Differences between the relative educational performance of 15-year old migrant daughters and sons and the gender inequality in countries of origin and destination.

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Abstract
We analyze the differences between the relative educational performance of 15-year old migrant daughters and sons from specific regions of origin countries, living in different destination countries, relative to the gender differences of the native pupils in their destination countries. We relate these relative differences in performance to variances of gender inequality in the countries of origin and destination. We analyze the relative educational performance (both in reading and math) of 16569 15-years old daughters and 16763 sons in destination countries across Asia, Europe, Latin America, and Oceania with the PISA 2009 data. We can distinguish 57 origin countries or regions and 28 destination countries. We use a number of macro-indicators of the countries of origin, relating to their level of gender inequality, educational systems, economic development, and religion. We find that migrant daughters have a relatively higher educational performance than sons, but only those who live in a single-parent family. We also find that the lower the gender equality of origin countries, the higher the relative advantage in educational performance of both migrant daughters and sons. But this negative effect of gender equality of origin countries is only found if we take the differences between gender equality of destination and origin countries into account. The larger this later GEM difference, the lower is the relative educational performance of migrant daughters and sons. Migrant daughters from origin countries with Eastern Christianity or Islam as the dominant religion have a higher relative performance than sons from those origins.

1. Introduction

Today, most Western societies host a substantial and still growing immigrant population (Castles and Miller, 2003). With technological developments such as the Internet and (mobile) telephone communication, migration has increased and less expensive ways of long-distance travel, as well as the emergence of the European Union, have helped to facilitate it. Consequently, the share of foreign-born pupils in primary and secondary education in many Western countries is now larger than ever before.

Overall, the educational position of immigrant children has been well documented, but there is far less systematic documentation about the educational position of migrant sons and daughters in relation to features of their country or region of origin. Using the 2003 data of the Programme for International Student Assessment (PISA), Levels and Dronkers (2008) found that the educational performance of immigrant pupils from certain regions was different from that of comparable pupils from other regions. Their analysis shows, for example, that second-generation migrants from Western Europe (but only those from lower-educated classes), Southern and Central America, Northern Africa, and Western Asia have substantially lower math scores than comparable natives in the destination countries, while comparable second-generation migrants from East Asia had higher math score than the native pupils in their destination countries. The authors conclude that both the origin and destination of migration have substantial effects on scholastic achievement, and these have an important influence on differences in scholastic knowledge between native pupils and first- and second-generation migrants. Analyzing migrants' integration into host societies without properly taking into account these origin effects will lead to flawed results. Depending on the composition of the migrant population in a certain society, the results can be overly optimistic or pessimistic. Western Europe, Southern and Central America, Northern Africa, and Western Asia seem to be problematic regions of origin: Migrants from these regions perform worse in mathematics than comparable migrants from other regions, regardless of their country of destination. In addition, Levels and Dronkers (2008) also found destination effects: Some countries of destination are better equipped to deal with immigration than others. For example, their analysis shows that migrants in Denmark are doing worse than those in Germany, despite educational selection at an older age in the former country and its selective migration policies. In general, the authors conclude that relatively new immigrant-receiving countries, such as Denmark and Switzerland, are not yet capable of dealing with immigrants, even if they have very strict and selective migration policies. In some new immigrant-receiving societies, immigrants reach substantially lower levels of scholastic achievement than the natives of these states, in comparison to the differences between immigrants and natives in Australia, a traditional immigrant-receiving nation.

Levels and Dronkers (2008) did not, however, study the educational performance of the male and female children of immigrants. Even though successive papers with PISA 2003 data (Levels, Dronkers, & Kraaykamp, 2008) and PISA 2006 data (de Heus & Dronkers, 2010; Dronkers & Heus, 2012) carried out far more sophisticated analyses by including macro features of the origin and destination countries, possible gender differences in educational performance between the migrant daughters and sons continued to be neglected. In addition, other researchers of the educational performance of migrant children with a double perspective (origin and destination) ignored possible differences between male and female pupils. Only recently has a group of researchers started to address these differences (Fleischmann & Kristen, forthcoming), but they could only use national data for their cross-national analysis, thus limiting comparisons.

In an earlier paper (Kornder & Dronkers, 2012) we addressed these gender differences of the educational performance of migrant children with the data of the PISA 2009 wave. This earlier paper described these gender differences and their variations by origin and destination, controlling for the educational performance of native female and male pupils in their destination countries. In this successive paper we make a more sophisticated analysis, replacing the destination and origin countries by macro-indicators, which can explain the relative educational performance of migrant children and their gender variation. Our focus here is on these gender differences in educational performance by migrant children, relative to the gender differences of the native pupils in their destination countries, and on the explanation by gender inequalities in their countries of origins and destinations. We include also macro-indicators for the educational opportunity structure and other societal characteristics.

Another drawback of this series of papers on the educational performance of migrant children is the narrow scope of western countries as destination. In contrast, Kornder & Dronkers (2012) and this paper analyze the relative educational performance of the migrant daughters and sons in countries across Asia, Europe, Latin America, Africa, and Oceania. We distinguish 57 origin countries or origins areas in 28 destination countries. We also include internal migration from China to Hong Kong, Macao, and Shanghai.

2. Multiple origins and destinations

Since immigration is intrinsically a transnational phenomenon, it should be studied accordingly (Portes, 1999). Immigrant parents and children from various countries of origin move to various countries of destination. Therefore, instead of relying on observations of multiple-origin groups in a single destination or single-origin groups in multiple destinations our analyses compare multiple origins in multiple destinations simultaneously. Since this design disentangles the effects of the characteristics of the countries from which immigrants come from (origin effects) and the characteristics of the countries to which they migrate (destination effects), it is extremely useful in gaining insight into the factors influencing immigrants' outcomes, such as educational performance. This paper applies this double comparative perspective, based on a multi-level approach, as developed by van Tubergen, Maas, and Flap (2004).

3. Societal gender equality and educational outcomes of male and female migrant pupils

3.1 Higher female adaptability to migration

The main conclusion from our first analysis of the differences in educational performance of female and male migrant pupils (Kornder & Dronkers, 2012) was that female pupils had relatively higher reading and math scores than male pupils, also if one took into account the difference in reading and math scores of the native female and male pupils in their destination countries. A possible explanation of this higher female educational performance among migrants' children is a higher level of adaptability to new situations and circumstances (like migration) of women than of men. We will test again the existence of these relative higher reading and math scores by female migrant pupils with a more sophisticated method (multi-level) and control for macro characteristics (Gender Empowerment Measure in origin and destination countries; religion in origin countries, economic development of origin countries, the level of education provision in the origin countries; educational performances of native pupils in destination countries). Therefore our first hypothesis is "Migrant daughters have a higher relative educational performance than migrant sons, both in reading and in math" (hypothesis 1).

3.2 Effect of societal gender equality in origin countries on the female educational advantage.

Our first hypothesis assumes that the majority of migrants move from societies with a larger gender inequality to societies with a more equal power balance between the sexes. Girls in societies with a larger gender inequality have fewer educational opportunities compared to their brothers. The reasons for this unequal gender power balance include religious and/or cultural traditions, as well as the fact that educational investments in boys are more profitable for parents in these societies than the same educational investments in girls (Fuligni, Tseng, & Lam, 1999). Moreover, this larger gender inequality of their origin societies may still limit female migrant pupils more in their educational performance due to more obligations at home and pressure for an early marriage. We assume that "the higher the gender equality in origin countries, the higher is the relative educational performance of migrant daughters in comparison with that of migrant sons" (Hypothesis 2).

3.3 Effect of distance in societal gender equality between destination and origin on female educational advantage.

However, the migrant daughters from origin societies with larger gender inequality may use the larger educational opportunities in their destination societies to escape from the male bias of the religious and/or cultural traditions of their origin societies (Abada & Tenkorang, 2009), and therefore perform better in education. Moreover, the closer supervision and stricter parental monitoring of the migrant daughters compared to their sons may also strengthen the discipline of the daughters more, thus impacting positively their educational performance (Zhou & Bankston, 2001; Feliciano & Rumbaut, 2005). Therefore we formulate two additional hypotheses. “Migrant daughters with a large difference in gender equality of their destination and origin countries have a higher relative educational performance than migrant daughters with a small difference in gender equality of their destination and origin countries” (Hypothesis 3); “Migrant sons with a small difference in gender equality between their destination and origin countries have a higher relative educational performance than comparable migrant sons with a large difference in gender equality of their destination and origin countries” (Hypothesis 4).

4. Data and variables

4.1. PISA 2009

Since 2000, the OECD has conducted large-scale tri-annual tests among 15-year-olds living in its member and partner states to assess pupils’ mathematical, reading, and scientific literacy. In doing so, the OECD has aimed to determine the extent to which pupils near the end of their compulsory education have acquired some of the knowledge and skills essential for full participation in society. Alongside information on pupils’ educational performance, PISA also provides information on their individual characteristics (e.g. parental education and careers, resources available at home, languages spoken at home, and the birth countries of both the parents and the pupil) through the administration of pupil and principal questionnaires. In this paper we use the latest PISA wave of 2009 (OECD, 2010).

This study focuses on reading abilities (the dependent variable), which was the focus of the PISA 2009 wave, but we will use the math test as well to test the robustness of our results. A 390-minute pencil-and-paper test was developed. However, since it would not be sensible to administer a test of more than six hours to an individual pupil, 13 largely comparable item clusters (seven for reading, three for mathematics, and three for science) of two hours duration each were derived from the core test. These test booklets were allocated to individual pupils according to a random selection process, requiring them to answer multiple-choice as well as open questions. In some countries, an additional 40-minute test was administered covering tasks related to reading and understanding electronic texts.

Since two test booklets can never have exactly the same average difficulty, item response modeling was used to establish comparable reading results across pupils. Item response modeling involves the construction of several plausible reading values for each pupil. Thus, instead of obtaining just one score to indicate each pupil's reading ability, five possible reading score values were estimated per pupil. For each pupil, we averaged the five plausible values to calculate a composite score. The composite scores were standardized using an average of 500 and a standard deviation of 100 for all OECD pupils (native and non-native). Tables 1 and 2 show the reading and math test scores for male and female migrants, respectively, differentiated by the origin country or region and the country of destination.

In order to take into account the variance between these five plausible values for math and reading we also computed the standard error for these five plausible values of reading and math. We will include the standard errors of these two average scores into the multilevel equations as a measurement model.

4.2. Pupils' country of origin and immigrant status

Since specific information on the country of birth of both a pupil and the parents is necessary to determine a pupil's country of origin, destination countries that did not allow enough specificity in birth countries were omitted. For instance, when asking about the country of origin, the US only provided the options "United States of America" and "another country." Among destination countries that did provide enough variety in birth country options to be included in our analysis, the question was not consistently asked. PISA offered participating test countries the possibility of determining a set of answers in advance, allowing countries to include in the dataset their most important groups of immigrants. For instance, in the German questionnaires, the possible countries of origin were Croatia, Greece, Italy, Macedonia, Montenegro, Poland, Serbia, Slovenia, Turkey, and one of the former USSR republics, while New Zealand listed the options Australia, China, Republic of Korea, South Africa, the United Kingdom, and Samoa. Therefore, only data from 28 of the 67 participating countries were useful for the analysis (we deleted Indonesia and Turkey because they had less than 50 male and female migrant pupils with a known origin country).[1] However, contrary to previous

[1] The OECD allows participating countries to propose their own birth country categories. As a result, the origin countries of the different destination countries are partly dependent on the quality of the available categories. To

studies, we did not limit ourselves to destination countries in Europe and the Pacific Rim but, instead, included Asian and Latin American countries. All destination countries are given in table 1.

[Table 1 about here]

To determine a pupil's *country of origin*, several decision rules were used based upon the pupil's birth country and the birth countries of both parents.[2] To capture as many respondents as possible, we also included aggregate origin areas, which were sufficiently specific for the purpose of this analysis, as countries of origin. Most destination countries allowed for the selection of at least one aggregate origin area. For example, besides Germany, also Greece, Israel, and the Netherlands allowed for the origin selection "one of the former USSR republics." We combined these migrants in an equivalently labeled composite category. In addition to information on Chinese migrants in non-Chinese countries, our dataset also contains information on two internal migrant groups, from either westernized or Mainland China. Since internal migration in China is difficult and requires governmental approval, the Chinese who originate from Mainland China and move to Shanghai, Hong Kong, or Macau are considered internal immigrants in China. Additionally, internal migration between the major cities in and around China is labeled internal immigrants from westernized China. These migrants originate from Hong Kong, Macau, or Chinese Taipei and live in Shanghai, Hong Kong, or Macau. We combined in some cases origin countries to larger units (separate former Yugoslav or USSR states into former Yugoslavia or former USSR; Pakistan and Bangladesh together; Czech Republic and Slovakia together; the Maghreb countries[3] together; all Caribbean countries together). In total, using decision rules to identify pupils' countries of origin and immigrant status yields a final sample of 16569 female and 16763 male migrant pupils originating from 57 different origin countries and regions (see table 2; for a full list of all uncombined origin countries and regions see Kornder & Dronkers, 2012).

4.3. The dependent variable

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account for this possible bias, we compared, as much as possible, the origin countries in PISA with national statistics. In most cases the largest immigrant groups identified by the statistical offices are also represented in our PISA data. Since the PISA data do not oversample immigrant pupils, smaller immigrant groups (if asked for) are understandably not always present in our data. There are no indications that this selectivity (only the largest migrant categories of destination countries) has produced a bias, because small migrant categories in destination countries hardly influence the results.

[2] Decision rules are available on request from the first author.

[3] Algeria, Morocco, and Tunesia

PISA wave 2009 focuses on reading literacy with a large scale but also contains a smaller scale for math literacy. Table 1 reports the reading and math scores and the number of cases of male and female migrants in all destination countries. Table 2 shows the reading and math scores and the number of cases of male and female migrants in all origin countries and regions.

[Table 2 about here]

Table 1 shows that female and male migrant pupils to Shanghai have the highest reading and math score compared to migrants in other destination countries (female 580/609; male 539/602), followed by migrants to New Zealand (female 555/527; male 520/542), Hong Kong (female 551/544; 519/559), Scotland (female 535/515; male 531/542) and Australia (female 541/520; male 507/530). Female and male migrant pupils to Argentina (female 395/373; male 364/382), followed by migrants to Qatar (female 414/374; male 368/376), and Mexico (female 397/410; male 443/426) have among the lowest reading and math score compared to migrants in other destination countries. Apparently, some destination countries are able to attract better-educated migrants or have educational systems that promote educational performance of migrant pupils more than other destination countries.

Table 2 shows that female and male migrant pupils from China to non-Chinese countries have the highest score (female 573/570; male 545/578), followed by migrants from India (female 565/548; male 532/552), Korea (female 535/543; male 506/556), South Africa (Female 553/529; male 510/530) and the UK (female 518/538; male 518/538). Female and male migrant pupils from Yemen have the lowest reading and math scores (female 370/342; male 321/337), followed by migrants from Paraguay (female 376/359; male 337/362), Cape Verde (female 409/406; male 343/395), Bolivia (female 405/377; male 379/387), Chile (female 424/396; male 368/383), Ethiopia (female 422/364; male 391/374), Palestinian Territory (female 418/376; male 359/369) and Jordan (female 426/383; male 385/399). Apparently, migrant pupils from certain origin countries are better performing educationally than migrant pupils from other origin countries, either because of features regarding the origin society or culture, because of the selectivity of their migration (“brain-drain”) or because of features of the educational systems of their destination countries.

As a dependent variable we use the difference between the reading or math score of the female or male pupil with a migrant background and the average reading or math score of female or male native pupils in their destination countries. The advantage of this variable is that the quality of the educational system (measured by the average reading or math score of female or male native pupils in their destination countries), which the pupil with a migrant background attends, is taken into account. If this difference is positive, it means that the male or female pupil with a migrant background has a higher score than the average score of female or male native pupils in their destination countries. Tables 1 and 2 also show these differences. It is important to note that these differences can vary between destination countries not only because they have different average scores of their native pupils, but also because the origins of migrants vary between destination countries. Table 1 shows that female and male migrant pupils have higher reading and math scores than native pupils in Australia (female 16/19; male 19/19), Israel (female 13/16; 23/23), Montenegro (female 19/21; male 22/20), New Zealand (female 10/12, male 19/17), Qatar (female 57/40; male 49/29), Scotland (female 22/23; male 41/35) and Serbia (female 17/16; male 25/25). Female and male migrant pupils have lower reading and math scores than native pupils in Austria (female -55/-51; male -49/-52), Belgium (female -44/-55; -46/-52), Denmark (-82/-87; -80/-81), Germany (female -49/-52; male -59/-60), Greece (female -45/-38; male -51/-51), Luxembourg (female -48/-45; -60/-59) and Switzerland (female -39/-50; -37/-49). Apparently, some destination countries are able to attract migrants who perform better than their own natives (for instance by their selectivity or attractiveness as a migrant-receiving society) or have educational systems that promote educational performance of migrant pupils more than other destination countries.

The same is true for origin countries: migrants from some origin countries go to destination countries, where native pupils have lower scores than the migrant pupils. Table 2 shows that female and male migrant pupils have higher reading and math scores than native pupils, if they originate from Argentina (female 21/28; male 25/20), Palestinian Territory (female 53/31; 48/33), India (female 41/48; male 45/42), Jordan (female 60/39; male 74/63), Vietnam (female 29/31; male 16/27), Egypt (female 90/64; male 68/43), UK (female 22/21; male 27/22), and China to non-Chinese societies (female 43/64; male 53/61). Female and male migrant pupils have lower reading and math scores than native pupils, if they originate from Afghanistan (female -82/-86; male -111/-103), Albania (female -62/-59; male -65/-64), Cape Verde (female -112/-101; male -144/-138), Ethiopia (female -73/-78; male -65/-80), Greece (female -66/-66; -55/-44), Iraq & Iran (female -93/-98; male -74/-76), Portugal (female -65/-66; male -70/-75), Somalia (female -69/-72; male -93/-101), Turkey (female -88/-87; male -89/-89), Samoa (female -63/-73; male -75/-83), and Algeria, Morocco or Tunisia (female -60/-83; male -63/-70). Apparently, migrant pupils from some origin countries are better performing educationally than the native pupils of their destination countries, either because of the features of the origin society or culture, or the selectivity of their migration ("brain-drain") or the features of the educational systems of their destination countries, than migrants from other origin countries.

4.4. Individual-level variables

Table 3 summarizes all relevant micro and macro variables and regions of origin, including the minimum and maximum scores and the mean and standard deviation for pupils with a migration background and a known country or area of origin.

[Table 3 about here]

After a pupil's country of origin, we identified his/her immigrant status. Pupils of whom at least one of the parents was born in a country different from the destination country were identified as immigrants. Migrant pupils were classified as *first generation* (reference category) when they were themselves born outside the destination country, and *second-generation* when at least one of the parents was born abroad. This distinction between first- and second-generation migrants deviates from that of Portes and Rumbaut (2001), who classify migrant generation status based on age upon arrival in the destination country. However, we believe that this distinction is cross-nationally clearer and is less likely to underestimate the importance of pre-school socialization.

Migrant pupils whose generation could not be determined were taken into account by creating a *missing generation dummy variable*. Of the remaining respondents with sufficient information to be classified as natives, those pupils who spoke a foreign language at home that allowed for a reasonable inference about the country of origin were reclassified as *third generation*. For instance, migrant pupils in Germany who spoke Turkish or Kurdish at home but were classified as native Germans were reclassified as third-generation immigrants from Turkey. Similarly, pupils in Australia who indicated they spoke Albanian, Bosnian, Croatian, or Serbian were regarded as third-generation migrants from "former Yugoslavia", even though the previous decision rules to identify countries of origin classified them as natives. As such, we did not capture a representative sample of third-generation immigrants since only those pupils who continued to speak a language other than the official language of the destination country at home could be identified. This category may be regarded as non-integrated immigrants despite their long presence in the destination country.

We combine these generation variables with the indicator of the language spoken at home into seven dummy variables: first generation and official language, first generation and foreign language, first generation and unknown language, second-generation and official language, second-generation and foreign language, second-generation and unknown language, and third generation and foreign language.

We use a number of additional variables to account for the status of migrant pupils. First, we controlled for the parental environment of pupils by using the *index of the economic, social, and cultural status of the parents (ESCS)*. This variable represents a composite index created in the PISA dataset of the occupational status of the parents (Ganzeboom, de Graaf, Treiman, & de Leeuw, 1992), the educational level of the parents (United Nations Educational, Scientific and Cultural Organization, 2006), and the presence of any material or cultural resources at the pupils' homes.[4] This combination of the parents' occupational status and educational level, together with resources at home, produces the strongest indicator of the parental environment. If one or more of these variables were missing for a respondent, we imputed the ESCS value by taking the average of the prior and next pupil after sorting all cases based on the destination country, generation, country of origin, ISCED, ISEI, and home possessions. The ESCS score was standardized such that the OECD average was set to zero.

Second, we controlled for the effects of family structure on scholastic performance. Since a previous analysis revealed that migrant pupils from single-parent families perform worse, on average, than pupils with both parents (Dronkers & de Lange, 2012), we include a *nuclear family dummy variable* that measures whether children live in two-parent households. Those pupils with other family structures are the reference group.

Third, we included a dummy variable labeled *one parent born in destination country* to identify pupils who had one immigrant and one native-born parent; pupils with two non-native parents represent the reference group. This is a way of controlling for the effects of having a presumably stronger relation with the society and culture of the destination country when one parent is a native. A corresponding *mixed marriage missing dummy variable* was introduced to compare pupils for whom the birth country of one of the parents was missing with pupils for whom both parents are non-native.

Fourth, we controlled for the effects of speaking a foreign language at home with the dummy variable o*fficial language of destination country spoken at home*. This variable

[4] The measure consists of the presence of a desk, a private room, a quiet place to study, a computer, educational software, Internet access, literature or poetry, art, books that may be of use when doing schoolwork, a dictionary, a dishwasher, and the presence of more than 100 books in the house.

distinguishes between migrant children who speak one of their destination country's official languages at home and children who speak a foreign language. Again, a *language missing dummy variable* was taken into account to differentiate pupils whose language spoken at home is unknown with pupils who speak one of their destination country's official languages at home. We combine these two language indicators with the generation indicators.

4.5. Gender Equality macro variables

4.5.1. Gender Empowerment Measure (GEM)

The Gender Empowerment Measure evaluates women's participation and decision-making ability in political and economic forums. Ranging from 0 to 100, it combines variables such as women's share in parliamentary seats and ministerial positions as well as managerial, senior official and legislative jobs, the share of technical and professional jobs held by women and gender income differences. This variable was centered on its grand mean for the multi-level analyses.

4.5.2 GEM distance between destination and origin country

We compute a gender equality distance indicator (GEM) by subtracting the values for the origin countries from the values for the destination countries. The more positive this GEM distance, the larger the difference between origin and destination countries with respect of gender equality, with relatively low gender equality in the origin country and/or high gender equality in the destination countries. The average positive score on this GEM distance indicator in table 3 shows that the majority of the migrant pupils migrate from origin countries with less gender equality to destination countries with more gender equality. However the negative minimum shows that a minority of the migrant pupils migrate from origin countries with more gender equality to destination countries with less gender equality.

The aggregated correlation between GEM origin and GEM difference is high (-0.80), but not too high enough to raise serious concerns regarding multicollinearity (see also figure 1). Neither is the high correlation artificial. A large GEM difference can only occur (but is not necessary) for migrants from origin countries with low GEM score, and the GEM differences of migrants from origin countries with high GEM scores will in most instances be small (because most migration goes to destination societies with more gender equality, as testified by the positive average (11) and the high maximum (72) of the GEM difference between destination and origin in table 3). Including of Asian and Latin American countries as both origin and destination countries in our analysis causes combinations of small or even negative GEM differences (table 3).

(about here figure 1)

4.6 Educational opportunity macro variables

4.6.1 Years of Compulsory Education (YCE)

The index years of compulsory education refers to the duration of compulsory schooling in countries of origin. On average for all origin countries and areas in our data, pupils are obliged to attend school for 9 years. The mandatory length of schooling varies considerably between origin countries, from 4 to 12 years. This variable was centered on its grand mean for the multi-level analyses.

4.6.2 Expected Years of Schooling (EYS)

EYS represents the expected number of years a child at school entrance age spends at school and university, including grade repetitions, when current enrolment patterns in all educational levels (primary, secondary, post-secondary non-tertiary, and tertiary) remain the same. This variable was centered on its grand mean for the multi-level analyses.

4.7 Societal macro variables.

4.7.1 HDI

A country's level of economic development was approached by its Human Development Index (HDI). Ranging from 0 to 100[5], the Human Development Index combines national information on peoples' life expectancies, adult literacy rates, gross enrolment ratios in primary, secondary, and tertiary education, and GDPs. This variable was centered on its grand mean for the multi-level analyses.

4.7.2 Religion

To take into account origin countries' religious backgrounds, dummy variables were created to indicate whether or not at least forty percent of the countries' inhabitants are Latin Christian, Eastern Orthodox (Ethiopia, Macedonia, Greece, Romania, USSR), Hinduism (India) or Islamic (Afghanistan, Albania, Bangladesh, Egypt, Iran, Iraq, Jordan, Lebanon, Maghreb, Palestine Territory, Pakistan, Somalia, Turkey, Yemen). Countries in which no religious denomination has the support of at least forty percent of the population were classified as 'no-religion' (China, Czech Republic, Estonia, Korea, Vietnam). Similarly, if two religious groups are represented by at least forty percent, the country is regarded as

[5] Transformed from 0 to 1 into 0 to 100.

‘Mixed’ (Bosnia & Herzegovina, Suriname). Due to our combination of countries with diverse religions (for instance former Yugoslavia and USSR), these religious macro-variables become variables on the individual level.

4.8 Native reading or math score of country of destination.

We use one additional macro-indicator for the destination countries: the *native reading or math score.* This indicator is the average PISA score of the corresponding native male or female population. This variable serves to approximate the quality of the educational system in the destination country. To enable a more appropriate analysis of gender differences, the average score of native males was assigned to male immigrants. Conversely, the average score of native females was assigned to female immigrants.

5. Methods

By using individual-level techniques on data with multiple levels, standard errors of the macro-level effects will be underestimated, and consequently, parameters may unjustly appear to be significant (Raudenbush and Bryk, 2002; Snijders and Bosker, 1999). To analyze non-hierarchically structured data, cross-classified multilevel regression analyses are appropriate. We used Iterative Generalized Least Squares (IGLS) estimation techniques from the statistical analysis program MLwiN to estimate models (Browne, 2003). Although originally designed to fit hierarchical models, IGLS can also be adapted to non-hierarchical data structures. At the lowest level we include the standard error of the reading or math test as an error-term of the equation. As dependent variable we use the difference between the reading or math score of the female and male pupil with a migrant background and the average reading or math score of the female or males pupils in their destination countries. As a result of this dependent variable the equations express the deviation of the reading or math score of the migrant pupil from the average math and reading score of the native pupils of the same gender.

6. Results for reading scores

Table 4 shows the results from the multi-level analyses for the reading score of migrant children. While the constant in the equations shows the difference between the score of male migrant pupils and that of the male native pupils, the parameter of the gender variable shows the additional difference between the score of female migrant pupils and the female native pupils.

[Table 4 about here]

6.1 Gender

The first model shows that male migrant pupils have a nearly 19 point lower score on the reading test than the male native pupils in their destination countries. But female migrant pupils have a nearly 21 points lower score (-18.5 + (– 2.2)) than the female native pupils in their destination countries. Taking into account the average outperformance of female pupils to male pupils, migrant females on prima facie do not score higher than their male counterparts. That is, being a migrant does not increase the difference between the reading scores of female pupils and male pupils.

6.2 individual characteristics

The second model includes the gender and the individual characteristics of the migrant pupils in the equation. As one might expect, the parental ESCS and living in a nuclear family have positive effects on the reading score while speaking a different language than one of the destination country's official languages negatively affects the reading score. We added two interactions between gender and nuclear family as well as between gender and second-generation same language because in additional analyses these two interactions were significant (see appendix F). Second-generation female pupils who speak the destination country language at home have only slightly higher reading scores than comparable second-generation male pupils. Living in a nuclear family has a positive effect on reading scores of migrant sons and daughters, but it is stronger for male migrant pupils than for female migrant pupils, resulting in a 12 points difference. Dronkers (2012) will analyze this nuclear family effect for migrant pupils more in-depth. The parameter of gender became positive (+9.4) by this inclusion of these two interactions, which implies that female migrant pupils have a relative higher reading score than male migrant pupils, but only if they live in single-parent families. But if they live in a nuclear family, their relative reading score is nearly the same, because the 9.4 is fully compensated by the -10.4 of the interaction nuclear family*female. Thus, our results support only partly our first hypothesis: "migrant daughters have a higher relative educational performance than migrant sons". This hypothesis is only correct for migrant pupils in single-parent families. This higher relative reading score of female migrant pupils in single-parent families remains stable and significant in all following models.

6.3 Gender Equality in origin countries

In Model 3 we add the Gender Empowerment Score (GEM) of the origin country to the equation. This addition hardly affects the parameters of the independent variables, which were already included in the previous models. The effect of GEM origin is not significant for male migrant pupils while the interaction between this variable and gender is significant: the total strength of GEM is around 0.2[6] for female migrant pupils. This supports our second hypothesis (The higher the gender equality of origin countries, the higher is the relative educational performance of migrant daughters in comparison with that of migrant sons). It means that female pupils from origin countries with the lowest GEM score (13.5, see table 3) underperform compared with female migrant pupils from origin countries with the highest GEM score (90.9) by 15 points, relative to the reading score of the female native pupils in their destination countries.

6.4 Difference between gender equality of origin and destination countries

In Model 4 we add the difference between the GEM scores of destination and origin countries to the equation. This addition of the difference makes the effect of GEM origin significant and negative for male and female migrant pupils, affecting however girls less (-0.9=-1.0+0.1) than boys (-1.0). This does not support our second hypothesis ("the higher the gender equality of origin countries, the higher is the relative educational performance of migrant daughters in comparison with that of migrant sons"), and the earlier support in model 3 is spurious. As soon as the difference between the GEM scores of destination and origin countries is added to the equation, there is no support for our second hypothesis. It means that as long as the GEM difference between destination and origin countries would be the same, female pupils from origin countries with the lowest GEM score (13.5) would have a higher reading test score of 70 points[7] than comparable female migrant pupils from origin countries with the highest GEM score (90.9), relative to the reading score of the female native pupils in their destination countries. However, if the difference between destination country and origin is large, the relative performance of migrant pupils drops compared to migrant pupils where this difference is lower. In the case of the largest positive GEM difference (91.7) migrant pupils underperform migrant pupils for which the GEM difference is zero by 119 points while migrant pupils with the largest negative GEM difference (-22.0) outperform them by 26 points both times holding GEM origin constant. Thus, the negative effects of a large

[6] 0.1 (GEM origin) + 0.1 (GEM origin * Female).
[7] (90.9-13.5)*(-1.0+0.1)

difference between the GEM scores of the destination country and origin tend to counterbalance the positive effect of a low GEM origin.

Our analysis also shows that the difference in GEM between the destination and origin countries is a better explanation than the positive effect of gender equality in the origin countries on educational performance in model 3. The differences in loglikelihood of the models 3 and 4 show that model 4 with both variables fit better with the data than only GEM origin (392943 versus 392907 for only two extra parameters). Our rejection of the second hypothesis, after the inclusion of GEM difference can thus not been explained by "over-controlling" due to GEM difference destination and origin.

This negative effect of GEM difference contradicts our third hypothesis ("Migrant daughters with a large difference in gender equality of their destination and origin countries have a higher relative educational performance than migrant daughters with a small difference in gender equality of their destination and origin countries"). Although this negative effect was expected by our fourth hypothesis ("Migrant sons with a smaller difference in gender equality between their destination and origin countries have a larger male advantage in relative educational performance than comparable migrant sons from origin countries with larger difference in gender equality"), this hypothesis has to be rejected because the interaction between GEM difference and gender is insignificant, indicating an equal negative effect of GEM difference for female and male pupils instead of larger one for male pupils than for female pupils.

Figure 1 shows that there exist a strong negative relation between GEM origin and difference between the GEM scores of destination and origin countries. As a consequence the combination of a high GEM origin and a large negative GEM difference does not exist; the same holds for the combination of a low GEM origin and a large positive GEM difference. This non-existence of these combinations is a consequence of migration streams which flow mostly from poor and illiberal origin countries (and thus a low GEM score) to rich and liberal destination countries (and thus a large negative GEM difference). The migration stream from rich and liberal origin countries (and thus a high GEM score) to poor and illiberal destination countries (and thus a large negative GEM difference) hardly exists, especially if children are involved. This non-existence of these combinations results in less extreme parameters in model 4 than one might expect.

In separate analyses we added two macro indicators for educational opportunity structure and the Human Development Index of the origin countries to model 4 (see appendix C), in order to test the robustness of the GEM origin parameter. The addition of these macro indicators does not change substantially the effects of the GEM indicators. Additional analysis underlines this conclusion: without GEM and GEM difference in the equation, the parameters of the macro indicators are as expected: the higher either of the macro indicators in the origin countries, the higher the performance of the migrant pupils from these origin countries (see Appendix C). As soon as we include one of the GEM indicators in the equations, the effects of these macro indicators become insignificant. One might derive from these additional analyses that the Gender Empowerment Measure is a more reliable and/or valid indicator of educational performance in the origin countries than the more common macro indicators such as HDI.

6.5 Religion and gender equality

Gender relations are not only related to educational opportunities and the level of the quality of life in origin countries, but are partly also influenced by religious norms and attitudes. In model 5 we add the dominant religion of the origin countries to model 4 in order to test whether the significant effects of GEM origin have not partly a religious explanation. This addition of the dominant religion does not change the effect of GEM origin for migrant pupils, but the effect of the interaction GEM origin * Female becomes insignificant. This means that a part of the deviation of the effect of GEM origin on males and females is related to the dominant religion of the origin countries. But the addition of the dominant religion hardly changes the effect of GEM differences between destination and origin: the parameters for migrant pupils remain negative: from -1.3 to -1.2.

However, the origin country's dominant religion might affect the relative educational performance of female and male migrant pupils differently. In appendix D2 we show the parameters of the separate addition of the interaction terms between dominant religion of origin countries and gender. Based on these additional analyses we decided to add the interaction between Islam and female as well as Eastern Christianity and female to models 5 and 6. The interaction term Islam origin * female is not significant in model 5, but that of Eastern Christianity * female is significant and negative. This means that the relative reading score of migrant daughters from Eastern Christianity origin is significantly less high (-7.3) than those of comparable migrant daughters from other origins.

The last model 6 only includes the individual characteristics and the dominant religion. The omission of the indicators of gender inequality strengthens the parameters of the dominant religion in comparison with those of model 5, including the two interactions with female. This suggests that a part of the effects of dominant religion is related to the different gender values and norms of the dominant religion.

6. Robustness of results for math scores

Table 5 shows the analogous multi-level analyses as in table 4, but math scores are the dependent variable. It is important to test our hypotheses for the math scores because native male pupils score higher on the math test than native female pupils (514/500), while native female pupils have higher reading scores than native male pupils (509/472). Thus, the use of reading score as the sole indicator of educational performance might lead to biased results.

[Table 5 about here]

Our first hypothesis ("migrant daughters have a higher relative educational performance than migrant sons") is also partly true if we use math scores as an indicator of performance and include the individual characteristics to the equation (model 2). The constant of model 2 in table 5 is -34.0, which means that first generation male migrant pupils in single parent families who speak the destination country language at home score 34 points lower than the male native pupils in their destination society. The significant parameter of the gender variable of 8.2 means that first generation female migrant pupils in single-parent families who speak the destination country language at home score 26 points lower than the female native pupils in their destination society. But this difference between comparable male and female migrants pupils does not exist, if they live both in a nuclear family (8.4-8.3). This result holds for all models.

Our second hypothesis ("The higher the gender equality of origin countries, the higher is the relative educational performance of migrant daughters in comparison with that of migrant sons") is again only supported by the results of table 5, as long we do not add the GEM difference of destination country and origin to the equation (model 2). After the addition of GEM differences in model 4, however, the effect of GEM origin becomes negative, contrary to our second hypothesis. The negative effect of GEM origin does not differ for female and male migrant pupils.

The third hypothesis ("Migrant daughters with a large difference in gender equality of their destination and origin countries have a higher relative educational performance than migrant daughters with a small difference in gender equality of their destination and origin countries") is not supported by table 5, because GEM difference destination origin has a negative effect on math score.

Our fourth hypothesis ("Migrant sons with a small difference in gender equality between their destination and origin countries have a higher relative educational performance than comparable migrant sons with a large difference in gender equality of their destination and origin countries") can be accepted with our results. The effect of GEM difference destination origin should be negative for male pupils according to this fourth hypothesis, but the parameter is equal negative for female and male pupils. We did not expect this equal effect of GEM difference with hypotheses 3 and 4.

The dominant religion of the origin countries can mitigate the lower scores of migrant pupils. Male migrant pupils from origin countries with Latin Christianity as dominant religion and with an average GEM score and no GEM difference between destination and origin country score nearly 17 points lower on the math score than the native male pupils in their destination countries. This lower score is only 4 points[8] smaller for female migrant pupils in single parent families. In contrast, if the migrants originate from a country without a dominant religion, males and females score nearly 17 and 29 points higher, respectively, on the math test than the native male or female pupils in their destination countries.[9] Also migrant pupils originating from countries with Hinduism score 25 (males) and 37 points (females) higher on the math test than the native male or female pupils in their destination countries.[10] Male and female migrants originating from countries with Islam as dominant religion score both 25 points lower on the math score than the native pupils in their destination countries.[11] Similarly, male and female migrants originating from countries with Eastern Christianity as dominant religion score 23 and 21 points lower on the math score than the native male or female pupils in their destination countries.[12]

The interactions Islam origin * female and Eastern Christianity * female are significant and negative. This means that the relative reading scores of migrant daughters from Islam and Eastern Christianity are significantly less high (-11; -10) than those of comparable migrant daughters from other origins.

On the whole, our results are not substantially different, regardless of using reading scores or math scores as dependent variable.

[8] Single parent family -16.7 + 12.3; Nuclear family: -16.7 + 12.3 – 8.0.
[9] Males -16.7 +33.7; Females: -16.7 + 12.3 + 33.7.
[10] Males -16.7 + 41.3; Female: -16.7 +12.3 + 41.3.
[11] Males: -16.7 – 9.0; Females: -16.7 + 12.3 – 9.0 - 11.3.
[12] Males: -16.7 - 6.6; Females -16.7 + 12.3 - 6.6 – 9.9.

7. Conclusions

We analyze the differences between the relative educational performance of 15-year old migrant daughters and sons from specific regions of origin countries, living in different destination countries and relate these differences to variances of gender inequality between the countries of origin and destination. This paper focuses fully on possible gender differences in educational performance of children of migrants, relative to the gender differences of the native pupils in their destination countries. We analyze the relative educational performance of 16569 daughters and 16763 sons in destination countries across Asia, Europe, Latin America, and Oceania with the PISA 2009 data. We can distinguish 57 origin countries or regions and 28 destination countries. We use a number of macro-indicators of the countries of origin and destination, relating to their level of gender inequality, educational systems, economic development, and religion.

7.1 The higher female educational performance.

Our first hypothesis "migrant daughters have a higher relative educational performance than migrant sons, both in reading and in math" is only very partial upheld by our results. There is only such a higher relative educational performance by migrant daughters if they live in single-parent families and if the comparable migrant sons also live in single-parent families. If they live in a nuclear family this higher female educational performance is neutralized by the larger advantage for migrant sons of living in such a nuclear family.

Female migrant pupils score 36 points absolute higher on reading skills than male migrant pupils (see totals of table 1: 499,3 - 463,0), while male migrant pupils score 14 points absolute higher on math skills than female migrant pupils (see totals of table 1: 500,9 – 487,1). But our analysis show that this is a general gender difference, which is not special related with migration. As soon as we control for the general gender differences in reading and math scores (indicated by the average reading and math scores of the native pupils in their destination countries), we do not find a general higher educational performance by migrant daughters compared with comparable migrant sons. We find such a higher educational performance by migrant daughters only if they live in a single-parent family. This female advantage in relative reading and math becomes even smaller for those from origin countries with Eastern Christianity or Islam as their dominant religion.

7.2 Gender equality in the origin country

Our second hypothesis assumes that “the higher the gender equality of origin countries, the higher is the relative educational performance of migrant daughters in comparison with that of migrant sons” (Hypothesis 2). This is true both for reading and math, as long as the distance in gender equality between destination and origin countries is not taken into account.

As soon as the distance in gender equality between destination and origin country is introduced in the equations, the parameter of GEM origin become negative and significant for both reading and math, which contradicts our second hypothesis. Moreover, this effect of the gender equality has the same direction and strength for male and female migrant pupils. It means that female pupils from origin countries with the lowest GEM score would have a 70 point higher relative reading score than comparable female migrant pupils from origin countries with the highest GEM score.

But this effect is counterbalanced by a negative effect of the difference between the GEM scores of destination and origin countries. This means that a larger difference in gender equality between destination and origin country lowers the reading score of migrant pupils. Given that there exist a strong negative relation between GEM origin and difference between the GEM scores of destination and origin countries (see figure 1), the combination high GEM score of origin country and large negative GEM difference does not exist; the same holds for the combination low GEM score of origin country and large positive GEM difference. This non-existence of these combinations is a consequence of migration streams which flow mostly from poor and illiberal origin countries (and thus a low GEM score) to rich and liberal destination countries (and thus a large negative GEM difference).

The negative effect of GEM origin suggests also that migrant pupils coming from origin countries with the highest gender inequality (thus often poor and illiberal) are more positively selected (for instance in ambition, perseverance and intelligence) by the heights of the hindrances to migration than migrant pupils coming from origin countries with more gender equality (thus often rich and liberal). But this positive selection is mitigated by the large differences between destination and origin countries in gender inequality (levels of poverty, abundance as well as personal and political freedom).

7.3 Difference between the gender equality in destination and origin countries

Our third hypothesis “Migrant daughters with a large difference in gender equality of their destination and origin countries have a higher relative educational performance than migrant daughters with a small difference in gender equality of their destination and origin countries” is not supported by our results, neither for reading nor for math. We found that the larger the difference between the level of gender equality in destination and origin countries, the lower the educational performance of both male and female migrants' children in their destination countries. We assumed such a negative effect of GEM difference for the male migrant pupils only, but not in more or less the same strength for female migrant pupils.

One can argue that we should have formulated the opposite of our hypotheses on the effect of gender inequality. The second hypothesis should be reformulated as "the lower the gender equality of origin countries, the higher is the relative educational performance of migrant daughters in comparison with that of migrant sons". The closer supervision and stricter parental monitoring of the migrant daughters compared to their sons which strengthen the discipline of the daughters more (Zhou & Bankston, 2001; Feliciano & Rumbaut, 2005) could be the explanatory mechanisms of the female educational advantage of originating from a country with the lowest levels of gender equality.

Our third hypothesis should be reformulated as well: "Migrant daughters with a large difference in gender equality of their destination and origin countries have a smaller relative educational performance than migrant daughters with a small difference in gender equality of their destination and origin countries". Migrant daughters with a large difference in gender equality between their destination and origin countries might get fewer educational opportunities, because the cultural distance between destination and origin (as indicated by a large GEM difference) is that large. A large cultural distance between destination and origin might mean that the religious and/or cultural traditions, the obligations at home, the pressure for an early marriage, and the willingness for more educational investments in boys than in girls (Fuligni, Tseng, & Lam, 1999) will be stronger and thus more negative for migrant daughters.

Only the fourth hypothesis ("Migrant sons with a small difference in gender equality between their destination and origin countries have a higher relative educational performance than comparable migrant sons with a large difference in gender equality of their destination and origin countries") does not need to be reformulated. Migrant sons with a large difference in gender equality between their destination and origin countries might get fewer educational opportunities, because the cultural distance between destination and origin (as indicated by a large GEM difference) is that large. The dominant male role of origin does not fit well in more gender equal destination countries.

Summarizing, not only the gender equality in the origin country but also and even more the difference between gender equality of their destination and origin country is relevant for the relative educational performance of female and male migrant pupils

7.4 Religion as factor in gender inequality

As we have seen in the previous sections, gender equality in the origin country is not the sole explanation of the educational differences between female and male migrant pupils. The dominant religion of their origin countries is also a factor. The female advantage in relative educational performance is largest for migrants' children coming from origin countries with Latin Christianity as the dominant religion. The female advantage in relative educational performance is smallest (or even negative) for migrants' children coming from origin countries with Islam or Eastern Christianity as the dominant religion. These outcomes are controlled for gender equality in the origin countries and the gender equality differences between destination and origin countries, next to individual characteristics such as parental background, migration generation, etc. Although the PISA data does not allow us to test these outcomes with individual religion of the pupils and their parents, Dronkers & Fleischmann (2010) have shown that the individual religion is the best indicator for the religious effects, but that the dominant religion of the origin countries is a good proxy for this individual effect.

7.5 Religion as factor in educational performance

Based on model 5 in tables 4 and 5, we can estimate the average reading and math scores of female and male migrant pupils per dominant religion with an equal GEM score of origin country, equal GEM difference between destination and origin and equal individual characteristics. Although they are artificial estimates, as these factors are never the same for two observations, they reflect most purely the relation between dominant religion and the relative educational performance of migrant pupils from certain origin countries. Both male and female migrant pupils from origin countries without a dominant religion or Hinduism would have the highest reading scores (490[13]/516[14] respectively for males and 539[15]/565[16] respectively for females) and also the highest math scores (531[17]/538[18] respectively for males and 531[19]/547[20] respectively for females). Both male and female migrant pupils from origin countries with Islam or Eastern Christianity as dominant religion would have the lowest

[13] 471.8 (=mean male natives) -5.4 + 24.0 = 490.4
[14] 471.8 (=mean male natives) -5.4 + 49.5 = 515.9
[15] 509.2 (=mean female natives) – 5.4 + 11.3 + 24.0 = 539.1
[16] 509.2 (=mean female natives) – 5.4 + 11.3 + 49.5 = 564.6
[17] 513.6 (=mean male natives) -16.7 + 33.7 = 530.6
[18] 513.6 (=mean male natives) -16.7 + 41.3 = 538.2
[19] 499.7 (=mean female natives) -16.7 + 12.3 + 33.7 = 530.6
[20] 499.7 (=mean female natives) -16.7 + 12.3 + 41.3 = 547.2

reading scores (457[21]/458[22] respectively for males and 501[23]/500[24] for females) and also the lowest math scores (486[25]/490[26] respectively for males and 483[27]/489[28] for females).

This large variation in estimated educational performance (which can not be blamed to level of gender inequality of origin country, the difference in gender inequality between destination and origin countries and individual characteristics) demonstrates the power of origin religion as a factor in educational performance of migrants' children.

7.6 Caveats

[21] 471.8 (=mean male natives) – 5.4 – 9.0 = 457.4
[22] 471.8 (=mean male natives) – 5.4 - 8.2 = 458.2
[23] 509.2 (=mean female natives) – 5.4 + 11.3 – 9.0– 5.8 = 500.5
[24] 509.2 (=mean female natives) – 5.4 + 11.3 - 8.2– 7.3 = 499.6
[25] 513.6 (=mean male natives) -16.7 – 9.0 = 485.9
[26] 513.6 (=mean male natives) -16.7 – 6.6 = 490.3
[27] 499.7 (=mean female natives) -16.7 + 12.3 – 9.0 = 486.3
[28] 499.7 (=mean female natives) -16.7 + 12.3 – 6.6 = 488.7

Figure 1: relation between GEM score of origin country and GEM difference between destination and origin countries, aggregated at the combination of origin and destination countries (n= 134).

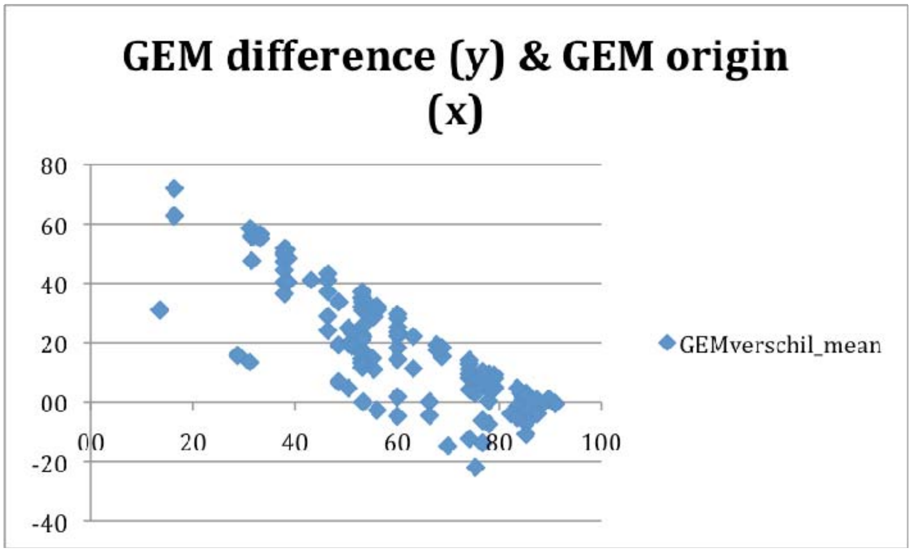

Table 1: Reading and Math scores of male and female pupils with a migrant background per country of destination (means, standard deviation, number of pupils) and the difference between these migrant pupils' score and the average reading and math score of male and female native pupils in these destination countries.

Destination country	Pupils with migrant background				Difference migrant pupils – average native pupils destination			
	Male		Female		Male		Female	
	Reading	Math	Reading	Math	Reading	Math	Reading	Math
Argentina	364,3	382,0	395,2	373,5	-22,8	-19,7	-24,0	-13,6
	101,6	82,3	95,6	80,2				
	136	136	174	174				
Australia	506,7	530,4	541,0	520,2	19,3	19,4	16,4	19,2
	96,8	89,9	87,2	85,8				
	1497	1497	1665	1665				
Austria	412,3	467,7	450,9	451,2	-49,2	-51,7	-55,3	-50,6
	94,3	86,1	94,6	84,6				
	524	524	513	513				
Belgium	464,1	494,1	492,2	469,7	-45,5	-51,7	-43,8	-55,0
	103,3	99,1	97,2	99,2				
	806	806	709	709				
Croatia	449,1	465,4	495,3	447,8	-4,0	0,7	-10,8	-9,7
	87,1	85,7	73,4	80,4				
	619	619	492	492				
Czech Republic	459,8	500,4	501,7	485,4	-13,0	-13,5	-22,1	-27,8
	102,3	106,9	100,8	101,4				
	239	239	198	198				
Denmark	403,1	433,3	430,6	411,6	-80,3	-80,6	-82,3	-86,9
	72,7	72,3	75,9	78,9				
	429	429	527	527				
Finland	478,8	521,4	528,1	512,9	-26,8	-19,3	-32,6	-25,6
	89,5	82,2	84,8	86,1				
	103	103	107	107				
Germany	430,5	472,4	480,4	466,0	-59,4	-59,8	-49,2	-51,8
	93,6	92,8	84,6	87,6				
	418	418	406	406				
Greece	418,6	430,5	467,9	426,8	-51,1	-51,2	-45,2	-37,7
	92,8	84,6	80,7	70,6				
	199	199	195	195				
Hong Kong	519,3	558,7	550,8	544,1	-1,1	-8,5	-5,0	-13,0
	79,5	90,1	73,2	85,5				
	1390	1390	1275	1275				
Israel	479,3	477,1	507,6	457,8	23,2	23,0	12,9	15,9
	107,1	104,6	97,6	92,2				
	408	408	504	504				
Latvia	466,6	489,2	508,4	480,2	1,2	-1,5	-2,4	-6,2
	80,5	76,3	68,6	73,0				
	377	377	381	381				
Liechtenstein	483,5	553,6	516,9	526,4	-9,0	11,8	1,8	8,1
	80,0	82,8	73,7	81,7				
	109	109	101	101				
Luxembourg	427,0	473,8	473,0	461,2	-59,9	-58,9	-47,5	-45,4
	104,3	96,1	99,4	88,7				
	1023	1023	1058	1058				
Macao	471,8	532,2	505,4	520,8	9,2	3,6	6,9	4,7
	71,1	80,6	66,7	75,2				
	2480	2480	2434	2434				

Mexico	396,6	410,2	443,2	426,1	-26,7	-25,2	-1,8	7,1
	92,4	84,0	90,8	83,8				
	164	164	146	146				
Montenegro	397,3	424,1	447,3	411,6	21,9	19,8	18,7	20,8
	83,3	80,1	78,6	72,5				
	477	477	473	473				
Netherlands	472,3	501,1	498,9	487,3	-38,1	-48,4	-36,6	-46,0
	85,2	83,3	79,4	80,3				
	303	303	321	321				
New Zealand	520,0	542,1	555,2	527,6	18,9	17,0	10,1	11,7
	100,8	95,0	87,0	83,5				
	579	579	482	482				
Norway	461,9	484,2	529,7	496,9	-21,3	-18,6	-1,0	-1,4
	102,1	85,9	87,8	79,2				
	84	84	61	61				
Portugal	477,1	497,7	512,3	484,3	9,3	5,7	4,5	2,8
	82,0	88,0	69,7	81,7				
	380	380	458	458				
Qatar	368,2	376,3	414,2	374,2	57,0	40,0	48,8	29,3
	96,6	82,7	92,4	70,4				
	787	787	826	826				
Scotland	530,7	541,8	534,5	514,6	41,3	34,5	22,3	23,4
	103,6	99,2	58,1	66,4				
	36	36	35	35				
Serbia	444,2	470,1	476,5	451,2	24,9	25,3	16,7	16,6
	77,2	87,2	72,0	81,8				
	452	452	480	480				
Shanghai	538,5	601,8	580,1	608,9	2,2	1,0	6,0	10,7
	78,5	99,2	67,6	93,0				
	820	820	783	783				
Switzerland	453,6	507,8	489,9	489,0	-36,8	-48,8	-39,1	-49,9
	88,6	94,3	86,3	90,2				
	1844	1844	1709	1709				
Uruguay	388,8	416,9	437,8	414,8	-14,2	-15,1	-5,8	-4,6
	96,7	91,9	102,3	89,8				
	97	97	76	76				
Total	463,0	500,9	499,3	487,1	-8,8	-12,8	-9,9	-12,7
	98,6	102,7	92,2	98,8				
	16763	16763	16569	16569				

Source: own computation PISA wave 2009 (unweighted)

Table 2: Reading and Math scores of male and female pupils with a migrant background per country or region of origin (means, standard deviation, number of pupils) and the difference between the reading or math score of the female or male migrant pupil and the average reading or math score of the female or males pupils in their destination countries.

Origin country	Pupils with migrant background				Difference migrant pupils – average native pupils destination			
	Male		Female		Male		Female	
	Reading	Math	Reading	Math	Reading	Math	Reading	Math
Afghanistan	372,2	411,4	430,9	412,6	-111,2	-102,5	-82,0	-85,9
	64,8	64,6	75,8	71,1				
	29	29	39	39				
Albania	400,8	425,6	443,7	410,2	-65,1	-63,5	-61,6	-59,2
	94,5	89,0	85,8	69,2				
	186	186	185	185				
Argentina	427,9	452,3	464,9	447,1	25,0	20,2	21,2	27,7
	94,2	94,4	98,3	82,4				
	44	44	31	31				
Australia	499,9	515,8	557,5	524,5	6,3	-1,6	12,3	8,6
	117,5	106,9	78,5	72,4				
	69	69	65	65				
Austria	479,1	542,2	529,4	530,6	-11,8	-10,3	3,8	-3,4
	78,2	84,3	69,4	68,8				
	92	92	90	90				
Belgium	494,4	546,0	522,9	513,5	4,7	11,3	0,1	2,7
	85,6	82,8	83,3	82,9				
	78	78	96	96				
Bolivia	379,4	386,7	404,7	377,4	-7,7	-15,0	-14,6	-9,7
	89,9	73,2	75,1	72,0				
	42	42	51	51				
Brazil	411,5	441,1	465,0	439,4	-25,1	-20,7	-12,8	-12,0
	109,8	106,6	96,0	95,2				
	128	128	126	126				
Cape Verde	343,1	394,7	408,6	405,9	-143,9	-138,0	-111,9	-100,8
	107,9	93,6	110,1	88,0				
	36	36	46	46				
Caribbean	462,7	488,8	499,7	487,3	-46,1	-57,6	-32,5	-40,1
	87,0	84,0	76,5	80,6				
	27	27	14	14				
Chile	368,0	383,2	424,1	395,7	-19,1	-18,5	4,9	8,6
	91,8	76,0	98,2	87,9				
	23	23	27	27				
Denmark	441,9	474,5	530,2	507,6	-41,3	-28,3	-0,6	9,4
	115,9	95,0	88,7	84,4				
	33	33	23	23				
Ethiopia	390,9	373,8	422,1	363,7	-65,1	-80,2	-72,9	-78,4
	82,4	72,0	106,4	87,3				
	76	76	89	89				
France	478,5	516,3	522,5	505,7	-13,8	-23,3	-2,1	-10,3
	98,4	99,0	90,7	90,4				
	504	504	493	493				
Palestinian Territory	359,2	368,9	418,1	376,2	48,0	32,6	52,7	31,3
	85,9	70,9	91,8	69,6				
	145	145	145	145				
Germany	494,6	541,0	532,2	525,5	7,2	2,3	9,0	5,6
	90,6	90,4	85,9	91,7				
	581	581	562	562				

Greece	434,4	485,1	461,6	445,7	-55,2	-44,3	-66,0	-65,5
	109,2	106,7	82,2	83,8				
	15	15	23	23				
India	532,3	552,3	565,0	548,3	44,7	41,5	41,2	47,9
	93,4	85,3	75,2	74,3				
	66	66	68	68				
Iraq & Iran	415,7	446,2	423,6	405,6	-74,0	-76,0	-92,6	-97,9
	72,6	74,6	73,5	74,6				
	81	81	69	69				
Italy	447,6	499,8	485,4	478,4	-42,2	-49,5	-41,6	-50,9
	82,4	86,3	82,8	87,3				
	520	520	439	439				
Jordan	384,7	399,0	425,8	383,4	73,5	62,7	60,4	38,5
	98,3	90,5	98,0	80,3				
	130	130	138	138				
Republic of Korea	506,1	556,3	534,5	543,0	10,1	36,4	-0,5	34,5
	93,5	89,7	100,8	100,4				
	88	88	71	71				
Lebanon	406,3	433,7	421,2	394,0	-77,2	-80,2	-91,7	-104,5
	73,7	69,7	73,4	74,4				
	61	61	76	76				
Liechtenstein	458,6	521,4	537,2	543,9	-31,7	-35,3	8,3	4,9
	97,4	103,5	59,2	69,2				
	19	19	13	13				
Netherlands	477,5	515,4	531,8	526,0	-24,7	-21,9	-1,5	7,1
	85,7	88,8	79,9	88,3				
	120	120	88	88				
New Zealand	485,3	506,1	524,2	499,6	-2,1	-4,9	-0,4	-1,4
	100,1	87,2	87,6	86,3				
	314	314	360	360				
Pakistan & Bangladesh	445,7	465,3	459,7	441,4	-39,5	-46,6	-52,9	-54,8
	87,4	89,6	89,1	86,6				
	57	57	63	63				
Paraguay	336,6	362,1	375,7	359,3	-50,6	-39,7	-43,6	-27,8
	103,9	82,9	106,6	84,6				
	44	44	74	74				
Philippines	472,3	497,2	518,8	499,8	-11,3	-16,5	-1,4	-3,7
	83,3	78,9	79,9	72,5				
	98	98	132	132				
Poland	458,3	500,9	496,1	487,4	-25,0	-28,4	-28,3	-26,9
	88,7	96,7	81,2	78,8				
	78	78	86	86				
Portugal	417,9	467,3	457,9	452,3	-69,9	-74,7	-65,0	-65,8
	92,4	89,7	86,5	79,8				
	763	763	753	753				
Romania	424,2	469,5	487,8	489,6	-37,3	-50,0	-18,4	-12,2
	88,9	83,6	91,3	71,2				
	22	22	15	15				
Former Czechoslovakia	459,7	499,7	492,2	476,0	-12,9	-13,6	-31,3	-36,2
	106,4	112,9	105,5	106,0				
	179	179	157	157				
Viet Nam	497,7	539,5	553,1	537,2	16,4	27,3	28,8	31,2
	86,1	80,3	68,0	69,2				
	72	72	69	69				
Somalia	390,9	413,3	444,1	426,9	-92,5	-100,6	-68,8	-71,5
	74,8	78,1	74,5	74,6				
	32	32	24	24				

South Africa	509,9	529,5	552,7	529,0	17,5	13,3	21,3	23,1
	95,9	81,6	82,3	77,4				
	140	140	140	140				
Spain	488,0	536,3	506,9	501,3	-3,5	-19,7	-21,7	-36,3
	79,6	85,4	71,1	71,9				
	96	96	98	98				
Suriname	486,3	516,9	512,7	498,3	-24,1	-32,7	-22,8	-35,1
	94,5	87,7	76,6	75,7				
	58	58	63	63				
Sweden	479,0	509,8	525,2	499,1	-16,5	-13,8	-24,5	-24,5
	91,3	84,3	74,9	74,1				
	113	113	103	103				
Switzerland	493,2	572,6	535,0	559,2	0,7	30,8	19,9	41,0
	76,7	85,7	67,3	69,3				
	49	49	40	40				
Turkey	397,7	444,9	433,9	427,7	-89,3	-88,5	-87,8	-87,0
	84,8	81,3	84,7	84,6				
	725	725	776	776				
Egypt	401,6	400,1	433,0	388,0	90,4	63,8	67,6	43,0
	98,3	85,1	90,1	69,3				
	290	290	346	346				
United Kingdom	518,1	538,4	551,0	525,8	26,5	22,3	21,9	21,2
	90,8	84,2	82,1	78,7				
	937	937	963	963				
United States of America	456,9	468,2	498,4	473,1	12,1	10,5	19,7	27,2
	118,3	111,4	105,6	98,2				
	278	278	308	308				
Uruguay	428,2	436,9	424,4	403,0	41,1	35,2	5,1	15,9
	88,5	82,1	84,4	58,5				
	19	19	12	12				
Samoa	426,2	442,0	482,4	443,1	-74,8	-83,2	-62,7	-72,8
	99,6	88,9	85,0	76,3				
	75	75	70	70				
Yemen	320,9	336,6	370,3	342,1	9,7	0,3	4,9	-2,8
	78,5	64,3	78,1	53,9				
	222	222	197	197				
African country with Portuguese language	480,8	499,1	513,1	483,6	11,6	6,5	5,3	3,0
	81,2	87,0	70,6	82,5				
	298	298	369	369				
Congo	481,6	503,5	499,3	468,1	-28,0	-42,3	-36,8	-56,6
	112,0	110,3	102,7	100,0				
	140	140	130	130				
Algeria, Morocco or Tunisia	446,8	476,3	475,6	444,5	-63,0	-70,4	-60,2	-83,0
	95,6	87,4	75,2	80,3				
	243	243	235	235				
Former USSR	468,8	489,0	509,1	476,7	0,1	-0,1	-2,4	-2,5
	90,7	84,7	81,0	80,2				
	892	892	928	928				
Former Yugoslavia	428,0	460,1	468,5	443,9	-15,1	-17,8	-19,1	-21,4
	87,1	87,8	79,5	81,0				
	2423	2423	2317	2317				
Arabic region or Middle Eastern country	465,1	506,5	464,2	449,4	-25,6	-11,8	-57,3	-52,6
	88,3	84,0	96,7	90,5				
	36	36	39	39				
Internal immigrants from westernized China	495,1	557,1	513,9	525,1	7,1	10,4	-4,0	-5,8
	85,3	85,4	80,8	83,8				
	143	143	144	144				

Internal immigrants in China	498,0	552,6	532,4	543,8	5,0	-0,5	3,8	1,2
	79,8	90,6	74,5	87,6				
	4517	4517	4310	4310				
External immigrants from China to non-Chinese countries	545,2	577,7	572,6	569,7	53,1	61,2	43,0	64,4
	106,5	106,4	93,2	87,4				
	239	239	202	202				
Total	463,0	500,9	499,3	487,1	-8,8	-12,8	-9,9	-12,7
	98,6	102,7	92,2	98,8				
	16763	16763	16569	16569				

Source: own computation PISA wave 2009 (unweighted)

Table 3: Descriptive statistics of the variables

	Minimum	Maximum	Mean	Std. Deviation
Individual				
Female	0,00	1,00	0,50	0,50
Weight	0,20	14,08	0,84	1,10
Reading test	59,29	823,70	481,02	97,20
Difference reading pupil – native average destination	-427,69	346,99	-9,42	91,11
Math test	102,36	869,93	494,00	101,04
Difference math pupil – native average destination	-401,42	333,59	-12,79	92,21
Standard error reading test	0,00	9282,43	902,42	735,60
Standard error math test	0,00	7947,39	553,65	442,00
Mixed parental marriage	0,00	1,00	0,37	0,48
Same language as country of destination	0,00	1,00	0,72	0,45
Parental ECSC missing	0,00	1,00	0,01	0,09
Parental ESCS score	-5,71	3,09	-0,27	1,04
Nuclear family	0,00	1,00	0,79	0,41
Migrant 1st generation same language	0,00	1,00	0,18	0,38
Migrant 1st generation not same language	0,00	1,00	0,08	0,27
Migrant 1st generation missing language	0,00	1,00	0,02	0,13
Migrant 2d generation same language	0,00	1,00	0,54	0,50
Migrant 2d generation not same language	0,00	1,00	0,13	0,33
Migrant 2d language missing	0,00	1,00	0,05	0,21
Migrant 3d not same language	0,00	1,00	0,01	0,11
Origin country or region				
Gender Empowerment Index	13,50	90,90	58,60	15,66
Years of Compulsory Education	4,00	12,00	8,8	1,47
Expected years of Schooling	0,68	21,00	13,2	2,55
Human Development Index	28,40	93,50	72,0	11,71
Latin Christian	0,00	1,00	0,36	0,47
Eastern Christian	0,00	1,00	0,13	0,25
No religion	0,00	1,00	0,30	0,46
Hinduism	0,00	1,00	0,01	0,06
Mixed religion	0,00	1,00	0,07	0,15
Islam	0,00	1,00	0,14	0,34
Country of destination				
Average female native reading score	365,41	574,08	509,21	44,74
Average female native math score	344,91	598,20	499,65	55,24
Average male native reading score	311,20	536,35	471,76	48,10
Average male native math score	336,30	600,80	513,57	57,67
Gender Empowerment distance Destination - Origin	-22,00	71,90	10,97	16,22

Source: own computation PISA wave 2009 (unweighted)

Table 4: Effects of gender, individual characteristics, Gender Empowerment Measurement of origin country and the difference between GEM in destination and origin on the difference between the reading score of children of migrants and that of the native pupils in their destination countries.

	Model 1: Gender	Model 2: 1 & Individual	Model 3: 2 & GEM	Model 4: 3 & GEM difference destination - origin	Model 5: 4 & religion	Model 6: 2 & religion
Constant	-18.5** (3.6)	-27.1** (3.2)	-27.1** (3.1)	-3.4 (4.5)	-5.4 (5.1)	-28.5** (3.8)
Female	-2.2** (0.9)	9.4** (2.0)	9.8** (2.0)	9.3** (2.1)	11.3** (2.3)	12.2** (2.1)
Mixed parental marriage		3.9** (1.1)	3.8** (1.1)	3.8** (1.1)	3.8** (1.1)	3.9** (1.1)
Missing mixed parental marriage		-6.3** (1.9)	-6.3** (1.9)	-6.1** (1.8)	-6.0** (1.8)	-6.3** (1.9)
Parental ESCS score		24.8** (0.5)	24.8** (0.5)	24.8** (0.5)	24.9** (0.5)	24.8** (0.5)
Missing Parental ESCS score		-54.0** (4.7)	-54.1** (4.7)	-53.8** (4.7)	-53.7** (4.7)	-54.0** (4.7)
Nuclear family		22.3** (1.4)	22.4** (1.4)	22.3** (1.4)	22.2** (1.4)	22.3** (1.4)
Nuclear family*Female		-10.4** (2.0)	-10.6** (2.0)	-10.5** (2.0)	-10.2** (2.0)	-10.3** (2.0)
1st generation not same language §		-27.2** (1.9)	-27.2** (1.9)	-26.8** (1.9)	-27.0** (1.9)	-27.4** (1.9)
1st generation missing language §		-54.2** (3.4)	-54.4** (3.4)	-54.3** (3.4)	-54.2** (3.4)	-54.2** (3.4)
2d generation same language §		7.9** (1.5)	8.1** (1.5)	8.1** (1.5)	8.2** (1.5)	8.2** (1.5)
2d generation same language*Female		-6.1** (1.7)	-6.5** (1.7)	-6.4** (1.7)	-6.7** (1.7)	-6.9** (1.7)
2d generation not same language §		-14.3** (1.8)	-14.5** (1.8)	-14.3** (1.8)	-14.3** (1.8)	-14.5** (1.8)
2d generation language missing §		-41.4** (2.3)	-41.4** (2.3)	-41.3** (2.3)	-41.3** (2.3)	-41.4** (2.3)
3d generation not same language §		-18.4** (4.0)	-18.3** (4.0)	-17.5** (4.0)	-17.4** (4.0)	-18.4** (4.0)
GEM origin†			0.1 (0.1)	-1.0** (0.2)	-1.0** (0.2)	
GEM origin*Female†			0.1** (0.0)	0.1** (0.1)	0.1 (0.1)	
GEM destination - origin				-1.3** (0.2)	-1.2** (0.2)	
GEM destination – origin*Female				0.0 (0.1)	0.0 (0.1)	
Eastern Christian origin ‡					-8.2 (10.3)	-4.1 (11.8)
Eastern Christian origin*Female					-7.3** (3.3)	-8.1** (3.2)
Non religious origin ‡					24.0** (7.3)	31.9** (7.9)
Hinduism origin ‡					49.5** (17.9)	39.8* (20.1)
Mixed religion origin ‡					6.5 (15.3)	6.7 (18.0)
Islam origin ‡					-9.0 (8.1)	-12.5* (6.4)
Islam origin*Female					-5.8 (3.3)	-6.7** (2.3)
Variances						
Destination	1265 (404)	144 (613)	78 (622)	0 (0)	0 (0)	0 (0)
Origin	299 (350)	710 (617)	748 (629)	590 (81)	451 (65)	675 (92)
Pupils	3209 (37)	2837 (33)	2852 (33)	2839 (33)	2839 (33)	2849 (33)
Test (*1000)	8 (0)	6 (0)	6 (0)	6 (0)	6 (0)	6 (0)
Loglikelihood	397578	392950	392943	392907	392871	392906

Source: PISA 2009 own computation. Equal weights for destination countries. § Migrant 1st generation with same language as destination country is reference category. ‡ Latin Christian is reference category. † Centered grand mean

Table 5: Effects of gender, individual characteristics, Gender Empowerment Measurement of origin country and the difference between GEM in destination and origin on the difference between the math score of children of migrants and that of the native pupils in their destination countries.

	Model 1: Gender	Model 2: 1 & Individual	Model 3: 2 & GEM	Model 4: 3 & GEM difference destination - origin	Model 5: 4 & religion	Model 6: 2 & religion
Constant	-19.7** (3.7)	-34.0** (3.3)	-34.1** (3.3)	-9.1 (5.0)	-16.7** (5.3)	-37.3** (3.8)
Female	-1.7 (0.9)	8.1** (2.0)	8.4** (2.0)	9.6** (2.2)	12.3** (2.3)	10.8** (2.1)
Mixed parental marriage		6.3** (1.1)	6.3** (1.1)	6.3** (1.1)	6.4** (1.1)	6.4** (1.1)
Missing mixed parental marriage		-5.0** (1.9)	-4.9** (1.9)	-4.7** (1.9)	-4.6** (1.9)	-4.8** (1.9)
Parental ESCS score		25.9** (0.5)	25.9** (0.5)	25.9** (0.5)	25.9** (0.5)	25.9** (0.5)
Missing Parental ESCS score		-51.2** (4.7)	-51.3** (4.7)	-51.2** (4.7)	-51.1** (4.7)	-51.3** (4.7)
Nuclear family		22.8** (1.4)	22.7** (1.4)	22.7** (1.4)	22.6** (1.4)	22.7** (1.4)
Nuclear family*Female		-8.3** (2.0)	-8.3** (2.0)	-8.3** (2.0)	-7.9** (2.0)	-8.0** (2.0)
1st generation not same language §		-15.1** (2.0)	-15.2** (1.9)	-14.8** (2.0)	-15.0** (1.9)	-15.4** (1.9)
1st generation missing language §		-46.3** (3.4)	-46.3** (3.4)	-46.3** (3.4)	-46.4** (3.4)	-46.3** (3.4)
2d generation same language §		8.9** (1.5)	9.1** (1.5)	9.3** (1.5)	9.6** (1.5)	9.5** (1.5)
2d generation same language*Female		-5.5** (1.7)	-6.0** (1.7)	-6.4** (1.7)	-7.9** (2.0)	-6.9** (1.7)
2d generation not same language §		-5.0** (1.8)	-5.1** (1.8)	-4.9** (1.8)	-5.1** (1.8)	-5.2** (1.8)
2d generation language missing §		-37.5** (2.3)	-37.5** (2.3)	-37.5** (2.3)	-37.5** (2.3)	-37.6** (2.3)
3d generation not same language §		-4.6 (4.0)	-4.6 (4.0)	-3.8 (4.0)	-3.8 (4.0)	-4.6 (4.0)
GEM origin†			0.1 (0.2)	-1.1** (0.2)	-0.9** (0.2)	
GEM origin*Female†			0.2** (0.1)	0.1 (0.1)	0.0 (0.1)	
GEM destination - origin				-1.3** (0.2)	-1.1** (0.2)	
GEM destination – origin*Female				-0.1 (0.1)	0.0 (0.1)	
Eastern Christian origin ‡					-6.6 (10.9)	-3.3 (12.1)
Eastern Christian origin*Female					-9.9** (3.3)	-9.6** (3.2)
Non religious origin ‡					33.7** (7.8)	40.9** (8.1)
Hinduism origin ‡					41.3** (18.9)	32.2** (20.5)
Mixed religion origin ‡					7.6 (16.3)	6.0 (18.4)
Islam origin ‡					-9.0 (8.5)	-12.2* (6.4)
Islam origin*Female					-11.3** (3.3)	-11.0** (2.3)
Variances						
Destination	1526 (288)	863 (209)	850 (208)	576 (214)	271 (295)	492 (275)
Origin	138 (188)	121 (164)	121 (164)	149 (192)	245 (291)	214 (261)
Pupils	3399 (38)	3022 (34)	3006 (33)	3018 (34)	3002 (34)	3014 (34)
Test (*1000)	7 (0)	6 (0)	6 (0)	6 (0)	6 (0)	6 (0)
Loglikelihood	397728	393037	393037	393002	392949	392977

Source: PISA 2009 own computation. Equal weights for destination countries. § Migrant 1st generation with same language as destination country is reference category. ‡ Latin Christian is reference category. † Centered grand mean

Appendix A: Macro variables

Gender Empowerment Measure (GEM)[29]

The Gender Empowerment Measure evaluates women's participation and decision-making ability in political and economic forums. Ranging from 0 to 100, it combines variables such as women's share in parliamentary seats and ministerial positions as well as managerial, senior official and legislative jobs, the share of technical and professional jobs held by women and gender income differences.

Source: UNDP (2011) Measuring inequality: Gender-related Development Index (GDI) and Gender Empowerment Measure (GEM). Retrieved on August 28, 2011 from http://hdr.undp.org/en/statistics/indices/gdi_gem/

HDI[30]

A country's level of economic development was approached by its Human Development Index (HDI). Ranging from 0 to 100, the Human Development Index combines national information on peoples' life expectancies, adult literacy rates, gross enrolment ratios in primary, secondary, and tertiary education, and GDPs.

Years of Compulsory Education (YCE)[31]

Years of compulsory education refers to the duration of compulsory schooling in countries of origin. On average for all origin countries and areas in our data, pupils are obliged to attend school for 9 years. The mandatory length of schooling varies considerably between origin countries, from 4 to 12 years.

Expected Years of Schooling (EYS)[32]

EYS represents the expected number of years a child at school entrance age spends at school and university, including grade repetitions, when current enrolment patterns in all educational levels (primary, secondary, post-secondary non-tertiary, and tertiary) remain the same.

Religion[33]

To take into account origin countries' religious backgrounds, dummy variables were created to indicate whether or not at least forty percent of the countries' inhabitants are Latin Christian, Eastern Orthodox, Eastern religious or Islamic. Countries in which no religious denomination has the support of at least forty percent of the population were classified as 'Non-religious'. Similarly, if two religious groups are represented by at least forty percent, the country is regarded as 'Mixed'.

Appendix B: HDI (Macro variable) aggregate compositions

For aggregated origin areas, macro indicator values are calculated as the average of all country values available for the specific cluster. In the following, detailed information for each aggregate group is provided, using the Human Development Index as an example. The calculation of other aggregate group indicators follows the same group constellation used to calculate the HDI values but deviates sometimes to a slight extent as indicators were not

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[29] HDR 2009 (http://www.undp.org.tr/publicationsDocuments/Table_K_from_HDR_2009_EN_Gender%20Empowerment%20Measure.pdf)

[30] HDR 2009

[31] EFA Global Monitoring Report 2011 (http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/efareport/statistics/statistical-tables/)

[32] UNESCO Institute for Statistics 2011 (http://hdr.undp.org)

[33] CIA World Factbook (https://www.cia.gov/library/publications/the-world-factbook/fields/2122.html#lu)

always available for all countries that form the various aggregate groups. For more detailed information on specific aggregate group values, please contact the authors.

African country with Portuguese as the official language
Including countries are Angola, Cape Verde, Guinea-Bissau, Mozambique, and São Tomé and Príncipe.

Algeria, Morocco, and Tunisia

Arabic region
All 22 countries that belong to the Arabic League.

Caribbean & Netherlands Antilles
We took the average of these islands in the Caribbean, i.e. Bahamas, Barbados, Cuba, Dominican Republic, Haiti, Jamaica, and Trinidad and Tobago, because information about the other Caribbean islands were not available. For the Netherlands Antilles, we average the values for Suriname and the Caribbean islands.

Former USSR
All states of the former USSR.

Former Yugoslavia
Bosnia and Herzegovina, Croatia, Macedonia, Montenegro, Serbia, and Slovenia.

External immigrants from China to non-Chinese countries
This group is comprised by emigrants from all regions of China, including Mainland China, Hong Kong, Macau, and Taiwan.

I**nternal immigrants from westernized China**
Observations in this aggregate originate from “Hong Kong – China” (moved to “Macau – China”), “Hong Kong Macau Chinese Taipei” (moved to “Shanghai – China”), “Chinese Zaipei” and “Macau – China” (both groups moved to “Hong Kong – China”).

Internal immigrants in China
As this group includes people who moved from “another province in mainland China” to “Shanghai – China”, as well as from “China” to either “Hong Kong – China” or “Macau – China”.

Appendix C Additional analyses: variations on models 4 and 2 of tables 4 and 5

Reading	Model 4A: & YCE	Model 4B: & EYS	Model 4C: & HDI	Model 2A: & YCE	Model 2B: & EYS	Model 2C: & HDI
GEM origin †	-1.1** (0.2)	-1.1** (0.2)	-1.0** (0.2)			
GEM origin*Female	0.2** (0.1)	0.2** (0.1)	0.1** (0.1)			
GEM destination – origin †	-1.3** (0.2)	-1.2** (0.2)	-1.3** (0.2)			
GEM destination – origin*Female	0.0 (0.1)	0.0 (0.1)	0.0 (0.1)			
Years compulsory education (YCE) origin †	0.9 (1.6)			1.3 (1.5)		
Expected years schooling (EYS) origin †		0.9 (1.1)			1.3 (0.9)	
HDI origin †			-0.0 (0.2)			0.2 (0.2)
Maths						
GEM origin †	-1.0** (0.3)	-1.1** (0.3)	-1.2** (0.3)			
GEM origin*Female	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)			
GEM destination – origin †	-1.2** (0.2)	-1.2** (0.2)	-1.3** (0.2)			
GEM destination – origin*Female	-0.1 (0.1)	-0.1 (0.1)	-0.1 (0.1)			
Years compulsory education (YCE) origin †	0.4 (1.8)			1.3 (1.6)		
Expected years schooling (EYS) origin †		1.1 (1.2)			1.5 (0.9)	
HDI origin †			0.2 (0.3)			0.3 (0.2)

Source: PISA 2009 own computation. Equal weights for destination countries. Controlled for the individual characteristics. † Centered grand mean

Appendix D Dominant relation of origin and their relation with other variables

Table D1: Average GEM score and average GEM difference score per dominant religion of origin country

Dominant religion of origin country	Average GEM score	Average GEM difference destination - origin
Latin Christianity	73.6	8.4
Eastern Christianity	50.5	23.0
No dominant religion	53.4	2.3
Hinduism	38.6	47.9
Mixed religion	56.0	32.2
Islam	33.3	36.6

Table D2: Interaction between GEM origin and dominant religion of origin country in model 5 of table 4 and 5

Interaction dominant religion of origin country and Female added to model 5	Reading (table 4)	Math (table 5)
Eastern Christianity	-5.5 (3.1)	-6.2** (3.1)
No dominant religion	1.6 (2.5)	3.5 (2.5)
Hinduism	-8.5 (14.9)	-3.6 (14.8)
Mixed religion	-5.0 (4.6)	-6.5 (4.6)
Islam	-3.3 (3.1)	-8.0** (3.1)

Source: PISA 2009 own computation, based on model 5 of tables 4 and 5.

Appendix E: Analyses separate for female and male migrant pupils

Table E1: Effects of individual characteristics, Gender Empowerment Measurement of origin country and the difference between GEM in destination and origin on the difference between the reading score of migrant daughters and that on the native female pupils in their destination countries.

	Model 1: Individual	Model 2: 1 & GEM	Model 3: 2 & YCE	Model 4: 2 & EYS	Model 5: 2 & HDI	Model 6: 2 & religion
Constant	-12.6** (4.6)	8.0 (5.2)	7.4 (5.2)	7.4 (5.2)	8.0 (5.2)	4.3 (6.1)
Mixed parental marriage	1.3 (1.5)	1.0 (1.5)	1.0 (1.5)	1.0 (1.5)	0.9 (1.5)	1.2 (1.5)
Missing mixed parental marriage	-6.7** (2.6)	-6.6** (2.5)	-6.6** (2.6)	-6.6** (2.5)	-6.7** (2.5)	-6.6** (2.5)
Parental ESCS score	25.8** (0.6)	25.8** (0.6)	25.8** (0.6)	25.8** (0.6)	25.7** (0.6)	25.8** (0.6)
Missing Parental ESCS score	-68.7** (7.7)	-68.4** (7.7)	-68.4** (7.7)	-68.5** (7.7)	-68.4** (7.7)	-68.1** (7.7)
Nuclear family	12.0** (1.4)	11.9** (1.4)	12.0** (1.4)	11.9** (1.4)	12.0** (1.4)	11.9** (1.4)
1st generation not same language	-25.5** (2.6)	-24.8** (2.6)	-24.7** (2.6)	-24.8** (2.6)	-24.7** (2.6)	-25.2** (2.6)
1st generation missing language	-58.2** (4.7)	-57.9** (4.7)	-57.9** (4.7)	-58.0** (4.7)	-57.8** (4.7)	-57.8** (4.7)
2d generation same language	2.0 (1.8)	2.3 (1.8)	2.3 (1.8)	2.2 (1.8)	2.4 (1.8)	2.1 (1.8)
2d generation not same language	-15.7** (2.4)	-15.2** (2.4)	-15.2** (2.4)	-15.3** (2.4)	-15.1** (2.4)	-15.3** (2.4)
2d generation language missing	-43.6** (3.2)	-43.2** (3.2)	-43.2** (3.2)	-43.2** (3.2)	-43.1** (3.2)	-43.2** (3.2)
3d generation not same language	-26.2** (5.4)	-24.6** (5.4)	-24.6** (5.4)	-24.6** (5.4)	-24.6** (5.4)	-24.3** (5.3)
GEM origin†		-0.9** (0.2)	-0.9** (0.3)	-0.8** (0.3)	-0.9** (0.3)	-0.8** (0.3)
GEM destination - origin		-1.4** (0.2)	-1.4** (0.2)	-1.3** (0.2)	-1.3** (0.2)	-1.1** (0.2)
Years compulsory education† (YCE) origin			0.1 (1.5)			
Expected years schooling (EYS) origin†				-0.6 (1.1)		
HDI origin†					0.0 (0.2)	
Eastern Christian origin						-7.8 (9.5)
Non religious origin						27.5** (7.5)
Hinduism origin						28.7* (17.5)
Mixed religion origin						2.2 (13.8)
Islam origin						-16.7** (8.2)
Variances						
Destination	327 (132)	135 (70)	143 (69)	143 (70)	133 (71)	191 (82)
Origin	473 (82)	385 (68)	384 (67)	380 (67)	377 (70)	265 (51)
Pupils	2580 (42)	2568 (42)	2588 (42)	2568 (42)	2583 (42)	2585 (42)
Test (*1000)	6 (0)	6 (0)	6 (0)	6 (0)	6 (0)	6 (0)
Loglikelihood	193604	193571	193571	193570	193571	193541

Source: PISA 2009 own computation. Equal weights for destination countries. Migrant 1st generation with same language as destination country is reference category. Latin Christian is reference category. † Centered grand mean

Table E2: Effects of individual characteristics, Gender Empowerment Measurement of origin country and the difference between GEM in destination and origin on the difference between the reading score of migrant sons and that on the native male pupils in their destination countries.

	Model 1: Individual	Model 2: 1 & GEM	Model 3: 2 & YCE	Model 4: 2 & EYS	Model 5: 2 & HDI	Model 6: 2 & religion
Constant	-24.3** (5.0)	-4.3 (6.1)	-4.3 (6.1)	-4.9 (6.1)	-4.6 (6.1)	-15.7** (7.0)
Mixed parental marriage	6.4** (1.6)	6.0** (1.6)	6.0** (1.6)	6.0** (1.6)	6.0** (1.6)	6.4** (1.6)
Missing mixed parental marriage	-5.0* (2.7)	-5.0* (2.7)	-5.0* (2.7)	-5.0* (2.7)	-5.0* (2.7)	-4.2 (2.6)
Parental ESCS score	24.2** (0.7)	24.2** (0.7)	24.2** (0.7)	24.2** (0.7)	24.2** (0.7)	24.3** (0.7)
Missing Parental ESCS score	-48.2** (6.0)	-47.7** (6.0)	-47.7** (6.0)	-47.6** (6.0)	-47.7** (6.0)	-47.4** (6.0)
Nuclear family	22.1** (1.5)	22.1** (1.5)	22.0** (1.5)	22.0** (1.5)	22.0** (1.5)	22.0** (1.5)
1st generation not same language	-28.3** (2.9)	-27.3** (2.9)	-27.2** (2.9)	-27.4** (2.9)	-27.2** (2.9)	-28.0** (2.9)
1st generation missing language	-51.8** (4.8)	-51.2** (4.8)	-51.1** (4.8)	-51.2** (4.8)	-51.1** (4.8)	-51.1** (4.8)
2d generation same language	7.1** (1.9)	7.3** (1.9)	7.3** (1.9)	7.3** (1.9)	7.4** (1.9)	7.2** (1.9)
2d generation not same language	-14.1** (2.7)	-13.3** (2.7)	-13.3** (2.7)	-13.4** (2.7)	-13.3** (2.7)	-13.7** (2.7)
2d generation language missing	-40.2** (3.3)	-39.5** (3.3)	-39.5** (3.3)	-39.6** (3.3)	-39.5** (3.3)	-39.9** (3.3)
3d generation not same language	-10.8* (5.6)	-9.5 (5.6)	-9.6 (5.6)	-9.6 (5.6)	-9.5 (5.6)	-9.9 (5.5)
GEM origin†		-0.9** (0.3)	-1.0** (0.3)	-1.0** (0.3)	-0.9** (0.3)	-0.5 (0.3)
GEM destination - origin		-1.3** (0.3)	-1.3** (0.3)	-1.3** (0.3)	-1.3** (0.3)	-1.1 ** (0.3)
Years compulsory education (YCE) origin†			1.5 (1.5)			
Expected years schooling (EYS) origin†				1.2 (1.1)		
HDI origin†					0.1 (0.2)	
Eastern Christian origin						-1.3 (10.1)
Non religious origin						39.0** (7.8)
Hinduism origin						51.1** (17.1)
Mixed religion origin						17.4 (13.8)
Islam origin						6.3 (8.1)
Variances						
Destination	411 (160)	263 (108)	257 (108)	261 (109)	264 (110)	341 (121)
Origin	508 (90)	403 (74)	395 (73)	396 (73)	403 (74)	260 (53)
Pupils	3093 (50)	3093 (50)	3095 (50)	3095 (50)	3092 (50)	3093 (50)
Test (*1000)	7 (0)	7 (0)	7 (0)	7 (0)	7 (0)	7 (0)
Loglikelihood	199214	199193	199192	199193	199192	199166

Source: PISA 2009 own computation. Equal weights for destination countries. Migrant 1st generation with same language as destination country reference category. Latin Christian reference category. † centered grand mean.

Table E3: Effects of individual characteristics, Gender Empowerment Measurement of origin country and the difference between GEM in destination and origin on the difference between the math score of migrant daughters and sons and that on the native female or male pupils in their destination countries.

	Female		Male	
	Model 2: 1 & GEM	Model 6: 2 & religion	Model 2: 1 & GEM	Model 6: 2 & religion
Constant	4.9 (6.2)	-3.1 (6.8)	-7.6 (7.0)	-22.9** (7.9)
Mixed parental marriage	3.2** (1.5)	3.3** (1.5)	5.8** (1.6)	6.2** (1.6)
Missing mixed parental marriage	-4.8 (2.6)	-4.6 (2.6)	0.0 (2.7)	0.1 (2.7)
Parental ESCS score	28.0** (0.6)	28.1** (0.6)	26.3** (0.7)	26.4** (0.7)
Missing Parental ESCS score	-57.2** (8.0)	-56.9** (8.0)	-54.8** (5.9)	-54.7** (5.9)
Nuclear family	13.5** (1.4)	13.5** (1.4)	22.0** (1.5)	22.0** (1.5)
1st generation not same language	-13.8** (2.7)	-14.3** (2.6)	-12.4** (2.8)	-13.2** (2.8)
1st generation missing language	-55.7** (4.8)	-55.6** (4.8)	-41.0** (4.7)	-41.3** (4.7)
2d generation same language	4.7** (1.8)	4.4** (1.8)	7.0** (1.9)	6.6** (1.9)
2d generation not same language	-4.4 (2.5)	-4.6 (2.5)	-8.9** (2.7)	-9.6** (2.7)
2d generation language missing	-40.9** (3.2)	-41.1** (3.2)	-39.1** (3.3)	-39.6** (3.4)
3d generation not same language	-2.8 (5.4)	-2.7 (5.3)	6.5 (5.4)	5.4 (5.4)
GEM origin†	-0.9** (0.3)	-0.7** (0.3)	-0.8** (0.3)	-0.3 (0.4)
GEM destination - origin	-1.5** (0.3)	-1.2** (0.3)	-1.3** (0.3)	-1.0** (0.4)
Eastern Christian origin		-15.7 (8.9)		-5.8 (10.0)
Non religious origin		44.2** (7.3)		55.7** (7.8)
Hinduism origin		67.7** (15.7)		45.7** (16.9)
Mixed religion origin		16.2 (12.4)		26.4* (13.6)
Islam origin		-11.6 (7.8)		8.2 (8.3)
Variances				
Destination	267 (119)	353 (114)	404 (155)	539 (172)
Origin	423 (76)	200.7 (43)	479 (86)	239 (50)
Pupils	2893 (45)	2891 (45)	3573 (55)	3570 (55)
Test (*1000)	3 (0)	3 (0)	2 (0)	2 (0)
Loglikelihood	194286	194229	199612	199568

Source: PISA 2009 own computation. Equal weights for destination countries. Migrant 1st generation with same language as destination country reference category. Latin Christian reference category. † centered grand mean

Appendix F: Interactions between gender and individual characteristics in model 2 of tables 4 and 5

Table F1: Interaction between gender and individual characteristics separately added to model 2 of tables 4 and 5

Interaction with Female	reading	math
Mixed parental marriage	-2.9 (1.7)	-1.7 (1.7)
Parental ESCS	-0.2 (0.8)	0.1 (0.8)
Nuclear family	-10.5** (2.0)	-8.4** (2.0)
1st generation not same language	4.8 (3.1)	5.0 (3.1)
2d generation same language	-6.3** (1.7)	-5.6** (1.7)
2d generation not same language	4.6 (2.5)	4.3 (2.6)
3d generation not same language	5.1 (3.0)	14.4** (6.6)

Source: PISA 2009 own computation, based on model 2 of tables 4 and 5.