targeted[33].

Each of the six dimensions above represents a scale in TIMSS. In addition, a scale is constructed which captures students' overall mathematical ability. All students are assessed in each dimension forming in total seven different scales. For each scale students' ability is estimated in a set of five 'plausible values'[34], a technique used since students answer only to a subset of information requested[35]. The use of multiple values is one way of taking the uncertainty associated with the estimates into account[36] where the variability among estimated plausible values for each student reflects some of the inherent uncertainty in estimating the actual, 'true' value of individual performance. This report uses the scale for students overall mathematical ability. The statistical modeling uses estimates based on the total set of five plausible values[37]

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[30] Which separate the IEA studies from the OECD PISA in which the level of classroom and teaching is not included
[31] Goldhaber, D, Brewer, D (1997)
[32] Willms, D (2010)
[33] Mullis, I.V.S., Martin, M. O. et al (2005)
[34] Item response theory (IRT) is the statistical technique used
[35] The use of plausible values, or multiple imputation, is necessary in that the procedure for administration involved matrix sampling, an approach in which only a subset of assessment materials were answered by each students, in order to minimize students' response burden. The method as such results in some uncertainty, reported as estimated standard errors. The standard errors express two variance components, one based on the sampling, and one on the method used for imputation of students' results.
[36] von Davier, M., Gonzalez, E., & Mislevy, R.J. (2009)
[37] See the TIMSS2007 Technical Report for the full description of IRT, plausible values and scaling procedures. In Olson, J.F. Martin, M.O., & Mullis, I.V.S. (2008)

Rational and purpose of the study

The interest in the study is what might account for migrant students generally poorer educational achievement. The persistent gap in performance in native and migrant students' achievement gives a first priority to sort out factors that might be explanatory. The ambition is to reduce the gap. As such it might be noted right away that the interest in this study is not focused on the question of explained variance, but on the gap between native and migrant students' performance[38]. The increasing level of migration puts pressure on schools and teachers, and as well students are faced with an increasingly diverse student setting in classroom and at school. A special interest refers to the levels of teaching, classroom and school in the search for factors important for student achievement in mathematics. Such factors might be targeted for change on the policy level. It is more difficult to change existing circumstances at the individual student level, although providing important knowledge[39]. However, the importance of first getting to grips with the individual student level factors is argued. Different relationships in students' backgrounds are what schools and teachers are in fact challenged with in their task to educate students. As well from a more methodological point of view it is motivated to control for the individual background factors. It would otherwise be difficult to investigate and disentangle possible effects that come with the classroom – teaching and school level.

As the category migrant student includes considerable variation in terms of student backgrounds, an overall argument in this study is the importance to acknowledge this heterogeneity. The ambition is to contrast the on average statistical difference displayed for native and migrant students' performance with a more nuanced analysis and description. This includes an analysis for possible differences between 1st and 2nd generation migrant students and looks out for gender and home background differences as well.

The structure of the report

In the following sections, results are presented in the order of analysis. A first section focuses on the factors relevant on the individual student level. A second section focuses factors at the level of teaching and classroom and in a third and final section school is included. In the introduction of the results a general strategy for analysis is outlined, including a defined criterion for country inclusion and a definition of native and migrant status. In each section results are complemented with a more descriptive analysis to the various relationships before entering model estimation. The relationships are of interest in themselves, not only their eventual effects on students' achievement in math. This regards for instance the actual pattern of distribution in terms of the typical classroom and school for migrant and native students, or the typical pattern of teacher competencies and backgrounds. The results are concluded for each section of analysis. An overall conclusion and discussion of possible implications is presented in the final chapter of this report.

A note on the reporting of factors at the level of classroom and teaching is warranted. Although the results pertain to teachers, they will be analyzed and written from a perspective of students. This relates to teachers in TIMSS2007 not being selected to represent the population of teachers. They are selected by the choice of class/students[40]. Writing from the perspective of students is reflected in such statements as 'x percentage of students are taught geometry every second day'.

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[38] Realizing that in a more traditional use of HLM the level of explained variance is in focus. Here is argued that although the variance might not change the relative gap between native and migrant students might well be changed given different factors considered.

[39] Hanushek (2002)

[40] Joncas, M (2007) describes the basic sample design used as a two-stage stratified cluster design. Countries used the two-stage probability proportional to size (PPS) sampling strategy to sample schools, and classes were sampled using a systematic random method, with equal probability for students within classes to be sampled

Migrant students overall mathematical ability – analyzing TIMSS2007

A strategy of analysis

TIMSS2007 presents the possibility to study factors important at different levels for students' achievement. The general design involves a randomized sampling of schools in a first step, with a choice of class, typically one or sometimes two classes, within the selected schools as a second step. In addition to the instruments of assessment, TIMSS include different background questionnaires administered to students, their teachers, and to the principals at their schools. For this study's purpose information from all these sources will be used.

To accommodate the different levels of information hierarchical linear modeling is used as main analysis, HLM[41]. Generally, the large scale studies, such as TIMSS, are well fitted for such analysis. The technique might be described as multilevel multiple regression in that it allows for an analysis of the relative importance, effect, of the various factors represented at the different levels[42]. The modeling is applied in a stepwise manner, and presented in combination with descriptive statistics. The different models estimated have included both fixed and random components. The random slope models have been applied for every model in order to investigate if factors in the model vary significantly at the country level.

Students' overall mathematical ability is defined as the dependent variable using TIMSS scale scores. The average achievement is in TIMSS2007 set to 500 scale score points with a standard deviation of 100 scale score points. The reported coefficients for the different factors included in the models reflect the respective factor's relative importance for students overall mathematical ability, or the estimated change in performance given the specific condition (and controlling for other included factors). Coefficients are expressed in TIMSS scale scores.

The estimated gap in performance between native and migrant students is a point of departure for the analyses performed. The gap is expressed by the variable Migrant, included in the main models, and represents the on average difference in achievement for native and migrant students. The aim of the study is to locate which factors, at what levels, are reducing this gap. The analyses are performed by including and controlling for different factors at the respective levels of students, teaching and classroom and school. A hypothesis is that circumstances reflecting all the different levels will help to explain the difference between migrant and native students' achievement. As such, the interest in this report is the relative position comparing native and migrant students' performance, not the actual performance for migrant or native students.

The analyses performed are based on the total group of students, as the migrant group is small. However, supplementary analyses are performed. On the one hand the model is tested for the sample of migrant students only. On the other hand it is an analysis that considers the eventual differences between 1st and 2nd generation migrant students. The results of the supplementary analyses performed are commented in text, and estimated coefficients are presented in the reports appendix.

Since migrant students are few and the samples for the various countries are small, no specific country analysis is performed. However, the study aims to analyze the possible variation between countries, in terms of which factors are varying and which factors are in common for the countries included. Such knowledge provides a first level of information for policy making, pointing to the need either for country specific or general policies. Expressed in statistical terminology this means that the various analyses performed typically include both fixed and random components. As the fixed components in the models might be regarded a weighted average across groups, i.e., countries for this report, the random component captures the group-to-group variability, representing in this study the variation between countries[43].

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[41] Snijders and Bosker (2004) points out that the assumption of covariance, as for example students nested in classes, is the underlying rationale to employ Hierarchical Linear Modeling

[42] Hox, J (1998)

[43] Bickel (2007)

On the conceptual level factors are broadly considered as either context or practice related[44]. Student composition in classroom and school is an example of an important context variable in the study, whereas teaching strategies are example of practice related variables. On the student level language spoken at home is an example of practice whereas the level of education and different available assets at home are example of context. The sorting of the variables in these two basic categories is useful in providing an analytical structure, not only for the information included but as well for performing the analysis. It could well be for instance that different context provide different practices, as in the relation teaching strategies and different student composition in classroom. It could also be the case that for instance schools with similar contexts vary in practice[45].

Both the possibility to categorize variables differently and to construct new variables/ categories has been used for this study's purposes. It was needed for instance to construct a variable which reflects students' migrant/native status, but also other variables have been modified to better fit the analyses performed. The analysis has not made much use of indices in the database. As some of the indices have been tried out in preliminary analysis, there are important differences motivating the choice to instead use individual items/variables. It relates mainly to the fact that indices are constructed by a summing up of a set of questions. As such it does not allow for an analysis of which items included are more important. The use of indices does not as well serve the purpose to explain equally well the difference in achievement between native and migrant students. As indices based on several items are generally more powerful than single items, they are less sensitive studying what is more or less important for migrant students.

A criteria for country inclusion and a definition of migrants

The criterion for inclusion of countries in this study was set to a minimum of 3 percent migrant students represented in the sample. The percentage of migrant students represented per country in TIMSS2007 varies between the countries included. It should be noted that sample size do not necessarily reflect national proportions. Among other factors countries were recommended by the IEA not to include in the sample students who had less than a year of instruction in the language of assessment. For a list of countries included in this report with their share of migrant students in TIMSS2007, see Appendix 1.

In categorizing students respectively into native and 1st and 2nd generation migrant students the information on parents' and students' birth countries is used (Table 1).

Table 1 Definition of native student and of 1st and 2nd generation migrant students

- 1st generation migrant students are born abroad with both parents born abroad
- 2nd generation migrant students are born in the country of assessment with both parents born abroad
- Native students are born in the country of assessment with at least one parent born in the country of assessment.

Proportion of migrant students in 12 European countries

On average the 12 European countries represented in this study include about 11 percent of migrant students. The general pattern is a somewhat higher percentage of 2nd generation students (table 2). Countries vary both in terms of total percentage of migrant students and the distribution of 2nd and 1st generation migrant students. Czech Republic and Hungary represent no more than 3 percent students with a migrant background, meeting the criteria for inclusion in this study just barely. Austria and Germany have a comparatively higher proportion of about 16-17 percent of migrant students. In Germany, Slovakia and Slovenia there is a clear majority of 2nd generation students whereas most other countries in the group have a more equal representation of 1st and 2nd generation migrant students. (Appendix 1).

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[44] A strategy of analysis suggested by Willms, D (2010)
[45] Raudenbush and Willms (1995)

A question directed to migrant students aimed at knowing at what age 1st generation students entered the country. More than a third of students report entering the country older than five years old and less than a quarter came to the country when younger than a year (see table 3).

Table 2 Distribution of native and migrant students in 12 European countries participating in TIMSS2007

Native	89.0
1st gen migrant	4.3
2nd gen migrant	6.7

Table 3 Age of arrival for 1st generation migrant students

Older than 5 years old	36.7
Between 1 to 5 years old	39.6
Younger than 1 year old	23.7

Students family backgrounds

As noted in the introduction of this report TIMSS study does not include students' parents in the survey. As such, the information from students' family background is more limited, but includes language spoken at home and what the home includes for assets, both more generally and more specifically in terms of possibly important for students math studies.

Language spoken at home

It has been argued in this report that mathematics might be a subject less depending on the language spoken, given that it represents in itself a standardized language with a specific grammar. As such migrant students could be expected to be less influenced by their linguistic competence. On the other hand, it has also been reflected that even if mathematics as a subject has its own grammar, teaching occurs in the official language, and as well assessment of math ability is carried out with questions in the official language. In this sense also the mathematical subject taught for 4th grade students in school is surrounded by language, representing the mother tongue for native students but for migrant students their second language.

Asking students how often they speak the language of assessment at home to sometimes or never speak it is representative for little less than half the group of 1st generation students and for little less than a third of the group of 2nd generation migrant students. Some few percent of native students' state as well to speak the language of assessment at home only sometimes or even never. This might be explained by the fact that the native students group includes students with one parent born abroad (table 4).

Table 4 Language spoken at home by student status

Speaking language of assessment at home	Native students %	2nd gen migrant students %	1st gen migrant students %	Total migrant students %	Total students %
Always	86.6	29.4	21.6	26.3	80.0
Almost always	10.2	39.9	33.9	37.5	13.2
Sometimes	2.7	29.0	37.4	32.3	5.9
Never	0.5	1.7	7.2	3.9	0.8

Home resources

The student questionnaire included questions on the number of books at home, the availability of a pc and the presence of a study desk/table. In addition TIMSS students were asked if they had access to a calculator at home, a dictionary and internet. A preliminary analysis revealed that all these indicators are significant for students' mathematical achievement, and as such they are included in the modeling.

A majority of 4th grade students in math classes in these European countries have access to the assets asked for at home. There are no marked differences for native and migrant students. Around 85 – 90 percent of students respectively have at home a calculator, dictionary, pc and/or a study desk. Three out of four students are connected to internet at home.

Whereas less than a third of students have many books at home, the pattern of very few books at home is more marked for migrant students. About 6 out of 10 1st generation migrant students have at most 25 books at home. (Table 5)

Table 5 Number of books at home by migrant – native status

Number of books at home	Native students %	1st generation migrant students %	2nd generation migrant students %	Total %
0-25	32.1	59.3	50.9	34.5
26-100	35.1	26.6	30.4	34.4
>100	32.8	14.1	18.7	31.1

Modeling the individual student level

The average performance in TIMSS is set to a scale score of 500 with a standard deviation of a 100 scale score points. For these 12 countries the estimated average is 521. Only a small part, about 4 percent, represents a systematic variation between countries.

The gap in migrant and native students' mathematical achievement is on average 34 scale score points, nothing else considered. (Table 6) The individual factors included in the model serve to reduce the gap quite substantially between migrant and native students achievement, from a minus 34 to a minus 16 scale score points. Considering the model for the factors included, books at home has a strong effect, in particular the negative effect displayed for having few books. As was noted in introducing the various factors of importance this particular item has been proven to reflect quite well the socio-economic status of the family. Since no other information on SES is available this might explain the relative strong effect of number of books in the family. The effect of speaking or not speaking the language at home is more moderate, representing a difference about 20 scale score points, and comparable to having or not having access to a PC at home. The impact of having a dictionary at home is in fact larger. The gender effect is as well quite pronounced, representing a plus 12 for boys. In adding the individual relationships, gender and language spoken at home, as this affects the migrant – native status the other factors remain at large the same (as visible in the table's sigma squared and in the estimated coefficients).

Table 6 Variables at the individual student level (HLM)

Variables	Baseline model (MOD0)	+ Migrant/ native status (MOD1)	+ Home possessions (MOD2)	+Individual student characteristics MOD3
Overall mathematical ability	**521, 06** (5.99) Sigma squared (5694.76)	Migrant – **492,07** (4.93) Sigma squared (5713.56) Native – **526,47** (6.74) Sigma squared (5594.48)	Sigma squared (4859.57)	Sigma squared (4801.84)
Migrant students		**-34,11** (3.94)	**-22,48** (2.51)	**-16,28** (2.77)
>200 Books			**11.39** (4.26)	**11.11** (4.36)
<25 Books			**-29,98** (3.23)	**-30,06** (3.14)
PC			**20,46** (1.87)	**19,08** (1.98)
Internet			**16,42** (3.64)	**15,98** (3.62)
Calculator			**18,79** (2.47)	**18.58** (2.45)
Dictionary			**23,73** (1.44)	**23.97** (1.51)
Study Desk			**13,24** (4.74)	**15.24** (5.16)
				Individual factors
Boy				**11.72** (1.44)
Speaking or not speaking the language of assess-ment at home				**-19.66** (4.07)

Significant country differences

The model has included the possibility of random effects at the country level, in order to investigate if factors in the model vary significantly at the country level[46]. As such, it reveals that the effect of migrant-native status differs significantly between countries, and that almost all the included indicators as well are significantly different between the countries in terms of their effects on students overall mathematical achievement. The exception is having a computer at home which does not vary significantly between countries but has the same effect for the countries included. The difference between countries concerns as such the gender effect, language spoken and the home assets. However, country effects are more moderate and not pronounced, although significant.

[46] A so-called random slope model

Migrant students in special consideration

The model produced on the total student group was tried out for migrant students only. The main analysis presented in Table 6 was also supplemented with an analysis for the respective group of 1st and 2nd generation migrant students. The underlying estimated for the respective analyses are presented in Appendix 2.

Considering the separate analysis performed on migrant students only, as the group of migrant students is small not all, but still many, indicators are significant. The effects of having few books at home, having an own study desk, a dictionary, calculator and internet connection are all significant, as are also the effect of gender. Compared to the main model, presented in Table 6 above, the effect of gender for migrant students is more pronounced as is also the effect of having a calculator at home.

The effect of the individual factors included for 1st and 2nd generation migrant students respectively is presented in Table 7. The gap in performance to native students is considerably wider for 1st than for 2nd generation migrant students. However, whereas the negative effect is less pronounced for 2nd generation, controlling for the various relationships and assets at home has a comparatively larger effect on 1st generation migrant students. Their negative effect is reduced with some 27 points, relative native students, compared to an about 14 point reduction for 2nd generation migrant students. For 1st generation migrant students home possessions (MOD2) have twice the effect on the gap, the distance to native students, as the effect of the individual relationships (MOD3). For 2nd generation migrant students the respective steps in the model reduce the gap equally much.

Regarding the estimated coefficients for the impact of the included factors the patterns arrived at are not much different from Table 6, with one exception - the effect of language spoken at home. Language spoken at home has a more pronounced effect for both generations of migrant students, but specifically for 2nd generation migrant students overall mathematical achievement. (Appendix 2) It is as well apparent when comparing the estimated models for the two groups of migrants that country differences are more pronounced for 2nd generation migrant students (not in appendix).

Table 7 The student level model applied for 1st and 2nd generation migrant students respectively

	Migrant/ native status (MOD1)	+ Home possessions (MOD2)	+Individual student characteristics MOD3
1st gen	**-44, 93** (7.04)	**-27,15** (5.81)	**-18.11** (5.89)
2nd gen	**-25,22** (5.27)	**-17,83** (3.20)	**-10.77** (3.65)

Concluding - the individual student level variation

Students' different home backgrounds clearly matters for their overall achievement in mathematical ability, and the information used provides an explanation for the gap between native and migrant students' achievement. Controlling for the various assets at home, language spoken and gender, the gap between native and migrant students' performance in math is reduced from an initial 34 to 16 scale score points. As the difference between 1st and 2nd generation migrant students is marked, the introduction of the factors in the model serves to reduce this difference, from an initial about 20 to a final less than 10 scale score points of difference. Of the relationships introduced having few books at home is especially pronounced, perhaps capturing some effect of family SES which is missing in TIMSS, as pointed out previously. Language spoken at home is in particular important for 2nd generation migrant students' math ability.

Students in classrooms

On the classroom and teaching level student composition in the class might be considered an important conditioning factor for teaching. It might as well be of consequence for students' learning and achievement. It could influence students' achievement both directly, in the context of peers in the class, and indirectly, as transmitted by teaching practices. As students in the same class, or in the same school, to various degree do homework together the effect of student composition can extend over and above the actual classroom and school[47]. Except for teaching practices there could be other teacher factors involved, as for instance teachers' higher or lower expectations on students' achievement.

The measures for student composition in this study are the migrant proportion in class. Studies have demonstrated a general effect of ethnic segregation for students' educational outcomes. It could have special significance for migrant students, perhaps in particular 1st generation who immigrated to the country[48]. Thus, it is worth considering that student composition in class and school might not have the same effect on all student groups[49].

A special interest for this study lies in investigating what are better learning conditions for migrant students. It is not obvious which classroom setting is optimal, a classroom with more native or more migrant students. It could be the case that teachers and schools are better equipped and have better possibilities to focus on relevant practices and methods in a classroom/school with a majority of migrant students, i.e., in a more homogenous student setting. Or it might be better learning conditions for migrant students to be in a class and school with many native students, providing natural contacts with native language and native friends.

Classroom composition in terms of the proportion of migrant students in class is here based on the categorization made of students as migrant or native, described in the previous section. Another option would have been, as performed in other studies, to use the indicator of not speaking the language of assessment at home as representative for the proportion of students with migration background in the class[50]. The assumption here is however that migrant status not only is a question of language but reflects a larger context. Being migrant student, also when speaking the language of assessment at home might be assumed still to represent in many cases another and more negative status than being native student. That the status of being migrant student does in fact refer to more than just language proficiency makes sense when considering both the general pattern of migrant students' lower educational achievement, and that also 2nd generation migrant students perform generally lower than native students. There are other socio-cultural differences than language in students' backgrounds that might play a role, and various factors involved at the system level, such as the level of integration in society, might as well be important.

It is also the case that the status of language spoken at home might represent a broader group of students, not only migrant students. As the category 'native students' includes families where one of the parents is of another origin, this might influence language spoken at home. This is reflected also in TIMSS2007, compare Table 4 above. The status of not always speaking the language of assessment at home is however likely to be different for native and migrant students. This is because the language of assessment represent native students mother tongue but migrant students second language. For native students, the situation of not always speaking the language of assessment at home might represent an added value, in terms of speaking several languages. For migrant students on the other hand the same situation could indicate a lack of practice/knowledge in the official language used in the country of habitat, equal to the language of assessment.

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[47] Szulkin, Jonsson (2007)
[48] Szulkin, Jonsson (2007)
[49] Willms, D (1986)
[50] See for instance Bellin, N, Dunge, O, Gunzenhauser, C (2010), Araujo, L, Dinis da Costa, P (2012)

Classroom composition

More than a third (36%) of students in these 12 European countries is situated in all-native classes. But countries differ. For instance Hungary has two third of their 4th grade students in all-native classes, and also Czech Republic and Italy have some more than half their students in such classes. Whereas all 12 countries have all-native classrooms only three countries have all-migrant classrooms, and another four countries have students in classes with about 80 – 90 percent migrant students. The average classroom in these countries have about 11 percent migrant students, and considering the median value about 6 percent migrant students.

As native students are concentrated in classrooms with predominantly native students, migrant students are more evenly situated across varying categories of classrooms. (Table 8) The average proportion of migrant students in the different categories of classrooms as represented in table 8. A classroom with more than 50 percent migrant students holds on average about two thirds of migrant students. (Table 8)

Table 8 Percentage of native and migrant students in different categories of classroom (migrant proportion) in 12 European countries

Classroom composition – migrant/native students	Native students (%)	1st gen migrant students (%)	2nd gen migrant students (%)	Total (%)	Average percent migrant in class category
All native	41.4	-	-	36.9	.00
-10	31.1	15.7	19.8	29.6	.06
11-25	19.1	28.7	32.0	20.2	.16
26-50	7.1	33.5	30.0	9.8	.36
>50	1.3	22.1	18.2	3.4	.65

Teachers educational backgrounds

Teachers are one of the more important conditioning factors for how well students might achieve in their studies. How they teach, what practices and methods they use for teaching is likely to be related both to their personal and professional background and to various factors in classroom and school, such as for instance the composition of students in the classroom.

Questions in TIMSS related to teachers level of education and if they were certified to teach. A large majority of students, about 96 percent, have teachers who are certified to teach. For a few percent of students, located in all-native or up to ten percent migrant classes, teachers are not certified. Students in classes with at least 26 percent migrant students have almost exclusively certified teachers. For students in classes with more migrant students their teachers are comparatively higher educated.

Between 85-90 percent of students in classes with at least 25 percent migrant students have teachers tertiary educated (ISCED5), compared to between two thirds and three quarters of students in classrooms with at most 10 percent migrant students.

In total about 6% of students have teachers with a major in math as their postsecondary education, but a fifth of students in classes with higher percentage of migrants[51]. Almost six out of 10 students in migrant dominated classes whose teacher had a major in education specialized in math[52].

Given these teachers generally higher educational profile it is interesting to note a tendency that teachers in classes with a higher percentage of migrant students feel less well prepared to teach, defined as teaching geometric shapes, measures and numbers. This pattern could perhaps reflect a more complex teaching situation, where a need for different pedagogical tools/didactics might be emphasized in a diverse group of students.

[51] 0-10 classes 4, 4%, 26-50 classes 17, 5% and >50 classes 19, 8%
[52] 0-10 classes 34, 6% and >50 classes 58,5%

Pedagogical tools

Teachers were asked about the different tools they used when teaching math to 4th graders. The list included textbooks, calculators allowed, and availability of pc. A little less than half the group of students is allowed to use a calculator in class, for the majority restricted to certain situations and lessons[53]. Some more than half the group of students has access to a computer in class[54], and four out of five of those students had access to Internet[55]. More than nine out of 10 students have a textbook in Math and for seven out of 10 of those students their teacher uses it as the primary tool for teaching Math.

Teaching practices and activities

Teachers were asked how often they practice various math activities in class[56].
As students in all-native classes tend to engage more in the work with fractions[57], to practice to explain answers[58], and to memorize formulas and procedures[59], they practice less basic skills. Students in classes with more than 25% migrants engage more in writing equations from word problems[60].

Modeling the teaching and classroom level

Not all of information above contributed to the modeling of student achievement in math. The final model thus includes a smaller set of factors that were found to significantly influence students overall math achievement.

Introducing the different relationships at the level of classroom and teaching reduced the gap between native and migrant student performance with an additional three scale score points, down to a minus 13 for migrant students. A more important contextual relationship is the proportion of migrant student in the class. A standard deviation increase represents a negative effect of about 25 scale score points[61]. Quite a few practices in classrooms are significant for students' achievement in math. It is positive both to explain answers and to practice writing equations from word problems. It is not positive for math achievement to memorize formulas and procedures. That teachers use a textbook as the primary basis for lessons has a positive effect on math achievement. Positive is also the (restricted) use of calculators but a pc in math classes has a negative effect.

Some circumstances are important when considering teachers' background to teach math. A visible effect relates to the significance of teachers well prepared to teach[62]. Teachers' higher level of formal education is as well significant for students' achievement[63] In addition there is an effect of teachers being specialized in math, not included in the table but discussed below. Other studies have indicated the subject specific relevance for students' achievement as opposed to teacher ability more generally. Teachers with degrees in mathematics are associated with students higher test score in math, but not influencing student outcomes in other subjects[64] and in studies which used the variation in teacher subject knowledge matched to student achievement as well indicate an effect[65].

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53 Less than one percent of students are allowed to use calculator whenever they want and need, i.e., an unrestricted use
54 Students allowed to use calculator – 46,8%, students with PC in class – 57,1%
55 81,6%
56 such as using the four basic calculations (adding, subtracting, multiplying and dividing), measuring different objects, producing tables, graphs, write equations for word problems, student explaining their answers, relating math to daily life activities and ask students to memorize formulas and procedures
57 All-native classes 90, 1% - migrant dominated classes 81, 3%
58 All-native classes 77, 4% - migrant dominated classes 69, 4%
59 All-native classes 84, 3% - migrant dominated classes , 71,6%
60 All-native classes 78, 3% - migrant classes (>25%), 88, 3%, 88, 5%
61 In reference to the average for countries included
62 The effect of feeling prepared to teach is asked for in TIMSS in relation to specific areas, not in general. The effect significant for students' achievement math is for teachers to feel prepared to teach Geometry.
63 The coefficient for teachers' highest level of formal education is estimated on 11 countries, Hungary is missing. The model estimated to capture the effect of higher education does not deviate to any significant degree to the estimated model based on 12 countries, whereby the coefficient is simply added to the main model displayed in the table. The estimated model for the 11 countries is not included in the report.
64 Goldhaber, D.D., Brewer, D.J (1996)
65 Metzler, J., Woesmann, L (2012)

Table 9 Variables at the teaching and classroom level (HLM)

Variables	Estimated model individual students level (MOD3)	Estimated coefficients Introducing Level 2 HLM/teaching and classroom
Overall mathematical ability	Sigma squared (4801.84)	Sigma squared (3871.59)
Migrant	**-16,28** (2.77)	**-13,16** (1.94)
>200 Books	**11.11** (4.36)	**9.78** (1.36)
<25 Books	**-30,06** (3.14)	**-23,51** (0.83)
PC	**19,08** (1.98)	**16,56** (1.99)
Internet	**15,98** (3.62)	**11,04** (0.94)
Calculator	**18.58** (2.45)	**13.68** (1.23)
Dictionary	**23.97** (1.51)	**18.60** (1.19)
Study Desk	**15.24** (5.16)	**7.39** (1.17)
Boy	**11.72** (1.44)	**11.39** (1.26)
Speaking or not speaking the language of assess-ment at home	**-19.66** (4.07)	**-16.08** (2.60)
TEACHER/CLASSROOM		***Context***
Highest level of formal education[66]		**8, 71** (3.04)
Teachers preparedness to teach – Geometric (shapes/measures)		**4.13** (1.50)
Percent migrant students in class (0-100%)		**-24.73**[67] (12.78)
		Practice
Textbook as primary basis for teaching		**7,26** (1.77)
Students permitted to use calculator		**4.45** (1.94)
PC in the classroom		**-3.14** (1.56)
Students explain their answers		**3,42** (1.70)
Students practicing writing equation from words		**7.14** (1.99)
Memorizing formulas/procedures		**-5.76** (1.92)

Considering the relationships from the individual student level, practically all effects are reduced, some quite substantially, when introducing the level of classroom. Regard for instance in Table 9 to have few books at home, or a calculator, a desk and as well language spoken at home.

[66] Based on 11 countries, Hungary is missing on this information.
[67] P=.08

Significant country differences

The modeling included the investigation of random variation between countries. This possibility revealed that countries differ concerning the gap between native and migrant students' achievement, the language spoken at home, gender and the indicator used for SES – the number of books (few books at home) at the individual student level. What these relationships mean for students achievement in math depend as such on the country in question. The effects of the various assets at home are in common and do not vary significantly between countries. On the level of classroom the effect of student composition varies significantly between countries, as do some of the practices, most notably students memorizing and teachers feeling prepared to teach (geometry). To use computers, allow calculators and to teach by the book and to let students explain their answers are all in common effects for these countries.

The model for migrant students

The model in table 9 above has been estimated for the group of migrants only, as well as for considering the effect on respectively 1st and 2nd generation migrants. The underlying estimates for the respective analyses are presented in Appendix 3.

Estimating the model for migrant students only, it reveals a different pattern and not all indicators are significant, likely to depend on the small sample size. The negative effect of student composition in the classroom is much stronger for migrant students. Considering a higher percent of migrant students in class this is comparatively more negative for migrant students' math achievement. However, the stronger effect might also relate to patterns of classroom location. As visible in Table 8 above, native students are located mainly in classrooms with low percentage migrant students, whereas migrant students have a more evenly distributed pattern across different categories of classrooms. Given the dominant native student group's influence on the main model and the larger variation for the migrant students in terms of classroom categories, this together might explain the stronger effect for migrant students, relative the main effect displayed in Table 9. The effect of using a pc in the math class is more negative for migrant students, whereas the use of a math book as main tool for teaching is more positive. (Appendix 3)

As well the individual factors in the model have different effects for migrant students. To have a computer and an internet connection at home is less pronounced. On the other hand, to have a calculator, a study desk and a dictionary at home have stronger effects. The more pronounced gender effect for migrant students remains as the classroom and teaching factors are introduced in the model. (Appendix 3)

As the model has been estimated for the respective group of 1st and 2nd generation migrants (based on the total sample of students) the difference in relation to native students' performance is displayed in table 10 below. Introducing factors at classroom and teaching has a more visible effect on 2nd generation migrant students' achievement. The gap for 1st generation migrant students is not much different to the estimation based on the individual student relationships. Considering the different estimates arrived at in applying the model for the respective group of migrants, as there are minor differences between the two groups of migrant students there a more pronounced differences with respect to the main model, Table 9. This concerns number of books at home, more important for migrant students, and also the significance of internet, calculator and study desk at home. (Appendix 3)

Table 10 The level of classroom and teaching applied for 1st and 2nd generation migrant students respectively

Variables	Estimated model individual students level (MOD3)	**Estimated coefficients Introducing Level 2 HLM/teaching and classroom**
1st gen	**-18.11** (5.89)	**-17.15** (3.77)
2nd gen	**-10.77** (3.65)	**-7.80** (2.64)

Teacher math specialization affecting students' math achievement

To have a math specialized teacher proved significant, and estimated about 6 scale score points, for students' math achievement[68]. In total the inclusion of math specialization reduce the gap in native and migrant students overall math ability with some further points, to about 11 scale score points.

However, including the specialization in math as an indicator in the model, other estimates change, both in effects and in significance. It is interesting to note that most of the indicators reflecting classroom context are no longer significant, i.e., have no relevance for students' achievement. Having a pc in the classroom, allowing the use of a calculator, including teachers feeling of being well-prepared to teach, they all drop from the model. The teaching practices applied in the classroom, however, all remain significant, as in students explaining their answers, or formulating equations from words, and memorizing formulas and procedures. For migrant students it is positive for 2nd generation migrants to have a math specialized teacher, but it doesn't help the situation for 1st generation migrant students. (Appendix 3)

Concluding – the level of teaching and classroom

The significant variables included on the classroom and teaching level represent a quite equal balance between context and practice factors. The more important contextual variable is the proportion of migrant students in the class with a negative effect of about 25 scale score points. It is positive on the other hand having a teacher highly educated and who feels well prepared to teach[69] and for the teacher to use a book as a main tool for teaching math. The use of a pc in the classroom is negative but allowing students to make a restricted use of a calculator is positive for their achievement. Positive practices are for students to explain answers and to practice writing equation from word problems. A negative practice is for students having to memorize formulas and procedures.

There is an interesting pattern for teachers who have a math specialization. Such qualification overrides the negative significance of using a pc in class and the positive effect in allowing a calculator in class. These relationships are no longer important when teachers are specialized in math. A math specialized teacher has a positive influence on the achievement of 2nd generation migrants, but the effect is not significant for 1st generation migrant students.

Students at school

The previous chapter illustrated that teaching and classroom does matter for student achievement. As such, the level of classroom has a supposedly more direct influence on student achievement than does various factors at school. In the following we will investigate the question if the school – context and practice – has an influence on student achievement over and above the individual level and the level of teaching and classroom.

Information on the school conditions for the students in math is given by the principals, answering to a questionnaire part of the survey. In addition to the information given by the principals the analysis utilize information on the level of teaching and classroom as aggregated to represent the level of school. To aggregate data to the level of school is justifiable given the design of TIMSS, where classes of student are selected to be representative for the level of school

As part of the school context TIMSS includes information about the student population. Principals were asked to estimate the percentage of students at school, in predefined categories, for the following characteristics: students with another mother tongue and students from economically disadvantaged family backgrounds. Both proportions are used for these analyses.

About two thirds of students are in schools with not more than 10 percent migrant students (Table 11). Whereas less than a tenth of native students are located in schools where migrant students are in dominance this is representative for about a quarter of migrant students. The pattern varies between countries. For

[68] The model is based on 11 countries, since Italy is missing this piece of information
[69] The effect of feeling prepared to teach is asked for in TIMSS in relation to specific areas. The effect significant for students' achievement math is for teachers to feel prepared to teach Geometry.

Czech Republic, Hungary, Slovak Republic and Scotland, more than 9 out of 10 of their TIMSS students are in schools with less than 10 percent migrant students (including a majority of their migrant students). In Austria and Germany on the other hand less than half of students are located in schools with not more than 10 percent migrant students.

Considering the location of native and migrant students there are examples of countries with a more marked pattern of segregation. In Sweden about 7 out of 10 native students are in schools with at most 10 percent migrant students compared to less than 2 out of 10 migrant students. More than a third of their migrant students are located in schools with more than 50 percent migrant students as compared to less than five percent native students. A similar pattern of segregation, although not so marked, is visible for Germany, Austria, Netherlands and Denmark.

For seven out of 10 students in TIMSS their school includes up to 25 percent students from an economically disadvantaged background (Table 12). However, for about a quarter of native students and almost half the group of migrant students, they are in schools where 25 percent or more of students come from economically disadvantaged families. Countries differ as well in this respect. In Hungary and Czech Republic a higher percentage of students are in schools with more than 25% students from economically disadvantaged families. Most markedly, the Netherlands, but also Austria, Denmark and Sweden are countries with an opposite pattern, with a higher percentage of students in schools with few (<10%) students from poorer family backgrounds.

Table 11 Percentage of native and migrant students in schools with different proportions of migrant students in 12 European countries

School composition – percentage migrant students	Native students (%)	1st generation migrant students (%)	2nd generation migrant students (%)	Total (%)
0-10%	71.2	34.5	31.9	67.3
11-25%	15.9	25.0	23.9	16.8
26-50%	6.2	13.8	17.5	7.2
>50%	6.6	26.7	26.7	8.7
Total	100.0	100.0	100.0	100.0

Table 12 Percentage migrant and native students in schools with different proportions of students from economically disadvantaged homes in 12 European countries

School composition – Percentage students from economically disadvantaged homes	Native students (%)	1st generation migrant students (%)	2nd generation migrant students (%)	Total (%)
0-10%	40.1	23.7	22.8	38.3
11-25%	32.7	27.7	29.0	32.3
26-50%	15.5	21.4	19.6	16.0
>50%	11.7	27.2	28.6	13.4
Total	100.0	100.0	100.0	100.0

The two characteristics of schools are to some degree related. The pattern of correspondence is visible in Table 13 below. About half of the group of students from schools where few (<10%) students are migrants are in schools where also few students come from poorer family backgrounds. Oppositely, about half the group of students in schools with a majority of migrant students are in schools where a majority of students have a poorer family background. The correspondence of the two school characteristics is stronger in some countries. This is the case for Germany, Sweden, Netherlands and Denmark, all countries with a more marked pattern of school segregation[70].

Considering migrant and native students respectively the patterns are different, as might be expected. Whereas a third of native students are located in schools with the combined low percentage of migrants and poor family background students, the corresponding percentage is 15 for migrant students. Whereas almost a fifth of migrant students are in schools with the opposite pattern of combination – a majority of migrants and of poorer family background students – it is a school representative for 2 percent of native students.

Table 13 School composition - percentage of students in schools with different proportion of migrant students across schools with different proportion of students from economically disadvantaged home backgrounds

School composition –	Proportion	migrant	students		
Proportion of students from economically disadvantaged homes	0-10% migrants	11-25% migrants	26-50% Migrants	>50% migrants	Total (%)
0-10%	47.4	21.8	8.1	21.7	37.8
11-25%	31.0	49.1	26.1	16.3	32.5
26-50%	12.0	18.7	46.8	18.2	16.3
>50%	9.6	10.4	19.0	43.8	13.5
Total	100.0	100.0	100.0	100.0	100.0

As part of the school context, TIMSS included a question reflecting the climate, of which two items are of particular interest for this analysis. One relates to principal's characterization of teacher expectation. Studies have pointed to high teacher expectation as important for student achievement[71]. The other relates to student ambition, or as expressed by the principle, students desire to do well in school.

Teacher expectation is reflected in Table 14 and 15. For a little less than half the group of students in schools characterized of a majority of students from economically disadvantaged home backgrounds, and more than a third of students in schools characterized of a majority of migrant students, their school is characterized by their principal as of teachers having low expectations for student achievement. Considerably fewer students in 0 -10 percent schools, both categories, are in schools characterized by low teacher expectation. Differences are more pronounced in relation to proportion students from poorer family backgrounds.

Table 14 School composition and teachers' expectations - percentage of students in different categories of schools (migrant student proportion) across principal description

School composition –	Proportion	Migrant	students		
Teachers expectations (principal's description)	0-10% migrants	11-25% migrants	26-50% Migrants	>50% migrants	Total (%)
Low[72]	22.5	26.2	41.6	36.5	25.7
High[73]	77.5	73.8	58.4	63.5	74.3
Total	100.0	100.0	100.0	100.0	100.0

[70] All countries .335, Germany .639, Sweden .622, Netherlands .546, Denmark .500
[71] Jussim L, Eccles, J.S. (1992)
[72] Including percentage of medium, low and very low
[73] Including percentage of high and very high

Table 15 School composition and teachers expectations - percentage students in different categories of schools (economically disadvantaged student proportion) across principal description

School composition –	Proportion	students from	economically disadvantaged	homes	
Teachers expectations (principal's description)	0-10% EcDis	11-25% EcDis	26-50% EcDis	>50% EcDis	Total (%)
Low[74]	15.0	24.9	37.6	46.5	26.2
High[75]	85.0	75.1	62.4	53.5	73.8
Total	100.0	100.0	100.0	100.0	100.0

Considering principals characterization of school in terms of *student ambition,* the pattern is as well notably more expressed for the categories of schools with different proportion of students from poorer family backgrounds. For migrant proportion the pattern of lower student ambition associates with mixed student composition, schools with 26-50 percent migrants. (Table 16 and 17)

Table 16 School composition and student ambition - percentage of students in different categories of schools (migrant student proportion) across principals' descriptions

School composition –	Proportion	migrant	students		
Student ambitions (principal's description)	0-10% migrants	11-25% migrants	26-50% Migrants	>50% migrants	Total (%)
Low[76]	37.4	33.7	53.8	36.7	37.9
High[77]	62.6	66.3	46.2	63.3.	62.1
Total	100.0	100.0	100.0	100.0	100.0

Table 17 School composition and student ambition - percentage students in different categories of schools (economically disadvantaged student proportion) across principals' descriptions

School composition –	Proportion	students from	economically disadvantaged	homes	
Student ambitions (principal's description)	0-10% EcDis	11-25% EcDis	26-50% EcDis	>50% EcDis	Total (%)
Low[78]	22.0	38.0	60.4	56.3	38.1
High[79]	78.0	62.0	39.6	43.7	61.9
Total	100.0	100.0	100.0	100.0	100.0

[74] Including percentage of medium, low and very low
[75] Including percentage of high and very high
[76] Including percentage of medium, low and very low
[77] Including percentage of high and very high
[78] Including percentage of medium, low and very low
[79] Including percentage of high and very high

As part of school context, TIMSS asked if instruction was affected by a shortage in different aspects. For little more than half of the group of students, their principal states that instruction is not affected by any *lack of different items*. Principals in schools with a majority of students from poor family backgrounds describe instruction affected by a lack of a higher degree.

Reflecting practices applied at the level of school, there is a question related to the practice of grouping students according to ability. In addition it was asked if the school offered enrichment and/or remedial mathematics for fourth grade students.

The analyses revealed the practice of *ability grouping* of students as more common in schools with a majority of migrant students[80], but on average it reaches four out of 10 students. As well *enrichment material* for math is more common in schools with a higher percentage of migrant students[81]. *Remedial material* is used to a higher degree in math in schools with a higher percentage of migrant students and in schools with a higher percentage of students from poorer family backgrounds[82].

Modeling the level of school

In modeling student achievement in math including the level of school, the modeling will estimate the effect of indicators related to context and practice displayed above. As pointed out in the introduction to this section, the modeling will also include some aggregated information from the level of classroom and teaching to represent the school. This relates to the different teaching practices, including the book as a basis for teaching. It includes as well the occurrence of a pc in the classroom and the (mostly restricted) availability for students to use a calculator in class.

A stratified student group

For the purpose of this analysis the migrant proportion in classroom has been categorized. Students have been stratified in relation to their native and migrant background and in terms of their belonging in a specific category classroom. Stratifying the student population in such a way provides the model with an estimate of the direct interaction effect between migrant and native students and classroom composition. The stratification of students is done at the student level where the effect of being in specific classrooms for native and migrant students respectively is analyzed in the context of schools with different student composition. As the stratification of students represents an analytical strategy it also represents an interest from a research point of view. It is by no means obvious that the proportion of migrant students in class, when controlling for other factors on the individual and school level, will have an equal effect on native and migrant students[83].

This maneuver means that the estimated gap between native and migrant students achievement is compared for each of the different classes. The point of reference/comparison is the group of native students in classes with not more than 10 percent migrant students. This group represents two thirds of the total group of students, and about 73 percent of native students.

Two measures will be used for measuring the effect of student composition at school. One measure is the proportion of migrant students at school and the other the proportion of students from economically disadvantaged family backgrounds. Both measures are estimates given, as represented above, by the school principle. Preliminary analyses indicated a comparatively stronger effect for the proportion of students from economically disadvantaged family backgrounds. Also other studies have confirmed the stronger effect for socio-economic segregation on students' math achievement as compared to ethnic segregation[84].

However, as the two categorizations are related to some degree, the final modeling used a combined categorization. Categories which reflected schools with 0-10, 11-50 and more than 50 percent migrant

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[80] Total student group – 39.1% , students in schools with >50% migrants – 50.7%
[81] Total student group – 43.8% , students in schools with 26-50% - 50.9% student in schools with >50% migrants – 58.8%
[82] 0-10% migrant and econ disadv schools – 80.1%, 80.1%, >50% migrant and econ disadv schools – 86.8%, 85.8%
[83] For a study on school's composition effect for different student groups, see for instance Willms, J. D (1986). .
[84] See for instance Dronkers, J., Levels, M (2007)

students (M1, M2, M3) and the corresponding categories for students from economically disadvantaged family background (D1, D2, D3) were combined. As reference group for the analyses is the category of D1M1 schools, i.e., schools that combine the feature of not more than 10 percent migrant students with not more than 10 percent students from economically disadvantaged family backgrounds[85].

Thus, whereas the categorization of classroom is based on four categories the modeling of school as based on a three group categorization made for the respective two proportions at school. The logic of applying a broader categorization at school as compared to the classroom level is given by an assumption made of schools and classrooms different impacts. As student composition in class is argued to affect students on a more elaborate and direct level, it is argued to affect students' achievements more broadly at the level of school[86]. School composition is more likely to affect other relationships at school which in turn will have an effect on students' achievement. This could concern learning climate, student relationships[87], teacher expectations and teaching styles/ practices, disciplinary climate, course content, to mention some examples. In this sense school composition might be regarded more as a proxy for a number of possibly underlying relationships[88].

Except for student composition also equipment in classrooms, such as pcs and calculators, and school climate and the perceived lack of different equipment disturbing instruction, represent the context level of school. As school climate the model includes teacher expectations for student achievement, as described by the principal, but excludes as insignificant the characteristic of student ambition. The policy/practice level is represented by the school's using different types of extra material for math, the eventual practices of ability grouping and aggregated information on practices used in teaching. The practices used in teaching include the use of the book as the main method, student practicing writing equations and students memorizing.

Considering the model displayed in Table 18 the impact of student composition at school, as indicated by the preliminary analysis students' achievement are mainly affected by schools' proportion of students with economically disadvantaged family backgrounds. Schools with 0-10 percent students from poorer family backgrounds in combination with a majority of migrant students have no significant effect on students' achievement. However the effect of a higher proportion of students from poorer families is increased by a higher proportion of migrants. The negative effect is most pronounced for schools with a majority of students from poorer families in combination with a majority of students from migrant backgrounds (D3M3).

Material equipment/resources are part of the school context as is also teachers' expectations on students' achievement. Both these factors have an effect on students overall math achievement, but teacher expectations matters comparatively more for students achievement than do the lack of some material equipment as rated by the principal disturbing the instruction at school.

As regards schools practices it is negative for students' achievement to group students after ability, and negative as well is to use remedial materials. To provide supplementary enrichment materials is on the other hand a practice which is positively associated with students' math achievement. Turning to the classroom and teaching practices it is positive to teach by the book, to allow a calculator in class and to have students' practice equation writing. Negative practices relates to having a pc in class and to have students memorizing formulas and procedures.

Considering the effect of student composition in class it is noticeable that whereas native students are not affected migrant students are. For migrant students the least negative class is a class with at least 90 percent

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[85] The categories included are thus D1M2 (010% econ dis and 11-50% migr), D1M3(010% from econ dis and >50% migr), D2M1 (11-50% econ dis and 0-10% migrants), D2M2, D2M3, D3M1, D3M2 and D3M3 (schools with more than 50% students econ dis, and more than 50 % migrant students)

[86] How class is composed is likely to make a difference on a finer level, such as including 30 or 40 percent migrant students. At the school level it is more likely to affect in terms of schools being either predominantly native or predominantly migrant or mixed, i.e., more broadly.

[87] See for instance Entorf, H, Lauk, M (2006) who found, in analyzing peer effects in different educational systems for migrant and native students in PISA, that peer effects are more pronounced in ability differentiated school systems as compared to more comprehensive systems.

[88] Willms (1986)

native students. The other class room categories represent a negative effect of between 15 and 22 scale score points, with no obvious pattern to interpret.

With some few exceptions the relationships on the individual student level stay quite the same as they were when introducing the classroom and teaching level. A noticeable reduced effect concerns students' having a dictionary, pc and internet connection at home.

Table 18 Variables at the school level (HLM)

Dependent variable - Overall Mathematical ability	Estimated coefficients introducing Level 3 / Individual Student /Home			Estimated coefficients introducing Level 3 / School Context Practice/Policy
Student level			*The level of school*	
			Context	
Migr0-10	**-12,85** (3.25)		D1M2	**n.s**
Migr11-25	**-21,56** (2.51)		D1M3	**n.s**
Migr26-50	**-15,27** (3.69)		D2M1	**n.s**
Migr>50	**-17,10** (6.15)		D2M2	**n.s**
Nat11-25	**n.s**		D2M3	**-22,72** (5.42)
Nat26-50	**n.s**		D3M1	**-25,41** (3.83)
Nat>50	**n.s**		D3M2	**-31,07** (4.57)
>200 Books	**9,29** (2.94)		D3M3	**-36,42** (5.27)
<25 Books	**-25,11** (1.92)		Shortage/hindering instruction	**-2.93**[89] (1.62)
PC	**17,43** (2.84)		Teacher Expectation Student achievement	**4.91** (1.82)
Internet	**11,01** (2.05)		Math Book as Basis for Teaching*	**5.28** (2.13)
Calculator	**16,90** (2.42)		PC in class*	**-5.18** (1.92)
Dictionary	**17,32** (2.22)		Calculator in class*	**4,30** (2.01)
Study Desk	**11,31** (3.18)		Students Equation writing*	**10.52** (2.56)
Boy	**11.38**[90] (1.24)		Students Memorizing*	**-8.44** (3.45)
Speaking language of assessment at home (always or never)[91]	**15,22** (2.90)		*School Practice/Policy*	
			Enrichment Material	**6,95** (1.89)
			Remedial Material	**-5,84** (2.16)
			Ability grouping	**-5,14**[92] (2.68)

*aggregated from the teaching and classroom level

[89] p.07
[90] p.07
[91] the category never includes for the analysis the more frequent response sometimes, and the category always includes the response almost always / compare the table presented in relation to the previous presented student level model
[92] p.08

Country differences

As this final model include factors from the individual student level, aggregated information from the level of teaching and classroom and information reflecting the level of school, it is interesting to review the results in terms of what is specific and what is in common for the countries in the analysis. On the individual student level there are significantly different country effects for gender, language spoken at home and number of books at home, both few and many books. There are also significant differences in what effect different assets at home have on students' achievement. This includes a computer, the internet, the dictionary, the study desk and the calculator at home – their respective influence on students achievement, all depends on the country in question. In addition there are country differences for the effect of being migrant student in classrooms with more than 25 percent migrant students.

On the school level, only the effect of ability grouping students differ between countries as does also the practice to have students memorizing in math classes. For the rest of effects they are the same. As such the effect of teacher expectations on students' achievement is in common for the countries and all school composition effects as well as the policy/practice of using enrichment and/or remedial material.

Migrant students in focus

The model was applied for migrant students only, as well as for analyzing the effect for the respective groups of 1st and 2nd generation migrant students. The underlying estimates are presented in Appendix 4.

Applying the model for the smaller sample of migrant students not all indicators are significant, much due to the smaller sample size. However, schools with a combined majority of students from migrants and poorer family backgrounds (D3M3) has a more negative effect on migrant students overall math achievement.

Teacher expectation is significant and is also somewhat more pronounced for migrant students, about 7 scale score points. To use a book as main method of teaching has a twice as large effect for migrant students, about 12 scale score points. Considering home assets having a study desk, dictionary and calculator are more important when compared within the migrant student group. Having a computer on the other hand has only half the effect as compared to the main model, about 8 scale score points.

Considering the total sample of students but taking into consideration 1st and 2nd generation migrants respectively as related to native students, the overall patterns are similar, both in regard to the two generations and as compared to the main result, displayed in Table 18. However there is one difference between the generation migrant students and that regards classroom composition. The effects of being a student in different classrooms are considerably more pronounced for 1st than for 2nd generation migrant students. As a classroom with a majority of migrant students does not affect 2nd generation migrant student math achievement significantly the same classroom has a pronounced negative effect for 1st generation migrants, a minus 32, almost twice the negative effect displayed in Table 18. The classroom for 1st generation migrant students which seem to offer the better conditions is a class with mainly native students, i.e., with 0-10 percent migrant students. Considering the individual factors, the role of language spoken at home is somewhat more pronounced for both 1st and 2nd generation migrant students in comparison with the main table18. (Appendix 4)

Concluding – the level of school

In the last step of the modeling school was included, both factors related to school context and factors related to school practices. Considering school context the analysis pointed to the importance of student composition at school. The effects of school composition are estimated in relation to schools with at most 10 percent migrant students in combination with at most 10 percent students from economically disadvantaged families. The effect of higher proportion of students from poorer families is negative for students' achievement and stronger if combined with a higher proportion of migrant students. The effect of student composition in classroom is different for native and migrant students. The estimated effect stands in relation to the average performance of native students in classes with low percentage 0-10 of migrant students. For native student the classroom setting is of no significance. There are negative effects for migrant students. However in comparing the different generations of migrant students, there is a much more pronounced effect for 1st generation migrant students. The better condition seems to be a class with mostly native students, i.e., 0-10 percent migrant students.

Also teachers are part of the school context and the analyses pointed to the general positive effect of teacher high expectations on students' math achievement. That the teacher expect much is comparatively more important for migrant students. The aggregated information from the level of classroom and teaching are significant also on the level of school. This included the positive effects for using a book as main instrument for teaching, a practice comparatively more important for migrant students. Other teaching practices with positive effects are working with equations and allowing students to use a calculator. Negative effects are associated with students memorizing formulas and the use of pc in class.

Ability grouping of students in schools is negatively associated with students overall mathematical achievement and so is also the use of remedial material. To use enrichment materials is on the other hand positive.

Overall conclusion and discussion

This report uses data from TIMSS2007 for a study on which factors matter for migrant students overall mathematics ability. Information is used reflecting the individual student level, the level of classroom and teaching and the level of school. The analysis is based on the total student group in altogether 12 European countries. In focus is the gap in performance between native and migrant students. A working assumption is that conditions at different levels will have an impact on students overall reading ability, and that some factors will work to explain the gap between native and migrant students achievement. Throughout the analyses the eventual different effects for 1st and 2nd generation migrants have also been considered. The necessity to acknowledge the variation within the group of migrant students is argued. As the percentage of migrant students is comparatively small per country no specific country analysis has been performed. However, supplementary analyses in terms of the main models functioning for migrant students in particular have been performed, based on all 12 countries involved.

As the modeling have investigated factors of importance at the different levels the strongest effects on students overall math achievement relates to different individual background circumstances. However, it is interesting to note that factors at the school, and not least within the classroom, are important for students' achievement in math, and some are in particular important for migrant students.

The introduction of individual background factors managed to reduce the initial 34 scale score gap in achievement to 16 between native and migrant students. The reduction relates largely to different assets at home. In TIMSS there is no information on socio-economic background for students, since no questionnaire was administered to students' parents. However there is a question of number of books at home, which is argued to capture at least some of the difference in parents' educational levels. And number of books is also one of the circumstances in these analyses that make a difference. In particular few books at home have a large negative effect on students' math achievement. As well other assets are important, such as having a pc with internet connection, a calculator, a dictionary, and a study desk. All such assets make a significant difference for math achievement. The relationships in students' individual backgrounds continue to have an influence on their math achievement also after having considered various factors at the level of school, teaching and classroom, even if some background effects are somewhat reduced. Focusing migrant students, it is in particular 1st generation migrant students' achievement that is affected by the various assets at home.

The effect of language spoken at home is not dominant in the modeling of students' math ability but it does make a significant difference. And studying math in school as subject requires a certain level of language proficiency, in order both to follow teaching and to understand and respond to questions put forward in assessment. This reflects the general school situation in most countries, where teaching and learning takes place in a national language context. As such, it indicates that the effect of language at home comes into play for studying math as well, as is the case most likely for other school subjects. Language affects math achievement even though mathematics might be described as a language in itself, with its own syntax and grammar. It is interesting to note that when considering migrant students the effect of language spoken at home is more pronounced for 2nd generation students, i.e., students born in the country of assessment of parents born elsewhere and who once immigrated.

Quite a few factors related to teachers, teaching and classroom are significant for students' math achievement. Interestingly, both teachers general level of education and their specialization in math has an effect on math achievement and so as well has teachers preparedness to teach. As other studies have pointed to the specific effect of teachers being educated or specialized in the subject studied, and not affecting other subjects[93], it might be worth paying attention to. Teachers' competences matters for students learning math.

In fact, including teachers' specialization in math actually renders other context related factors in the classroom insignificant. This is for instance the use or not of pc and calculators in class. Teaching practices however seem not affected by teachers' math specialization. They stay put and still influence students' math achievement. Considering the specialized math teacher for migrant students, it is interesting to note that whereas this is a feature of positive significance for 2nd generation migrant students, it has no significant effect on 1st generation migrant students' achievement.

Including a pc in the class is negatively influencing students' math achievement. Teachers using a book as main tool in teaching math is on the other hand positive for students overall math achievement. Both of these relationships are stronger in effect, more pronounced for migrant students. As for the use of the book in class, this has twice the effect on migrant students, and is in particular important for 1st generation migrant students. Given the 1st generation migrant students possibly weaker situation in terms of language proficiency, it makes sense that they would be more depending on a 'structured teaching following the book'-method, in order to be able to cope in class and not fall behind.

As relates to other teaching practices the results clearly indicate a negative effect of memorizing formulas and procedures, whereas the practice to write equation is positive for students' achievement – a pattern for students generally. All in all, the introduction of the factors at the level of teaching and classroom managed to reduce the gap between native and migrant students some additional points, from 16 to 13 scale score points on average.

For the school, perhaps the more disturbing results relate to the segregated pattern in terms of student composition and its effects on students achievement. There is a clear pattern of segregation in these 12 countries where students are far from randomly assigned to schools. And there is a clear negative effect specifically for schools with many students from poor family backgrounds. This negative effect increases with a higher proportion of migrant students. The general pattern of correspondence between schools' proportion of migrant students and schools' proportion of students from economically disadvantaged family background is more pronounced for some countries than others For many countries these processes include both socioeconomic and ethnical segregation and for some in addition residential segregation[94].

The most pronounced negative effect, about minus 36 scale score points, is a school with a majority of students from poor family backgrounds and a majority of students from migrant backgrounds. Whereas this type of school is not representative for many native students, only about 2 percent, it is representative for almost a fifth of the migrant student population. In addition the negative effect is more pronounced for migrant students.

The segregated school pattern represents a more urgent action to take for countries, given their strong negative effects on students' achievement in math, over and above their own social backgrounds. Studies have pointed to the potential positive effects in using experienced senior teachers for minority students and students from low income families[95], which might be one possible more immediate action to take. As the question of segregation in education has many dimensions this requires consideration and careful action. The positive effect of teachers being higher educated, specialized in the subject, and well prepared, are results related to the recruitment of teachers and qualification requirements which should be considered.

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93 Goldhaber, D., Brewer, J (1996)
94 Raudenbush and Willms (1995)
95 Rivkin, S., Hanushek, E., Kain, J (2005)

To target class segregation within schools is equally well motivated. Class composition has pronounced effects for migrant students' achievement, but it does not seem to affect native students. Hence, it represents a possibility of action worth to consider. Also school practices make a difference for students' math achievement. To group according to ability is negatively associated with students' achievement as is also the use of remedial material. To use enrichment material is on the other hand a practice with positive effect on math achievement.

Summing up, this study has pointed to possible factors of importance on the level of school and classroom. Most significantly the role of student composition both at the level of classroom and at the level of school was demonstrated and policy action for rectify the situation is motivated in most countries. Other quite practical actions are possible to consider, as it comes to school practices and teaching strategies used.

The individual background factors demonstrate their importance throughout the analysis, and as such student background exerts an ongoing influence on their achievement, also when controlling for various conditions in classroom and school. Research in the sociology of education has focused on the extent to which the effects of family SES on educational achievement are mediated, enhanced or might be neutralized by school context. Research studies have also concluded the effect of family SES as resilient across different school contexts, although school context can affect the strength of the relationship[96].

Although the analyses indicate a somewhat reduced impact of individual student factors when introducing the level of classroom and school, it might be concluded that school and teaching, do not in fact manage to compensate more than marginally for students' different backgrounds. The strong impact of individual background factors is present all through the analysis, and the analysis has also pointed to the varying effects for different groups of students.

Such large influence of social background factors on student achievement plays a pivotal role also in public affairs. If educational achievement depends more on students backgrounds than ability, it can be regarded a waste of human capital. The transmission of social background status from parents to students by way of the educational system also circumvents the ideal of a meritocratic system. Considering the role that educational systems play in the functioning of democracies, where equality in education is imperative, a large influence of students' social backgrounds is clearly negative[97].

As this report has concentrated on the educational achievement of migrant versus native students, it has only briefly touched on the question of country effects. Comparing countries in terms of how successful countries are in integration politics would include an analysis of the system level. In such an analysis, aspects such as migration policies and practices and educational policies for incorporating 1st and 2nd generation immigrants at the country level could be targeted[98].

[96] Portes, A., MacLeod, D (1996)
[97] Schlicht, R, Stadelmann-Steffen, I and Freitag, M (2010)
[98] Hochschild, J.L and Cropper, P (2010)

References

Araujo, L, Dinis da Costa, P (2012) Reading Literacy in PIRLS2006: What explains reading achievement in 20 EU countries? European Commission, JRC, IPSC, JRC Scientific and Technical Reports, EUR66894 EN.

Bellin, N, Dunge, O, Gunzenhauser, C (2010) The importance of class composition for reading achievement: Migration background, social composition, and instructional practices. An analysis of the German 2006 PIRLS data, IERI Monograph Series: Issues and methodologies in large-scale assessment, pp. 9-34.

Bickel, R (2007) Multilevel Analysis for Applied Research. The Guildford Press, New York.

Bourdieu, P (1984) Distinction. A Social Critique of the Judgment of Taste. London & New York: Routledge and Kegan Paul.

Boswell, C (2005) Migration in Europe. A paper prepared for the Policy Analysis and Research Programme of the Global Commission on International Migration.

Brese, F, Mirazchiyski, P (2010) Measuring Students' Family Background in Large-scale Education Studies. A paper presented at the 4th IEA International Research Conference July 1-3, Gothenburg, Sweden.

Buchmann, C and Parrado, E.A (2006) Educational Achievement of Immigrant-Origin and Native Students: A Comparative Analysis Informed by Institutional Theory. International Perspectives on Education and Society, Vol 7, pp 335-366.

Coleman, J.S., et al (1966), Equality of educational opportunity. Washington, DC: US Government Printing Office.

von Davier, M., Gonzalez, E., & Mislevy, R.J. (2009) What are plausible values and why are they useful? In IERI Monograph Series: Issues and methodologies in large-scale assessments (Vol. 2, pp. 9-36). Hamburg/Princeton, NJ: IEA-ETS Research Institute.

Dronkers, J., Levels, M (2007) Do School Segregation and School Resources Explain Region-of-Origin Differences in the Mathematics Achievement of Immigrant Students? In Education Research and Evaluation, 13:5 pp 435-462

Entorf, H, Lauk, M (2006), Peer Effects, Social Multipliers and Migrants at School: An International Comparison. Institute for the study of labor, IZA DP No. 2182

European Commission (2008), Green Paper, Migration & mobility: challenges and opportunities for EU education systems, Brussels, 3.7 2008, COM (2008) 423 final.

European Commission (2011) Progress Towards the Common European Objectives in Education and Training. Indicators and Benchmarks 2010/2011. http://ec.europa.eu/education/lifelong-learning-policy/doc/report10/report_en.pdf

Eurydice (2009), Integrating Immigrant Children into Schools in Europe.

Fossati, F (2010), The Effect of Integration on Immigrants' School Performance: A Multilevel Approach. Center for Comparative and International Studies (ETH Zurich and University of Zurich), CIS Working Paper, No 57

Goldhaber, D., Brewer D (1996) Evaluating the Effect of Teacher Degree Level on Educational Performance. Developments in school finance, 1996 pp 197-210. nces.ed.gov

Goldhaber, D, Brewer, D (1997), Why Don't Schools and Teachers Seem to Matter? The Journal of Human Resources, Vol. 32, No 3, pp 505-523

Hansson, A & Gustafsson, J-E (2010), Measurement Invariance of socioeconomic status across migration background. Paper presented at the 4th IEA International Research Conference, 1-3 July, Gothenburg, Sweden.

Hanushek, E.A (2002) The Trade-off between Child Quantity and Quality. Journal of Political Economy, Vol. 100, No. 1 (Feb., 1992) pp. 84-117. The University of Chicago Press.

Hanushek, E.A., Woessmann, L (2010) The Economics of International Differences in Educational Achievement. IZA Discussion Paper Series, No 4925, Bonn, Germany.

Herm, A (2008) Recent migration trends: citizens of EU27 Member States become ever more mobile while EU remains attractive to non-EU citizens. Eurostat, Statistics in Focus 98/2008, Population and social conditions.

Hochschild, J.L and Cropper, P (2010) Immigration regimes and schooling regimes; Which countries promote successful immigrants incorporation? Theory and Research in Education 8(1) pp 21-61

Hox, J (1998) Multilevel Modeling: When and Why. In Balderjahn, I, Mathar, R & Schader, M (Eds). Classification, data analysis and data highways. New York: Springer Verlag Pp 147-154

Joncas, M (2007) TIMSS 2007 Sampling Design. Chapter 5 in TIMSS 2007 Technical Report

Jussim L, Eccles, J.S. (1992) Teacher Expectations: 11. Construction and reflection of student achievement. Journal of Personality and Social Psychology, Vol 63(6), Dec 1992, pp 947-961

Lareau, A (1987), Social Class Differences in Family School Relationships: The Importance of Cultural Capital. Sociology of Education, Vol. 60, No. 2, April, 1987, pp. 73-85

Lindsay Lowell, B (2007), Trends in International Migration Flows and Stocks, 1975-2005. OECD Social, Employment and Migration Working Papers.

Metzler, J., Woesmann, L (2012) The Impact of Teacher Subject Knowledge on Student Achievement: Evidence from Within-Teacher Within-Student Variation. Journal of Developmental Economics 99 (2), pp. 486-496

Mullis, I.V.S., Martin, M. O., Ruddock, G. J., O'Sullivan, C.Y, Arora, A, & Eberber, E.(2005) TIMSS2007Assessment Frameworks

Olson, J.F., Martin, M.O., & Mullis, I.V.S. (Eds.) (2008) TIMSS 2007 Technical Report. Chestnut Hill, MA http://timss.bc.edu/timss2007/techreport.html

NESSE (2008) Education and Migration. Strategies for integrating migrant children in European schools and societies. A synthesis of research findings for policy makers. www.nesse.fr/nesse/activities/reports

Nusche, D (2009). What Works in Migrant Education? A Review of Evidence and Policy Options OECD Education Working Papers, No. 22, OECD Publishing.

OECD (2006), Where Immigrant Students Succeed A comparative review of performance and engagement in PISA 2003

OECD (2010a) OECD Reviews of Migrant Education Closing the Gap for Immigrant Students: Policies, Practices and Performance.

OECD (2010b) Educating Teachers for Diversity: Meeting the Challenge.

Portes, A., Hao, L (2004) The schooling of children of immigrants: Contextual effects on the educational attainment of the second generation. PNAS, Vol. 101, No. 33, pp. 11920-11927

Portes, A., MacLeod, D (1996) Educational Progress of Children of Immigrants: The Roles of Class, Ethnicity, and School Context. In Sociology of Education, Vol 69 (October), pp 255-275

Raudenbush, S.W., Willms, J.D (1995) The Estimation of School Effects. Journal of Educational and Behavioral Statistics, Winter 1995, Vol 20, No 4, pp 307-335

Rivkin, S.G., Hanushek, E.A., Kain, J.F (2005) Teachers, Schools, and Academic Achievement. Econometrica, Vol. 73, No.2 (Mar., 2005), pp. 417-458, Publ The Econometric Society.

Robbins, D (2005), The origins, early development and status of Bourdieu's concept of 'cultural capital'. British Journal of Sociology 2005 VOL 56 Issue 1 pp. 13 – 30

Rutkowski, L, Gonzalez, E, Joncas, M, von Davier, M (2010) Interrnational Large-Scale Assessment Data: Issues in Secondary Analysis and Reporting. Educational Researcher, Vol. 39, No 2, pp. 142-151

Salt, J (2005) Current Trends in International Migration in Europe. Council of Europe

Schlicht, R, Stadelmann-Steffen, I, Freitag, M (2010) Educational Inequalities in the EU: The Effectiveness of the National Education Policy. European Union Politics 2010; Volume 11 (1); pp 29-59

Schneeweis, N (2011) Educational institutions and the integration of migrants Journal of Population Economics, Volume 24 (2011), Number 4, pp 1281-1308

Schnepf, S (2008) Inequality of Learning Amongst Immigrant Children in Industrialised Countries. HWWI Research

Sirin, S.R (2005) Socioeconomic status and academic achievement. A meta-analytic review of research. Review of Educational Research, 75(3), 417-453

Skolverket (2005) Elever med utlandsk bakgrund – en sammanfattande bild. National Agency for Education, Foreign background students – a summary.

Snijders, T, Bosker, R (2004) Multilevel Analysis. An introduction to basic and advanced multilevel modeling. Sage Publication, London

Szulkin, R, Jonsson, J.O (2007), Ethnic segregation and educational outcomes in Swedish comprehensive schools: A multilevel analysis. Paper submitted to the American Journal of Sociology, Stockholm University, Sweden http://www.etla.fi/edwin/publ/papers/ paper10.pdf

Willms, J.D. (2010) School Composition and Contextual Effects on Student Outcomes. Teachers College Record Volume 112 Number 4, 2010, p. 1008-1037

Willlms, .J.D. (1986), Social Class Segregation and Its Relationship to Pupil's examination Results in Scotland. American Sociological Review, Vol. 51, No. 2, (Apr., 1986) pp. 224-241

APPENDIX 1 - 4

Appendix 1

TIMSS2007 Distribution of native and migrant students in TIMSS2007 for countries included in the analysis

	Native students %	1st generation migrant students	2nd generation migrant students
Austria	83.7	6.7	9.6
Czech Republic	97.0	1.1	1.9
Denmark	90.1	4.4	5.5
Germany	82.6	5.1	12.3
Hungary	97.1	1.5	1.4
Italy	94.8	2.5	2.7
Netherlands	87.9	5.8	6.3
Slovak Republic	94.4	0.7	4.9
Slovenia	88.0	2.9	9.1
Sweden	86.1	5.2	8.7
England	89.2	5.6	5.2
Scotland	94.9	3.3	1.8

Appendix 2

Variables at the individual student level (HLM)

1st generation migrant students
2nd generation migrant students
Total migrant student group

Variables	Baseline model (MOD0)	+ Migrant/ native status (MOD1)	+ Home possessions (MOD2)	+Individual student characteristics MOD3
1st generation migrants		**-44, 93** (7.04)	**-27,15** (5.81)	**-18.11** (5.89)
>200 Books			**11.47** (4.04)	**11.30** (4.10)
<25 Books			**-29,91** (3.14)	**-30,07** (3.11)
PC			**21,53** (1.89)	**20,12** (2.01)
Internet			**17,35** (3.82)	**17,12** (3.79)
Calculator			**18,62** (2.49)	**18.40** (2.52)
Dictionary			**24,37** (1.65)	**24.48** (1.76)
Study Desk			**12,23** (4.75)	**14.29** (5.29)
				Individual factors
Boy				**11.51** (1.42)
Speaking or not speaking the language of assess-ment at home				**-22.96** (3.73)

Appendix 2

Variables	Baseline model (MOD0)	+ Migrant/ native status (MOD1)	+ Home possessions (MOD2)	+Individual student characteristics MOD3
2nd generation migrants		**-25,22** (5.27)	**-17,83** (3.20)	**-10.77** (3.65)
>200 Books			**11.89** (4.53)	**11.70** (4.63)
<25 Books			**-30,65** (3.46)	**-30,74** (3.38)
PC			**21,34** (1.93)	**19,92** (2.05)
Internet			**16,08** (3.56)	**15,89** (3.52)
Calculator			**16,86** (2.00)	**16.63** (1.92)
Dictionary			**23,71** (1.60)	**23.86** (1.64)
Study Desk			**13,08** (4.37)	**14.57** (4.56)
				Individual factors
Boy				**11.89** (1.50)
Speaking or not speaking the language of assess-ment at home				**-25.09** (2.95)

Appendix 2

Migrant students only, Student level, Table 6, model 3

Variables	Full model MOD3
Total migrant student group	
<25 Books	**-27,10** (3.22)
Internet	**12,08** (5.13)
Calculator	**26.52** (11.59)
Dictionary	**22.77** (3.88)
Study Desk	**17.54** (6.12)
	Individual factors
Boy	**14.42** (3.57)

Non-significant variables were excluded from the model, representing pc at home, many books at home, and speaking or not speaking the language of assessment at home

Appendix 3

Teaching and classroom level – 1st and 2nd generation migrant students respectively in comparison with native students

Variables	Estimated coefficients Introducing Level 2 HLM/teaching and classroom	Estimated coefficients Introducing Level 2 HLM/teaching and classroom
Overall mathematical ability	1st generation Sigma squared (3862.31)	2nd generation Sigma squared (3832.93)
Migrant – native	**-17.15** (3.77)	**-7.80** (2.64)
>200 Books	**9.78** (1.31)	**10.45** (1.32)
<25 Books	**-23,68** (0.83)	**-23,93** (0.84)
PC	**17,90** (2.02)	**17,46** (2.11)
Internet	**11,40** (0.95)	**10,50** (0.92)
Calculator	**13.28** (1.28)	**13.40** (1.31)
Dictionary	**18.76** (1.25)	**18.57** (1.23)
Study Desk	**7.15** (1.17)	**7.47** (1.16)
Boy	**11.33** (0.88)	**11.77** (0.79)
Speaking or not speaking the language of assessment at home	**-18.83** (2.48)	**-20.06** (1.82)
TEACHER/CLASSROOM	***Context***	***Context***
Highest level of formal education[99]	**8, 60** (3.05)	**8, 49** (2.96)
Teachers preparedness to teach – Geometric (shapes/measures)	**5.08** (1.51)	**4.23** (1.48)
Percent migrant students in class (0-100%)	**-27.92** (5.41)	**-29.70** (5.29)
	Practice	***Practice***
Textbook as primary basis for teaching	**7,88** (1.81)	**6,63** (1.75)
Students permitted to use calculator	**5.07** (1.95)	**5.62** (1.93)
PC in the classroom	**n.s**	**-2.97** (1.52)
Students explain their answers	**3,17** (1.72)	**3,74** (1.69)
Students practicing writing equation from words	**7.12** (1.94)	**6.69** (1.97)
Memorizing formulas/procedures	**-6.12** (1.97)	**-5.91** (1.90)

[99] Based on 11 countries, Hungary is missing on this information.

Appendix 3

Teaching and classroom level - Migrant students group

Variables	Estimated coefficients Introducing Level 2 HLM/teaching and classroom
Overall mathematical ability	Migrant students Sigma squared (3740.01)
<25 Books	**-21,11** (3.16)
PC	**9,06** (4.84)
Internet	**9,96** (4.24)
Calculator	**18.25** (6.28)
Dictionary	**21.06** (5.12)
Study Desk	**12.14** (5.13)
Boy	**14.23** (1.91)
TEACHER/CLASSROOM	***Context***
Percent migrant students in class (0-100%)	**-57.64** (27.44)
	Practice
Textbook as primary basis for teaching	**11,03** (2.63)
PC in the classroom	**-8,78** (3.63)

Non-significant variables were not included in the model.

Appendix 3

Teachers specialization in math – total group of students

Variables	Estimated model individual students level (MOD3)	Estimated coefficients Introducing Level 2 HLM/teaching and classroom
Overall mathematical ability	Sigma squared (4801.84)	Sigma squared (3871.59)
Migrant	**-16,28** (2.77)	**-10,74** (1.94)
>200 Books	**11.11** (4.36)	**12.97** (1.53)
<25 Books	**-30,06** (3.14)	**-26,56** (0.97)
PC	**19,08** (1.98)	**16,96** (2.35)
Internet	**15,98** (3.62)	**15,83** (1.10)
Calculator	**18.58** (2.45)	**16.75** (1.81)
Dictionary	**23.97** (1.51)	**16.08** (1.39)
Study Desk	**15.24** (5.16)	**11.77** (1.65)
Boy	**11.72** (1.44)	**11.41** (0.99)
Speaking or not speaking the language of assessment at home	**-19.66** (4.07)	**-16.49** (2.34)
TEACHER/CLASSROOM		***Context***
Teachers specialization in Math[100]		**6, 11** (1.71)
Teachers preparedness to teach – Geometric (shapes/measures)		**n.s**
Percent migrant students in class (0-100%)		**-34.72** (4.64)
		Practice
Textbook as primary basis for teaching		**9,15** (1.71)
Students permitted to use calculator		**4.45** (1.94)
PC in the classroom		**n.s**
Students explain their answers		**3,98** (1.63)
Students practicing writing equation from words		**7.39** (2.34)
Memorizing formulas/procedures		**-3.39** (1.63)

Non-significant variables are excluded from the modeling – included in the tables for comparison

[100] Based on 11 countries – Italy is missing this information

Appendix 3

Teachers' specialization in math – 1st and 2nd generation migrant students respectively in comparison with native students

Variables	Estimated coefficients Introducing Level 2 HLM/teaching and classroom	Estimated coefficients Introducing Level 2 HLM/teaching and classroom
Overall mathematical ability	1st generation Sigma squared (3754.36)	2nd generation Sigma squared (3707.05)
Migrant – native	**-18.77** (2.37)	**-5,03** (1.84)
>200 Books	**12.79** (1.54)	**13.41** (1.53)
<25 Books	**-26,81** (0.93)	**-27,17** (1.00)
PC	**17,72** (2.38)	**17,58** (2.54)
Internet	**17,14** (1.18)	**15,21** (1.11)
Calculator	**16.03** (2.03)	**16.02** (1.78)
Dictionary	**16.53** (1.36)	**15.74** (1.42)
Study Desk	**11.67** (1.70)	**11.20** (1.71)
Boy	**11.33** (0.88)	**11.27** (0.96)
Speaking or not speaking the language of assessment at home	**-20,01** (3.69)	**-19.64** (2.54)
TEACHER/CLASSROOM	***Context***	***Context***
Teachers specialization in Math	**5, 46** (1.80)	**5, 69** (1.70)
Teachers preparedness to teach – Geometric (shapes/measures)	**n.s**	**n.s**
Percent migrant students in class (0-100%)	**-28.91** (7.54)	**-33.28** (10.78)
	Practice	***Practice***
Textbook as primary basis for teaching	**8,71** (1.75)	***6,63*** (1.75)
Students permitted to use calculator	**n.s**	**n.s**
PC in the classroom	**n.s**	**n.s**
Students explain their answers	**4,75** (1.67)	**4,43** (1.64)
Students practicing writing equation from words	**7.07** (2.35)	**6.81** (2.34)
Memorizing formulas/procedures	**-3.11** (1.66)	**-3.52** (1.65)

Non-significant variables are excluded from the modeling – are included in the tables for comparison

Appendix 4

1st generation migrant students compared with reference group – native students in classroom with 0-10 percent migrant students – School level

Dependent variable - Overall Mathematical ability 1st generation	Estimated coefficients introducing Level 3 / student level		Sigma squared (3989.72)	Estimated coefficients introducing Level 3 / School Context Practice/Policy
Student level			*The level of school*	
			Context	
1st Gen 0-10	**-9,31** (4.15)		D1M2	**n.s**
1st Gen 11-25	**-28,41** (3.61)		D1M3	**n.s**
1st Gen 26-50	**-20,00** (4.22)		D2M1	**n.s**
1st Gen Migr>50	**-32,08** (6.71)		D2M2	**n.s**
Nat11-25	**n.s**		D2M3	**-21,47** (5.59)
Nat26-50	**n.s**		D3M1	**-29,35** (3.91)
Nat>50	**n.s**		D3M2	**-34,10** (4.91)
>200 Books	**9,56** (1.50)		D3M3	**-36,52** (5.58)
<25 Books	**-23,63** (0.96)		Shortage/hindering instruction	**n.s**
PC	**18,63** (2.16)		Teacher Expectation Student achievement	**3.92** (1.98)
Internet	**9,00** (0.97)		Math Book as Basis for Teaching*	**7.44** (2.30)
Calculator	**12,92** (1.25)		PC in class*	**-4.65** (1.93)
Dictionary	**19,82** (1.34)		Calculator in class*	**n.s**
Study Desk	**6,55** (1.18)		Students Equation writing*	**13.30** (2.68)
Boy	**10.99** (0.87)		Students Memorizing*	**n.s**
Language at home (always or never)[101]	**18,03** (2.32)		Students explaining answers	**5,11** (2.13)
			Practice/Policy	
			Enrichment Material	**7,35** (2.02)
			Remedial Material	**-5,41** (2.24)
			Ability grouping	**-3,73**[102] (2.68)

[101] Language of assessment - the category never includes for the analysis the response sometimes, and the category always includes the response almost always

[102] p.06

Appendix 4

2nd generation migrant students compared with reference group – native students in classroom with 0-10 percent migrant students – School level

Dependent variable - Overall Mathematical ability 2nd generation	Estimated coefficients introducing Level 3 / student level		Sigma squared (3953.68)	Estimated coefficients introducing Level 3 / School Context Practice/Policy
Student level			*The level of school*	
			Context	
2nd Gen 0-10	**-12,53** (4.43)		D1M2	**n.s**
2nd Gen 11-25	**-14,78** (3.48)		D1M3	**n.s**
2nd Gen 26-50	**-7,99** (3.24)		D2M1	**-5,07** **(2.28)**
2nd Gen Migr>50	**-16,22** (5.96)		D2M2	**n.s**
Nat11-25	**n.s**		D2M3	**-20,45** (5.47)
Nat26-50	**n.s**		D3M1	**-29,97** (3.92)
Nat>50	**n.s**		D3M2	**-33,14** (4.74)
>200 Books	**9,86** (1.41)		D3M3	**-38,20** (5.55)
<25 Books	**-24,09** (1.01)		Shortage/hindering instruction	**n.s**
PC	**18,35** (2.09)		Teacher Expectation Student achievement	**3.84** (1.94)
Internet	**8,36** (0.93)		Math Book as Basis for Teaching*	**7.38** (2.26)
Calculator	**13,58** (1.30)		PC in class*	**-4.19** (1.92)
Dictionary	**19,64** (1.34)		Calculator in class*	**n.s**
Study Desk	**7,02** (1.15)		Students Equation writing*	**12.83** (2.66)
Boy	**11.44** (0.76)		Students Memorizing*	**n.s**
Language at home (always or never)[103]	**18,52** (2.14)		Students explaining answers	**4,97** (2.08)
			Practice/Policy	
			Enrichment Material	**8,71** (1.94)
			Remedial Material	**-5,81** (2.17)
			Ability grouping	**-3,66**[104] (2.02)

[103] Language of assessment - the category never includes for the analysis the response sometimes, and the category always includes the response almost always

[104] p.07

Appendix 4

All migrant students– School level

Dependent variable - Overall Mathematical ability Migrant total	Estimated coefficients introducing Level 3 / student level		Sigma squared (3989.72)	Estimated coefficients introducing Level 3 / School Context Practice/Policy
Student level			*The level of school*	
			Context	
All Migrants 11-25	**n.s**		D1M2	**n.s**
All migrants 26-50	**n.s**		D1M3	**n.s**
All migrants migr>50	**n.s**		D2M1	**-11,76** (6.19)
>200 Books	**n.s**		D2M2	**-12,22** (5.07)
<25 Books	**-22,79** (2.65)		D2M3	**-25,47** (8.65)
PC	**8,60** (4.23)		D3M1	**-30,47** (11.14)
Internet	**10,66** (3.04)		D3M2	**n.s**
Calculator	**18,67** (3.99)		D3M3	**-47,97** (7.31)
Dictionary	**21,49** (4.22)		Math Book as Basis for Teaching*	**11.37** (4.21)
Study Desk	**15,46** (4.73)		Shortage/hindering instruction	**n.s**
Boy	**12.16** (2.23)		Teacher Expectation Student achievement	**n.s**
Language at home (always or never)[105]	**18,03** (2.32)		PC in class*	**n.s**
			Calculator in class*	**n.s**
			Students Equation writing*	**n.s**
			Students Memorizing*	**n.s**
			Students explaining answers	**n.s**
			Practice/Policy	
			Enrichment Material	**n.s**
			Remedial Material	**n.s**
			Ability grouping	**n.s**

[105]Language of assessment - the category never includes for the analysis the response sometimes, and the category always includes the response almost always

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Abstract
This report on migrant students overall mathematical ability is part of a larger project on migrants' achievements in education. Within the same project a parallel report focuses on what matters for migrant students' overall reading ability makes use of the IEA study PIRLS2006. Both reports address 4th grade migrant students' achievement in European countries. This report focuses on 12 European countries participating in TIMSS2007 and who met the criteria of at least 3 percent migrant students in their samples. The analysis demonstrates a large impact on achievement from individual backgrounds and it points to the significance of teaching and school factors. More noticeable is the effect of teachers' educational levels and eventual specialization in math. Also some specific teaching practices in math have an effect on math achievement. The study argues the importance of differentiating between 1st and 2nd generation migrant students. The findings are discussed in terms of possible country actions/policy implications.

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