fedea

Fundación de Estudios de Economía Aplicada

Immigration and Students' Achievement in Spain

by

Natalia Zinovyeva[*]

Florentino Felgueroso[**]

Pablo Vázquez[***]

DOCUMENTO DE TRABAJO 2008-37

Serie Capital Humano y Empleo

CÁTEDRA FEDEA- Santander

October 2008/Revised 2011

Paper prepared for the Fedea Report 2008

* FEDEA.

** Universidad de Oviedo. FEDEA

*** Complutense University and FEDEA.

ISSN:1696-750

Jorge Juan, 46

28001 Madrid -España

Tel.: +34 914 359 020

Fax: +34 915 779 575

infpub@fedea.es

N.I.F. G-78044393

Immigration and Students' Achievement in Spain: Evidence from PISA*

Natalia Zinovyeva† Florentino Felgueroso‡ Pablo Vazquez§

May 10, 2011

Abstract

In this paper we assess the educational performance of immigrant and native students in Spain using data from the Programme for International Student Assessment (PISA) run in 2003, 2006 and 2009. We find that immigrant students perform significantly worse than native students, but they improve their performance with time they stay in Spain. We observe that most of the achievement gap across native and immigrant students is explained by individual and family characteristics and less than 15% of the gap can be attributed to differential school attendance. Among specific school-level characteristics, the higher proportion of immigrant peers and the segregation of students across public and private schools seem to explain the lower performance of immigrants. However, both of these factors are indistinguishable from the effect of the parental background of native peers.

JEL Classification: I21, J15

Keywords: School Achievement, PISA Data, Immigration, Spain

*We are grateful to Manuel Bagues, Michele Boldrin, Antonio Cabrales, Jose Ignacio García and Sergi Jiménez, and the participants of the European Economic Association congress in Barcelona, the European Association of Labour Economists conference in Tallinn and the Spanish Economic Association congress in Granada for their helpful comments and suggestions. We acknowledge the financial support from Spanish Ministry of Science and Innovation, project ECO2008-06395-C05-05.

†(Corresponding author) Institute of Public Goods and Policies, Spanish National Research Council (IPP-CSIC), Calle Albasanz, 26-28, 28037, Madrid, Spain, Tel.: +34 91 602 23 50, Fax: +34 91 602 29 71, natalia.zinovyeva@cchs.csic.es

‡University of Oviedo and FEDEA, Avenida del Cristo s/n, 33071, Oviedo, Spain, ffelgue@uniovi.es

§Complutense University and FEDEA, Calle Jorge Juan 46, 28001, Madrid, Spain, pvazquez@fedea.es

1 Introduction

Over the last decade Spain has experienced an unprecedented increase in immigrant population, receiving almost a half of the EU's total immigration flows. The percentage of immigrant students in the Spanish educational system has been also constantly rising since the beginning of 2000s and now is over 15% in some autonomous communities. The experience of the countries of traditional immigration, like Germany and France, suggests that children of immigrant origin tend to lag behind native students in their school achievement. Therefore the issue of immigrant performance in Spanish schools becomes particularly important nowadays.

In this paper we assess the performance of immigrant and native students in Spain using the data from the 2003, 2006 and 2009 waves of the Programme for International Student Assessment (PISA). We provide evidence on the evolution of the performance gap over time and explore the responsiveness of both native and immigrant students to changes in school characteristics.

We find that immigrant students on average perform significantly worse than native students. This gap is bigger for more recent cohorts of students. Generally, immigrant students improve their performance the longer they stay in Spain. Nevertheless, we find that students who stay almost all their lives in Spain still perform worse than natives in all domains analyzed by PISA. The result holds even after controlling for a range of individual characteristics. This suggests that the children of immigrants who arrive now to Spain will probably only partially close the performance gap with native students.

Overall, few observed individual and family characteristics explain up to 85% of the performance gap between native and immigrant students. About a half of this effect can be attributed to the time immigrant students spend in Spain and to the associated catching up process. The rest is associated to the lower socio-economic background of immigrant students.

Segregation of immigrants and natives across schools can explain less than 15% of the achievement gap. Immigrants are relatively more likely to study in public schools, which on average provide slightly lower returns than private schools. Immigrants also tend to study in schools with relatively more immigrant peers, and the proportion of immigrant peers is again negatively correlated with individual performance. Nevertheless, the negative effects of public schools and the proportion of immigrant peers on students' performance could be mainly attributed to the differences in the quality of peers' parental education across schools. Once the (native) peers' parental education is taken into account, both school ownership and the proportion of immigrants in school have no significant effect on performance. Only charter schools remain to generate significantly higher reading performance, conditional on peers' parental education. Given that the effect of peers' parental education might be at least partially interpreted as a result of self-selection of immigrant and native students into different schools, the effect of schools on the achievement gap might be even smaller than 15%.

The low effect of school characteristics on the natives-immigrants achievement gap suggests that policies addressing immigrant students' performance should perhaps directly assist disadvantaged families rather than encourage immigrant students to attend certain type of schools.

The rest of the paper is organized as follows. Section 2 provides an overview of the recent immigration history in Spain and summarizes the main policy concerns related to integration of immigrant children in Spanish schools. Section 3 briefly summarizes the vast empirical literature addressing the issue of poor immigrant performance in different educational systems and defines the main hypotheses of our analysis. Section 4 describes the data sources for our empirical analysis. Section 5 presents the results of the empirical analysis. Finally, section 6 concludes.

2 Immigration and education in Spain: stylized facts

Substantial demographic changes, rapid immigration flows and increasing segregation of immigrant students in schools have characterized recently the Spanish educational system and might affect it during the next decade. In this section we will describe these features of the Spanish educational system in more details.

2.1 Demography and immigration

As a result of one of the lowest fertility rates in the world, Spain has lost near 1.5 million of students in the last decade of the 20th century. Few years later, in 2007, the educational system had recovered more than 400 000 students, due to the smooth improvement of fertility rates and a massive inflow of immigrants (see Figure 1). Additionally, immigrant population in Spain, being composed of relatively young people, has on average higher fertility rates than native population.[1] Therefore over time, the educational panorama is changing in a fast and intense way.

The effect of the demographic trend and the immigration flow could be clearly observed by comparing the evolution of the number of native and immigrant students across the levels of education (see Table 1). Since 1998-1999 the decrease in the number of students in the upper secondary school has been dramatic: the overall number of students dropped by 35.7%. In primary schools and lower secondary education the current number of students remained practically the same as it was a decade ago. At the same time, the number of students in pre-primary education has increased by around 45%. The number of immigrant students has also multiplied by 8-9 time in pre-primary, primary and secondary levels of education.[2]

The geographical distribution of immigrant students has not been homogeneous across the regions (autonomous communities) of Spain (Figure 2). La Rioja, Madrid, Catalonia and Baleares have had the largest increase in the fraction of immigrant students, which now is above 15% in secondary education institutions of these autonomous communities. At the same time, some regions keep having less than 7% of immigrant students at this educational level (Asturias, Galicia, Extremadura and Andalusia).

The structure of received immigration has also experienced substantial changes since the 90's. In the schooling system there has been a rapid increase in the share of immigrants coming from South America, which has stabilized in the last few years (see Figure 3). After the enlargement of the European Union the share of European immigrants from new EU member countries has been also increasing quite substantially. At the same time, the share of immigrants from EU-15 countries went down.

Although the changes in the nationality mix of immigrants over the last decade increased the share of Spanish-speaking immigrant students (from 30% to around 45%), the average parental educational level of foreign students has declined since the end of the 90's (Table 3): in primary and secondary education the share of students with at least one parent possessing university diploma was 33-34% in 1999 and it went down to 20-22% in 2008. On the contrary, the average educational level of native students' parents has grown quickly in the last decade due to the massive increase in the attainment of tertiary education and the delaying of childbearing decisions: the share of students with at least one parent possessing university diploma used to be around 20-25% in 1999 and it is already around 40-50% in 2008. Primary and secondary

[1] The fertility rate of natives in Spain was 1.07 child per female in 1999, whilst those of African and American immigrants living in Spain were 1.60 and 1.39 children per female, respectively.

[2] Children born in Spain can get the Spanish nationality after one year of residence in Spain. In 2008, only 59% of children of age between 0-5 years with both foreign parents had a foreign nationality. The impact of immigration in Table 1 is undervalued due to the fact that most of children aged between 0 and 5 years whose parents are foreigners already have Spanish nationality. In Table 2 we show how the proportion of immigrants varies with the definition of immigrants.

education (children until 11 years old) are the first to be affected by the impact of this structural change, which might widen the performance gap between immigrant and native students in the future.

2.2 Educational system

Although over the last decade a substantial decentralization of the education system has taken place and numerous educational laws have been approved, the fundamental lines of the Spanish educational model have not varied during the last 25 years. Education in Spain is largely public and free. The education is obligatory until the age of 16. Private schools that receive public funding (or semi-private schools, in Spanish *colegios concertados*) are forced to follow by and large the same instructions as public schools and there exist very few private schools that do not receive public funds at all.

One of such instructions requires that the selection of students on admission were mainly based on residential criteria. The differential distribution of native and immigrant students across different types of schools should be then due to different housing locations. Nevertheless, some additional factors might cause segregation of immigrants across public and semi-private school. For instance, in most regions pre-primary schooling used to be paid even if provided by semi-private schools. Then afterwards those students who attended pre-primary level in a semi-private school are given an advantage in admission to the primary education in the same school. Therefore the socio-economic background of students in semi-private schools is likely to be superior to the one of students in public schools.

During the last decade the proportion of native students in public schools has decreased substantially in pre-primary education and slightly in primary and secondary levels (see Table 4). Segregation of immigrants across schools occurs at a different pace across the country and generally is related to the size of the immigration flows (Figure 4). Given the high segregation rate in pre-primary education, one might expect that during the next few years segregation of immigrants across public and private and semi-private schools will rise in all levels of educational system.

The main difference between private and public (as well as semi-private) schools is in the autonomy of curricular design, student selection and governance. Generally, private schools in Spain have an advantage in the quality of educational resources such as computers, audio-visual equipment, etc. Still, contrary to most of the OECD countries, a peculiar characteristic of Spanish private schools is that the ratios of students to teaching staff in them are higher than in the public sector. According to "OECD: Education at a Glance" (2008), at the lower secondary level in Spain there are 16 students per teacher in private institutions compared with only 11 in public institutions. These differences only partially reflect the differences in the class size, which are 24 and 26 students per class in the public and private sector respectively, since the teaching loads tend to be higher in private schools. These differences mainly reflect the strong union protection that is received by teachers in the public sector.

2.3 Educational outcomes

Recent OECD Programme for International Student Assessment (PISA) revealed that Spanish 15-year-old students perform well below the average of the OECD in all analyzed domains: mathematics, reading and sciences (Figures 5 to 7).[3] Over time the situation does not seem to improve much.

The outcomes vary substantially across the Spanish regions with Northern regions generally performing better than the Southern ones (Figure 8). The report of Spanish Ministry of Education and Research on

[3]See the description of PISA data in section 4.

PISA results in Spain (2006) shows that some Spanish regions (Castilla y León, La Rioja) perform at the level of Korea, Germany and the UK, whereas others (Andalucía) perform only at the level of Greece.

According to 2006 PISA data, the average performance of immigrant students residing in Spain is particularly low being close to the average performance in Mexico and Turkey.[4] On average, the gap between both groups of students is about a half of the standard deviation of scores in OECD and in some regions the gap is 50% larger than the average. The gap is increasing over time in all domains (Figure 9).

Relatively worse performance of immigrants in the obligatory education is consistent with their consequent lower attendance rates of post-secondary education (Figure 10). Moreover, the difference in the educational attendance between natives and immigrants increases with age. The gap is mainly explained by the drop out rates for immigrants from non-EU countries.

Educational attendance differs for those who arrive to Spain before being 16 years old and those who arrive being older than 16. At the age of 17-21 the average rate of quitting educational system for those who migrate before getting 16 years old is 49 % for males and 38 % percent for females. This rate increases to 78 % per cent for males and 82 % percent for females that migrate after being 16 years old. This evidence is consistent with immigrants catching up with natives with time they stay in Spain, at least before they reach their twenties. Generally, the main difference between foreigners and natives is observed for university attendance. While 24.4 per cent of Spanish males study in university or have attained a tertiary education level, only 11.1 of foreigners do. This gap in university attendance is even higher for immigrant females.

3 Background literature

There exist a broad empirical literature assessing the factors that lead to the relatively low performance of students in certain countries. A large body of this literature relies on the PISA OECD dataset, which appears to be singularly suited for cross-country comparisons. One of the most popular explanations for cross-country differences in performance is the substantial differences in the share of non-citizens among the participating students combined with the relatively low performance of this category of students. Consistently, various studies find that students' family background is strongly related to their educational performance, especially in the countries with a large share of immigrant students (see, among others, Gang and Zimmermann 2000; Frick and Wagner 2001; Ammermuller 2005).

International experience on school-level policies targeting immigrant integration in schools is quite wide. One type of educational policies adopted in such countries as the US, Canada, Germany and some other European countries is related to providing special treatment and resources to immigrant students. This includes extra classes of native language and special classes helping immigrants to catch-up with natives' curricular. Some authors observed that acquiring national language and having extra hours of language classes in school is key to immigrants' faster integration and catching up in educational performance (Entorf and Minoiu 2005).

Providing schools with more educational resources and reducing the class size is discussed in the literature as a means of increasing the aggregate educational performance (Angrist and Lavy, 1999; Hanushek, 1999; Hoxby, 2000a). The evidence on the effect of school resources is mixed, especially with regard to the class size. Still, these studies rarely discuss whether class size could be an appropriate policy to decrease the performance gap between immigrants and natives.

[4]Here immigrants are defined as those individuals who were born abroad and whose both parents were born abroad.

Incentives, school competition and school ownership is another frequently mentioned policy instrument (among others Altonji, Elder and Taber, 2005; Angrist, Bettinger and Kremer, 2006; Friske and Ladd, 2000). It is often argued that students' performance in privately owned schools is relatively better and that voucher system might increase the performance of students. Still, the effectiveness of school competition for closing the performance gap between different social groups might be questionable. The evidence of some countries suggests that school competition might exacerbate the problems of bad schools and augment polarization. The experience of the *No Child Left Behind* policy in the US seems to suggest that competition should be coupled with other policies, for instance, with supporting districts where relatively bad schools are located.

The results of the previous research done on the PISA data suggest that early education, time in school and central exams positively and significantly affect immigrant student performance, while social segregation of students among schools is detrimental to their educational performance (Schneeweis, 2006; Entorf and Minoiu, 2005). Several authors argue that the system of early differentiation by ability has a negative impact on the school performance of immigrants, who come to school with language and social deficits (Fertig and Schmidt, 2002; Entorf and Lauk, 2006). Early streaming may sort them into a relatively lower educational track, without giving them the chance to catch up with natives in their language and social skills.

The impact of tracking on schooling outcomes seems to depend on the social interaction between high and low ability students and resulting peer effects (Brunello and Giannini, 2004; Hanushek and Wossmann, 2006; Hanushek and Rivkin, 2008). Many studies specifically focus on quantifying the peer effects present in various educational systems (Hoxby 2000b; Sacerdote 2001; Hanushek et al. 2003; Angrist and Lang 2004). These studies tend to find significant peer effects which though differ across countries and immigrant groups. Entorf and Lauk (2006) suggest that both native-to-native and migrant-to-migrant peer effects are higher in ability-differencing school systems (for instance, in Germany and Austria) than in comprehensive schools (like in Australia, Canada, New Zealand, Denmark, Norway and Sweden). The case of Spain was not considered in the latter study.

Generally, international evidence suggests that institutional characteristics overall can account for a substantial part of the performance differences across students. According to the 2009 PISA data, on average 41.7% of variation of students' performance in OECD countries occurs across schools. Spain scores very low on this indicator: only 20% of variation in performance of students in Spain is across schools, and around half of this between-school differences could be assigned to the differences in socio-economic background (Ministry of Education and Research report, 2010).

The present work contributes to the empirical literature in two respects. First, it assesses the significance of the achievement gap between immigrant and native students in Spain and analyzes how the performance of immigrants evolves over time they stay in Spain. Given that a large share of immigrants in Spain comes from the Spanish-speaking countries, the paper explores whether the native language proficiency helps them to catch up faster comparing to the rest of immigrant students. Second, the paper analyzes which part of the achievement gap could be attributed to the differential school attendance by native and immigrant students. We are interested in studying whether the aggregate low between-school variation in the performance of Spanish students hides significant segregation of immigrant and native students across schools. This segregation might be increasingly negatively affecting the overall performance, given the large recent flows of immigrants to the country. The paper also investigates which of the school-level characteristics discussed in the literature – resources, ownership, streaming by ability, peer's quality, etc. – are associated with better students' achievement in Spain.

4 Data

The Programme for International Student Assessment (PISA) has been initiated in 2000 in all member countries of the Organisation for Economic Co-operation and Development (OECD) and several non-OECD countries in order to assess the achievement of 15-year-olds in reading literacy, mathematical literacy and scientific literacy through a common international test. The PISA target population is made up of all students in any educational institution between the ages of 15 years and 3 months and 16 years and 2 months at the time of the assessment.[5] Up to now PISA has run the assessments on the representative samples of students in 2000, 2003, 2006 and 2009 from 32, 41, 57 and 67 countries respectively.

In 2000 and 2009 the main domain assessed was reading literacy whereas mathematical literacy and scientific literacy were minor domains assessed in a sub-sample of reading-literacy participants. In 2003 the main domain assessed was mathematics and in 2006 – sciences. According to PISA technical note on comparisons over time of PISA scores (2007), the scales were established in the year in which the respective domain was the major domain, since in that year the framework for the domain was fully developed and the domain was comprehensively assessed. The reading scores have been scaled in PISA 2000, the first cycle, to have a mean of 500 and a standard deviation of 100 at OECD level. In the 2003 data, the average and the standard deviation reached 494 and 100, respectively, largely because of new countries entering the sample. The mathematics scores have been scaled in PISA to have a mean of 500 and a standard deviation of 100 in the OECD student population in 2003. Note also that there was an important change in the way science was assessed in PISA 2006, as compared with PISA 2003 and PISA 2000, so the over time comparisons in performance in science should be considered with caution.

As we mentioned above, the recent wave of immigration to Spain has started at the beginning of 2000s. At that point there were still very few immigrants in the Spanish secondary education. Moreover those immigrant students differ a lot in their characteristics from those students who were brought to Spain by the recent immigration flow. Therefore, in our further analysis we do not use the 2000 wave of the PISA survey. As well, we drop observations containing missing values for our main variables.

Individual and family characteristics All respondents to PISA surveys were asked to report whether they and each of their parents were born in Spain or abroad. We use this information to characterize student immigration status. Specifically, we first define four broad categories of students according to their origin: foreign born students whose both parents are born abroad (FB-FP); foreign born students with at least one parent born in Spain (FB-SP); students born in Spain whose both parents are born abroad (SB-FP); students born in Spain with at least one of the parents born in Spain (SB-SP).

Most of students in our sample - 92.7% - are born in Spain and have at least one parent born in Spain (SB-SP). Still, more than 5% of students in the sample are FB-FP. Note that this statistics refers to the pooled data across years. At the same time, the proportion of immigrant students has increased from 2% in 2003 to 7% in 2009.[6]

PISA surveys collect information on several students' individual and family characteristics. In this paper we use students' gender, age (in months), parents' education and occupation, the number of books at home as well as the availability of a computer and a study place at home.[7] The descriptive statistics for above individual characteristics by students' origin is presented in Table 5. The data reveals substantial

[5]In Spanish PISA survey few observations lie outsize this age range. We drop these observation from the sample as they might be not representative of student population belonging to those age ranges.

[6]If we apply stratification weights, we obtain higher estimated proportion of immigrant students in the original population: 3.3% in 2003 and 9.4% in 2009.

[7]See Table A-1 for the definition of all variables used in this analysis.

disadvantage of immigrants with respect to natives in terms of their family background. The occupational status of immigrant parents is lower. Only 81% of immigrant students have a computer at home, whereas computer is available for 90% of native students. Most of parents of immigrant students have about 11-25 book at home, whereas this number is about 101-200 for a median native student. There are no substantial differences in the educational level of parents across native and immigrant students. This might suggest that the pool of immigrants in our sample is quite heterogeneous. In fact, as it was shown in Table 3, in 1999 immigrant students had relatively more educated parents than natives. The situation is reverted nowadays. The period analyzed in the paper falls on the turning point in immigrant population composition.

For students who are born abroad the data include the year of their arrival to Spain and the language that is typically spoken at home. An average immigrant student in the data moved to Spain at the age of 10. About 70% of immigrant students speak Spanish at home, which most likely signals their Latin American origin.

Finally, the majority of native students (70%) at the age of 15 report to attend the 10th grade (according to OECD standardized educational categories), while the majority of immigrant students attend only the 9th grade (52%).

School-level characteristics The schools, in which the PISA assessments were held, were asked to provide information on a number of school-level characteristics, such as ownership, location, school size, the number of full-time and part-time teachers and the average class size.[8] The descriptive statistics for school characteristics are shown in Table 6. Public schools are underrepresented in the PISA sample: only 55% of students in our sample attend public schools compared to 66% of students in the official statistics. This bias in the sample design is captured by the stratification weights, which we use throughout the analysis below.

Consistently with OECD data, private schools in our sample have higher student-teacher ratios. The reported average class sizes in private schools are also higher than in the public sector. Dividing student-teacher ratio by the average class size allows to obtain the measure of the approximate teaching load in terms of the number of classes per teacher. We normalize this measure, and observe that teaching loads tend to be higher in private schools. Private schools are also more likely to be located in the cities than public schools.

Schools were also asked to characterize the educational resources available for students, such as instructional materials, computers, software, calculators, library materials, audio-visual resources and science laboratory equipment etc. This information was summarized by PISA in an index reflecting the quality of educational resources. It appears to be higher for private school than for public schools.

PISA also provides some information on the usage of students' streaming on the basis of their ability. There are no significant differences across public and private schools in streaming of students.

In addition to the above characteristics we create other school-level variables applying sample stratification weights to the variables of interest and averaging the weighted variables for students from a given school. Using this procedure for each school we calculate the share of immigrant students. It appears to be higher in public schools – around 8% – and smaller in private schools – around 3%. For each student we also calculate the average education of peers' parents. It appears to be substantially lower in public schools than that in private schools.

[8] In Spain the students are normally kept together within the same class for attending the main courses.

5 Empirical analysis

We start the empirical analysis by testing the significance of the performance gap between immigrant and native students. We then analyze whether immigrants tend to improve their performance over the time they live in Spain. The answer to this question is important for predicting the future asymmetries between native and immigrant population in the labor market, social segregation and so on. We also analyze whether those immigrants who come from Spanish-speaking countries tend to catch up faster.[9] Finally, we analyze which part of the gap could be attributed to the compositional differences between immigrants and natives in terms of their family background and the characteristics of schools that they attend.

5.1 The size of the performance gap

Table 7 summarizes the average of PISA scores in mathematics, reading and science by origin of students. The Table suggests that FB-FP students perform significantly worse than native students. In mathematics FB-FP students obtain around 55 points less than native students, which equals to around a half of the standard deviation of scores in OECD (recall, that scores are normalized to have OECD average 500 with standard deviation 100). The standard deviation of scores in Spain is equal to around 80 points, so the achievement gap between immigrants and natives is equal to around 0.7 of the standard deviation of scores in Spain. This performance gap is significant at one percent level. Similar gaps are observed in reading and sciences – 49 points and 55 points respectively.

Spanish-born students with foreign-born parents (SB-FP) perform significantly worse than native students, though, the gap between the average performance of this group and natives is smaller than the corresponding gap between SB-SP and FB-FP: between 0.2 and 0.4 of the standard deviation of scores in Spain.

The scores of SB-SP and FB-SP students in reading and sciences do not differ significantly, and in mathematics FB-SP students have on average around 0.2 of the standard deviation lower scores. Given this minor difference in achievement between SB-SP and FB-SP students, we unite these students into one group and in the following we refer to them as to *native* students.

The scores in all disciplines are significantly lower for FB-FP students than for SB-FP. The fact that these differences exist might suggest that spending longer time in Spain for an immigrant might be associated with better academic achievement.

Figure 11 shows the dynamics of this catching up process of immigrant students. The figure presents this dynamics separately for immigrants who speak Spanish at home and for the rest of immigrants. Those immigrant students who stayed longer in Spain perform better than students who just arrived to Spain. Still, given the rate of improvement in performance, after 16 years spent in Spain immigrants are still not able to completely close the achievement gap with natives. The dynamics of the catching up process is similar for immigrant students whose native language is Spanish and for the rest of immigrant students.

The observed improvement in performance over time that immigrants spend in Spain is as well consistent with the worsening of some individual characteristics in more recent immigration cohorts. Therefore the "catching up" interpretation should be considered with caution, at least, before taking into account few observable individual and family characteristics. In the following section (section 5.2) we present the results of this analysis.

[9] Potentially, the catching up process can differ also across students coming from countries situated on different stages of economic development. However, the Spanish edition of PISA survey does not provide information on the nationality of immigrant students and their parent.

Figure 11 as well suggests that there are no significant differences in performance between those students who were born in Spain in an immigrant family (SB-FP, the last point to the right on the graph) and those who were born abroad (FB-FP), but have spent most of their life in Spain. Therefore in the following we analyze the performance of these students together and refer to this composite group as to *immigrant* students.

5.2 The effect of individual characteristics

We start by estimating the gap between immigrants and natives controlling for age and gender $\mathbf{X_i}$, time dummies $\mathbf{D_t}$ and regional dummies $\mathbf{D_r}$:

$$S^d_{isrt} = \alpha + \beta_1 Imm_i + \mathbf{X_i}\beta_2 + \mathbf{D_t}\beta_3 + \mathbf{D_r}\beta_4 + \epsilon_{isrt} \quad (1)$$

where S^d_{isrt} stands for the score in discipline d achieved by individual i who at moment t studied in school s and in region r and Imm_i is an indicator for immigrant students. Regional dummies are included to capture the compositional differences of immigrant population across regions.[10] Columns 1, 5 and 9 of Table 8 summarize the estimation results of model (1) for performance in mathematics, reading and science respectively. After controlling for few individual characteristics, we can again observe that the largest gap between immigrant and native students is in mathematics and sciences, and it is a bit smaller in reading.

The individual characteristics appear to be strongly correlated with performance. Female students perform significantly worse in mathematics and sciences, but are significantly better than male students in reading proficiency. Even if students in the sample are roughly between 15 and 16 years old, relatively older students tend to have significantly better scores.

Given that the time of arrival of an immigrant to Spain seems to play an important role, we proceed by analyzing which part of the observed performance gap between immigrants and natives could be attributed to the timing of immigrants' arrival. In other words, we estimate how big the gap would have been if immigrant students had spent all their life in Spain. We estimate the model controlling for the time spent by the immigrant student abroad before coming to Spain $TimeAbroad_i$:

$$S^d_{isrt} = \alpha + \beta_1 Imm_i + \beta_2 TimeAbroad_i + \mathbf{X_i}\beta_3 + \mathbf{D_t}\beta_4 + \mathbf{D_r}\beta_5 + \epsilon_{isrt} \quad (2)$$

For those immigrants who were born in Spain $TimeAbroad_i$ is equal to zero. Therefore in equation (2) the estimate of β_1 indicates the difference in performance between native students and those students who were born in Spain or were brought to Spain right after their birth. Columns 2, 6 and 10 reveal statistically significant effect of time spent in Spain in all subjects. On average, one more year spent by an immigrant student in Spain (or one year less spent abroad) is associated with three more points on PISA scale. The estimate of the gap between native students and immigrant students drops by a half after correcting for the catching up process. Nevertheless, there remains a significant achievement gap even if immigrants spent almost the whole life in Spain.

As we saw in Section 4, immigrant students come from relatively disadvantaged family background.

[10] As we discussed in section 4, conditional on age, immigrants are more likely to attend lower grades. This means that immigrant students on average have been exposed to a different curricular than native students. Therefore, the poor performance of immigrants might be a result of this latter phenomenon, and not of their poor learning ability. When we repeat the analysis adding a control for the grade attended by students, the predicted gap between native and immigrant students reduces by half. The gap, however, does not disappear completely. The predictions of the next sections concerning the relative importance of individual and school characteristics for explaining the gap remain the same. Given that the content of PISA tests does not require any specific knowledge that is acquired by students in the 10th grade, the results presented in this paper are not conditioned on grade attendance.

Thus the aggregate difference in average scores between immigrant and native students is likely to be at least partially explained by students' family characteristics. To analyze which share of the performance gap could be attributed to students' family background, we condition the estimate of the performance gap on family characteristics. Conditioning on students' family background is also important in order to interpret the positive dynamics of immigrants' scores with time they spent in Spain as a catching-up process.

We first include among family controls the level of education of students' parents. Parents' education is likely to be predetermined to the time of migration, so the inclusion of this variable will not conceive the estimated catching up process of immigrant students. As it is shown in columns 3, 7 and 11 of Table 8 parents' education is strongly and significantly related to students' performance. A child whose both parents have university diploma obtain 50-60 points more than a child whose both parents have just achieved the diploma of obligatory education. Our results suggest that the differences in parents' education can explain no more than 10% of the performance difference between native and immigrant students. The estimates for the effect of time spent by an immigrant abroad becomes slightly larger in absolute terms after controlling for parental education.

It is likely that apart from parental education sorting across schools is affected by other family characteristics such as parents' economic situation. PISA survey provides information on parents' occupation, family cultural background (number of books at home) and family economic factors (possession of computers and study places for kids). These family characteristics are likely to be exogenous to the choice of schools and thus conditioning on these variables will reduce the sorting component of the estimated effect of schools on achievement. However, these additional family characteristics are not predetermined to the time of family immigration. Family possessions might signal the degree of this family integration into Spanish society and time spent in Spain, and not only their *a priori* cultural and economic background. In fact, immigrants do not bring all their belongings from their countries of origin. They buy and accumulate new goods after moving to Spain and the longer they stay in Spain the more belongings they accumulate. Parental occupation is also likely to improve the longer the family stays in Spain. Thus conditioning on home possessions and parental occupation might conceal the true catching up dynamics in immigrant children performance. In other words, in this case we will underestimate the speed of the catching up process. Nevertheless, conditioning on these characteristics will allow us to assess which part of the achievement gap is attributable to observable parental background.

Columns 4, 8 and 12 present the estimation results for the specification of model (2), in which $\mathbf{X_i}$ includes parental occupation and family possessions. We observe that better family background is positively correlated with performance. Children of blue collar low skilled workers on average obtain about 20 points less than white collar high skilled workers. Having just 11-25 books at home instead of less than 10 books is associated with about 18-22 points more in children's PISA scores. Other family possessions, such as computer and study place, also signal a relatively better performance.

Around 35% of the estimated gap between immigrants and natives (after accounting for the catching up process) is attributable to these family characteristics.

As expected, the estimated catching up process is strongly affected by the inclusion of family possessions and parental occupation in the estimation. The estimated performance gap between immigrants and natives drops significantly when additional family characteristics are taken into account.

We conclude this section observing that the time of immigrant students' arrival to Spain and few observable family characteristics explain most differences in performance between natives and immigrants, and only around 17% of the gap remains unexplained. In addition, the achievement gap in reading and science is only marginally significant after controlling for these characteristics.

5.3 The differences in school characteristics across immigrant and native students

In this section we study whether there are significant differences in characteristics of schools attended by native and immigrant students. We summarize the mean differences between native and immigrant students in terms of various school characteristics, conditional and unconditional on individual and family controls.

Table 9 presents the results of this analysis. Column 1 shows the means of the characteristics of schools attended by native students. Column 2 reports the coefficients obtained from the regression of various school characteristics on the immigrant dummy. We can observe that immigrants have significantly lower probability than natives to study in private schools: 40% of native students attend either private or charter school, whereas only 15% of immigrant students attend these schools. This striking difference in the attendance of private schools does not always mean that immigrants study in schools with relatively worse characteristics. In fact, given that in Spain student-teacher ratio is on average higher in private school, we observe that immigrant students have 1-2 students less per teacher in their schools than native students. The difference in student-teacher ratio across schools is not reflected in the difference of average class sizes (immigrants and natives study in classes of similar sizes). On the contrary, it mainly signals the difference in average teaching loads (teachers of immigrant students have around a third of the standard deviation lower teaching loads). Moreover, on average, immigrant and native students seem to study in schools with similar quality of educational resources. There are no substantial differences in streaming policies across schools where native and immigrant students study. The main school characteristics that differ across immigrant and native students and that potentially could have a negative impact on immigrant relative performance are those capturing the individual background of students' peers. An average immigrant student has two times more immigrant peers than an average native student. Additionally, immigrant students study with *native* peers, whose parents have relatively lower education. This might signal either the sorting of immigrants to relatively disadvantaged schools and perhaps geographical locations or the crowding out of natives from the schools and locations where immigrants tend to study and live.

5.4 The effect of school characteristics

According to our data, more than 85% of the achievement gap documented in Table 7 occurs within schools, i.e. between immigrant and native students attending the same school. It means that, on aggregate, differential school attendance by native and immigrant students can explain at most 15% of the achievement gap. This estimate of the school effect is likely to be overestimated. In fact, it is likely that better students and students from relatively higher socio-economic background sort into schools with better characteristics. Then the observed school effect might partially capture the role of parents' characteristics and individual talent.

We now estimate the effect of the school attendance on the relative performance of immigrants, conditioning on the individual and family characteristics introduced in the previous section. We estimate the following model:

$$S^d_{isrt} = \alpha + \beta_1 Imm_i + \beta_2 TimeAbroad_i + \mathbf{X_i}\beta_3 + \mathbf{D_{st}}\beta_4 + \epsilon_{isrt} \tag{3}$$

where $\mathbf{D_{st}}$ are school dummies (note that the surveys in 2003, 2006 and 2009 were held in different schools).

The change in the size of coefficient β_1 from model (2) to model (3) should reveal the aggregate effect of schools on the achievement gap.

The estimates for model (3) are shown in column 2 of Tables 10, 11 and 12 for scores in mathematics, reading and science respectively. In order to facilitate the comparison, column 1 reproduces the estimates conditional on individual and family characteristics obtained in section 5.2. School effects increase the explanatory power of the model: the adjusted R-squared increases by more than 25%. The estimates of the gap between immigrant and native students is almost unaffected by the inclusion of these dummies. In mathematics and sciences the estimated gap drops by no more than 12% and in reading, if anything, it increases, potentially signaling the fact that immigrants, conditional on their personal characteristics, tend to sort to schools that improve their relative performance. So, overall, assuming symmetric effect of school characteristics on both native and immigrant students, our result suggests that moving an immigrant student from one school to another on average would make him/her at best 12% closer to native students in terms of school performance.

We proceed by analyzing which school characteristics might matter the most for explaining the achievement gap. In order to answer this question we estimate the following model:

$$S^d_{isrt} = \alpha + \beta_1 Imm_i + \beta_2 TimeAbroad_i + \mathbf{X_i}\beta_3 + \mathbf{Y_{st}}\beta_4 + \mathbf{D_t}\beta_8 + \mathbf{D_r}\beta_8 + \epsilon_{isrt} \tag{4}$$

where $\mathbf{Y_{st}}$ includes various observable school characteristics.

First we analyze whether the fact that immigrants tend to cluster in the same schools partially explains their lower performance relatively to natives. We include among regressors the proportion of immigrant students among the individual's peers. The results from this estimation are shown in column 3 of Tables 10, 11 and 12. According to our results, higher proportion of immigrant peers in school is associated to the lower performance of students: a student who has no immigrants in the class obtains 15 PISA points more than a student who has half of her classmates from immigrant origin. After inclusion of the control for the proportion of immigrants in school the gap between immigrants and natives in all PISA domains becomes statistically insignificant.

Given that immigrants are relatively more present in public schools than in private ones, we analyze the effect of school ownership on the achievement gap (column 4). We find that school ownership is significantly correlated with performance, with private and charter schools being relatively better in terms of their students' performance. Their advantage is especially high for the scores in the reading section of PISA. Inclusion of the ownership control reduces the significance of the achievement gap between immigrants and natives. Interestingly, school ownership also explains most of the effect related to the proportion of immigrants in school (column 5). In other words, the proportion of immigrant peers is not relevant for students' performance once we take into account whether they attend public or private schools.

Which characteristics of private schools make their students perform better? We observed that immigrants are more likely to study in schools where native peers' parents have relatively lower education. We include the control for the average parental educational level (in years) of each student's native peers in column 6. The quality of native peers' family background is strongly positively correlated with students' performance. Moreover, after controlling for this variable, the difference between average performance in private and public schools reduces significantly (column 7). It remains statistically significantly different from zero only in the case of reading performance of charter schools. Once again, the achievement gap between immigrants and natives does not get smaller after inclusion of this control.

Finally, we add other school characteristics: class size, teaching load, quality of educational resources, school size, location and the steaming policy (column 8). We do not observe significant effect of these school-level characteristics on performance, apart from the positive school size effect and the effect of the quality of educational resources on the performance in mathematics. The inclusion of these variables, if anything, slightly increases the estimate of the immigrant-native gap.

Our tentative conclusion at this stage is that a part of the performance gap between immigrants and natives is explained by the relative over-representation of immigrant students in public schools. In turn, the advantage of private schools over public ones in performance is mainly attributable to the lower quality of native peers' backgrounds.

5.5 Oaxaca-Blinder decomposition of the performance gap

In order to summarize the results of the previous analysis and to better describe the contribution of observable individual and school characteristics to the total performance gap between immigrant and native students, we perform Oaxaca-Blinder decomposition. This procedure splits the overall performance gap into two parts: the one that is explained by the composition of the two subsamples in terms of specific observable characteristics (endowments) and the part that is explained by the group differences in returns to endowments:

$$Gap = \bar{S}_{Native} - \bar{S}_{Imm} = [(\bar{\mathbf{X}}_{Native} - \bar{\mathbf{X}}_{Imm})\hat{\beta}_{Native}] + [\bar{\mathbf{X}}_{Imm}(\hat{\beta}_{Native} - \hat{\beta}_{Imm})] \tag{5}$$

In equation (5) $\bar{\mathbf{X}}_{Native}$ and $\bar{\mathbf{X}}_{Imm}$ stand for the mean values of individual and school characteristics calculated on the samples of native and immigrant students, respectively. $\hat{\beta}_{Native}$ and $\hat{\beta}_{Imm}$ are the coefficient vectors obtained from the estimation of model (4) run on the samples of, respectively, native and immigrant students.

Table 13 summarizes the results of Oaxaca-Blinder decomposition for the performance gap in mathematics, reading and sciences. Similarly to our previous results, we find that almost all observed differences in performance across immigrant and native students could be explained by composition effects.

Among the most important individual characteristics for explaining the differences in performance are cultural and economic background of parents as measured by the number of books at home and other home possessions. These variables explain around 45% of the total gap. The occupational level of immigrant students' parents is lower than that of natives and explains other 3% of the total gap. The level of mothers' education explains other 1-2% of the gap in reading performance. The time the family spent in Spain after migration explains 42% of the gap in mathematics and a bit less than 30% of the gap in reading and sciences.

Among school characteristics the one that explains the largest share of the gap in mathematics and sciences is the proportion of immigrant peers at school: around 4% of the total gap could be attributed to the difference across natives and immigrants in this dimension. The quality of the native peers' family background is the second most important dimension which is relevant for individual performance and with respect to which native and immigrants tend to differ. The role of school ownership can additionally explain some part of the gap in reading.

As columns 2, 6 and 10 suggest, there are no important differences between native and immigrant students in returns to school characteristics.

6 Conclusions

In this paper we analyzed the educational performance of immigrant and native students in Spain as measured by PISA OECD results. We find that immigrant students on average obtain around 50 points less than native students in all domains analyzed by PISA, which equals to more than 0.65 of the standard deviation of scores in Spain.

Immigrant students tend to improve their performance with time they stay in Spain. Sill, even students who were born from immigrant parents in Spain or were brought to Spain soon after their birth on average perform worse than native students. Overall, the differential time of arrival of immigrant students to Spain can explain around 45% of the average immigrants' disadvantage in performance.

A big part of the achievement gap between native and immigrant students could be attributed to the difference in few observable family characteristics, like parental occupation and home possessions. Altogether, the time of arrival, parental education and occupation and family possessions explain around 85% of the gap. At the same time, school effects explain at most 15% of the difference between native and immigrant students' performance.

Even if generally school characteristics do not explain much of the performance gap, we analyze which are the school characteristics that matter the most in this respect. First, we find that clustering of immigrant students in the same schools partially explains their relatively lower performance. However, in our data the negative effect of the proportion of immigrant peers on students' achievement could be fully attributed to the sorting of students across private and semi-private, and public school. At a first glance, private and semi-private schools appear to generate higher educational outcomes, so the fact that immigrant students are much less likely to attend private schools appear to affect negatively their relative performance. However, the performance differences between private, semi-private and public schools are themselves to a large extend explained by the parental education of native peers at school. Once this factor, together with individual characteristics, is taken into account, there are no significant differences in performance across students attending public and private schools. Such characteristics as class size, teaching load, quality of educational resources and streaming by ability are not correlated with performance once controlling for school ownership and parental education of peers. Given that the effect of peers' parental education might be at least partially capturing the self-selection of immigrant and native students into different schools, the effect of schools on the achievement gap might be even smaller than 15%.

On the one hand, this result is reassuring as it indicates that the existent compositional differences in school attendance between immigrants and natives do not generate substantial negative performance effects. On the other hand, this result suggests that if one wants to solve the problem of immigrants' relatively low performance, the scope of practices currently used in Spain would not allow to produce significant effects. Therefore other policies should be experimented, including those targeting the early intervention practices and the learning environment in immigrants' families.

References

Altonji J.G., T.E. Elder, and C.R. Taber (2005), "Selection on Observed and Unobserved Variables: Assessing the Effectiveness of Catholic Schools", *Journal of Political Economy*, Vol. 113, No. 1, pages 151-184.

Ammermuller, A. (2005). "Poor Background or Low Returns? Why Immigrant Students in Germany Perform so Poorly in the Programme for International Student Assessment," *Education Economics*, Volume 15, Issue 2 June 2007 , pages 215 - 230.

Angrist, J., E. Bettinger and M. Kremer (2006) "Long-Term Educational Consequences of Secondary School Vouchers: Evidence from Administrative Records in Colombia," *American Economic Review*, Vol. 96, No. 3, pages 847-862.

Angrist, J., K. Lang (2004) "Does School Integration Generate Peer Effects? Evidence from Boston's Metco Program," *American Economic Review* 94 (5): 1613-1634.

Angrist, J. and V. Lavy (1999), "Using Maimonides rule to estimate the effect of class size on scholastic achievement," *The Quarterly Journal of Economics*, MIT Press, vol. 114(2), pages 533-575.

Brunello, G., M. Giannini (2004) "Stratified or Comprehensive? The Economic Efficiency of School Design," *Scottish Journal of Political Economy* 51 (2): 173-193.

Boyd, S. (2003) "Foreign-born Teachers in the Multilingual Classroom in Sweden: The Role of Attitudes to Foreign Accent" in Multilingual classroom ecologies: Inter-relationships, interactions, and ideologies. (Eds.) Creese, A. and P. Martin. Clevedon, UK: Multilingual Matters.

Duncan, O. D. and B. Duncan (1955) "A Methodological Analysis of Segregation Indexes," *American Sociological Review* 20, (April): 210-217.

Entorf, H. and M. Lauk (2006). "Peer Effects, Social Multipliers and Migrants at School: An International Comparison," *IZA Discussion paper*, No. 2182.

Entorf, H. and N. Minoiu (2005). "What a Difference Immigration Policy Makes: A Comparison of PISA Scores in Europe and Traditional Countries of Immigration," *German Economic Review*, Blackwell Publishing, vol. 6(3), pages 355-376.

Fertig, M. and C. M. Schmidt (2002). "The Role of Background Factors for Reading Literacy: Straight National Scores in the PISA 2000 Study," *IZA Discussion Paper* No. 545.

Fertig, M. (2003). "Who's to Blame? The Determinants of German Students' Achievement in the PISA 2000 Study," *IZA Discussion Paper* No. 739.

Frick, J.R., G. Wagner (2001) "Economic and Social Perspectives of Immigrant Children in Germany," IZA Discussion Paper No 301, IZA, Bonn.

Friske E.B. and H.F. Ladd (2000) When Schools Compete: a Cautionary Tale, Brookings Institution Press.

Gang, I. N., K. F. Zimmermann (2000) "Is child like Parent? Educational Attainment and Ethnic Origin," *Journal of Human Resources*, 35: 550-569.

Hanushek, E.A. (1999) "Some findings from an independent investigation of the tennessee STAR Experiment and from other investigations on class size effects," *Educational Evaluation and Policy Analysis*, Vol. 21, No. 2, 143-163.

Hanushek, E.A., J. Kain, J. Markman, S.G. Rivkin (2003) "Does Peer Ability Affect Student Achievement?" *Journal of Applied Econometrics*, 18 (5): 527-544.

Hanushek, E.A., L. Wossmann (2006) "Does Educational Tracking Affect Performance and Inequality?

Differences-in-Differences Evidence Across Countries',' *Economic Journal*, 116 (510): C63-C76.

Hanushek, E.A., S.G. Rivkin (2009) "Harming the Best: How Schools Affect the Black-White Achievement Gap," *Journal of Policy Analysis and Management*, forthcoming.

Hoxby, C. (2000a) "The Effects of Class Size on Student Achievement: New Evidence from Population Variation," *The Quarterly Journal of Economics*, Vol. 115, No. 4, The MIT Press, pp. 1239-1285.

Hoxby, C. (2000b) "Peer Effects in the Classroom: Learning from Gender and Race Variation," NBER Working Paper, No. 7867, Cambridge.

Ministerio de educación y ciencia, Secretará general de educatión, Instituto de Evaluación (2006). PISA 2006. Programa para la Evaluación Internacional de Alumnos de la OCDE: Informe Español.

Ministerio de educación y ciencia, Secretará general de educatión, Instituto de Evaluación (2010). PISA 2009. Programa para la Evaluación Internacional de Alumnos de la OCDE: Informe Español.

OECD (2006). Where immigrant students succeed. A comparative review of performance and engagement in PISA 2003.

OECD (2007). Draft technical note on comparisons over time on the PISA scales.

Sacerdote, B. (2001) "Peer Effects with Random Assignment: Results for Dartmouth Roommates," *Quarterly Journal of Economics*, 116(2): 681-704.

Schneeweis, N. (2006). "How should we organize schooling to further children with migration background?" *Economics working papers* 2006-20, Department of Economics, Johannes Kepler University Linz, Austria.

Table 1: Number of students and share of foreign students by educational level, changes between 1999 and 2008

Educational level	The number of students in 2008 (%), base = 100 in 1999			Share of foreigners (%)	
	All	Nationals	Foreigners	1999	2008
Pre-primary	145.3	136.3	952.7	1.1	7.2
Primary	101.5	91.3	859.7	1.3	11.2
Lower secondary	96.6	87.2	874.1	1.2	10.8
Upper secondary	64.3	61.9	431.8	0.7	4.4
Vocational training	92	86.2	1307.3	0.5	6.8

Source: Ministerio de Educación, Política Social y Deporte

Table 2: Percentage of immigrant students by different definitions of immigrants and by age groups

Definition of immigrant students	Age group				
	0-2	3-5	6-11	12-15	16-17
Only foreign nationality	4.3	4.9	6.6	7.9	11.9
Foreign or double nationality	7.1	7.3	9.3	10.1	15.2
Both parents of foreign nationality	12.2	11	9.6	10.2	14.2

Source: Spanish Labor Force Survey (EPA, 2008, second quarter). Age groups correspond to the major levels of Spanish educational system.

Table 3: Percentage of students with at least one parent having attended university

	Age group				
	0-2	3-5	6-11	12-15	16-17
At least one parent has the Spanish nationality					
1999	26.8	25.6	18.8	16.3	13,8
2008	53.5	49.7	40.3	33	29,1
Both parents are foreigners					
1999	33.3	33.2	34.2	18.3	7,5
2008	18.2	21.8	20.1	16.9	19,0

Source: Spanish Labor Force Survey (EPA, 2008, second quarter). Age groups correspond to the major levels of Spanish educational system. Foreigners include those with foreign and double nationality.

Table 4: Share of students in public schools, by nationality and year

	Share of students in public schools by nationality:					
	All		Spanish		Foreign	
	1999	2008	1999	2008	1999	2008
Pre-school education	67.7	64	67.6	62.5	76.4	83
Primary education	66.6	67.4	66.5	65.2	75.9	84.7
Secondary education	69.4	66.3	69.2	64.4	80.6	81.3
Upper secondary education	74.5	74.1	74.6	73.6	62.1	84.8
Vocational training	71.7	75.5	71.7	75.4	74.5	77

Source: Ministerio de Educación, Política Social y Deporte.

Table 5: Descriptive statistics: individual characteristics

	1	2	3	4
	SB-SP	FB-SP	SB-FP	FB-FP
Age	15.83	15.83	15.82	15.82
	(0.28)	(0.28)	(0.29)	(0.28)
Female	0.51	0.53	0.56	0.51
Time in Spain		9.36		6.25
		(4.36)		(3.85)
Foreign language at home	0.01	0.05	0.24	0.30
Mother education:				
- Primary or less	0.05	0.04	0.16	0.08
- Lower secondary	0.40	0.30	0.25	0.28
- Medium professional	0.10	0.11	0.05	0.07
- Upper secondary	0.17	0.23	0.24	0.24
- University diploma	0.07	0.05	0.08	0.08
- University graduate	0.21	0.28	0.21	0.24
Father education:				
- Primary or less	0.06	0.05	0.06	0.07
- Lower secondary	0.38	0.36	0.35	0.30
- Medium professional	0.10	0.09	0.10	0.10
- Upper secondary	0.16	0.14	0.11	0.20
- Upper professional	0.10	0.07	0.15	0.10
- University	0.21	0.29	0.22	0.23
Highest parent occupation:				
- high skilled white collar	0.43	0.44	0.48	0.29
- low skilled white collar	0.27	0.29	0.30	0.31
- high skilled blue collar	0.21	0.16	0.17	0.27
- low skilled blue collar	0.10	0.11	0.06	0.14
Computer	0.90	0.87	0.89	0.81
Study place	0.92	0.93	0.85	0.89
Number of books at home (Median)	101-200	26-100	26-100	11-25
Grade attended:				
- 8	0.05	0.08	0.07	0.11
- 9	0.25	0.38	0.33	0.52
- 10	0.70	0.54	0.60	0.37
Number of observations	35,332	482	252	1,854

Notes: Descriptive statistics refer to the pooled data for 2003, 2006 and 2009. Means weighted with sample composition weights. Standard deviations in parentheses. SB-SP stands for students born in Spain with at least one parent born in Spain, FB-SP stands for foreign-born students with at least one parent born in Spain, SB-FP refers to students born in Spain with both parents born abroad, and FB-FP refers to foreign-born students with both parents born abroad.

Table 6: Descriptive statistics: school characteristics

	1	2	3	4
	All schools	Public schools	Private group 1	Private group 2
School size	617.49	556.60	669.28	737.78
	(403.60)	(306.56)	(480.57)	(399.86)
Pupil-teacher ratio	12.99	9.32	16.81	17.65
	(4.83)	(2.19)	(3.77)	(5.83)
Class size	24.37	22.78	25.81	27.20
	(8.85)	(8.48)	(8.85)	(10.12)
Teaching load	0.00	-0.58	0.64	0.60
	(1.00)	(0.51)	(0.95)	(1.17)
Quality of educational resources	0.00	-0.17	0.09	0.50
	(1.00)	(1.00)	(0.88)	(1.02)
Proportion of immigrant peers	0.06	0.08	0.04	0.03
	(0.10)	(0.12)	(0.07)	(0.06)
Parents' education, years	11.51	10.75	12.07	13.37
	(1.77)	(1.60)	(1.62)	(1.66)
City location	0.40	0.29	0.52	0.46
Streaming:				
- no streaming	0.26	0.26	0.26	0.26
- for some classes	0.57	0.55	0.59	0.59
- for all classes	0.17	0.19	0.15	0.15
Number of schools	1,509	823	593	93

Notes: Pooled data for 2003, 2006 and 2009 are used. Standard deviations in parentheses. Private type 1 schools are private schools that receive more than 50% of funding from the government. Private type 2 refers to the rest of private schools.

Table 7: Difference in performance across students of different origin

	1	2	3	4
	Mean	Difference:		
		FB-SP	SB-FP	FB-FP
Mathematics				
SB-SP	495.99	-16.80**	-33.08***	-54.57***
	(1.56)	(7.07)	(8.00)	(3.73)
FB-SP	479.19	-	-16.28	-37.78***
	(6.80)		(10.43)	(7.95)
SB-FP	462.91		-	-21.50**
	(8.21)			(8.92)
FB-FP	441.4			-
	(3.5)			
Reading				
SB-SP	487.11	-5.11	-14.26*	-48.67***
	(1.60)	(7.03)	(7.92)	(4.33)
FB-SP	482.00	-	-9.15	-43.55***
	(6.88)		(11.06)	(8.01)
SB-FP	472.85		-	-34.40***
	(7.85)			(9.01)
FB-FP	438.44			-
	(4.36)			
Science				
SB-SP	501.70	-11.87	-23.28***	-55.26***
	(1.70)	(7.39)	(7.19)	(4.37)
FB-SP	489.82	-	-11.41	-43.38***
	(7.47)		(10.63)	(8.17)
SB-FP	478.42		-	-31.98***
	(7.30)			(8.70)
FB-FP	446.44			-
	(4.57)			

Notes: In parentheses standard errors corrected for sampling and measurement errors using balanced repeated replication weights and plausible values. * p-value<0.100, ** p-value<0.050, *** p-value<0.010.

Table 8: Determinants of PISA scores: individual and family characteristics

	1	2	3	4	5	6	7	8	9	10	11	12
	Mathematics				Reading				Science			
Immigrant	-51.44***	-26.26***	-23.45***	-8.81**	-45.43***	-23.43***	-20.46***	-7.81*	-51.37***	-25.44***	-22.15***	-7.93*
	(3.63)	(4.83)	(4.93)	(4.34)	(3.93)	(5.47)	(5.91)	(5.51)	(4.17)	(4.78)	(5.05)	(4.85)
Time abroad		-2.98***	-3.47***	-1.67***		-2.72***	-3.18***	-1.61***		-3.21***	-3.74***	-2.01***
		(0.51)	(0.52)	(0.45)		(0.53)	(0.57)	(0.54)		(0.54)	(0.54)	(0.53)
Age	18.47***	17.82***	17.26***	15.00***	15.93***	15.79***	15.25***	13.47***	20.09***	19.78***	19.19***	17.00***
	(3.12)	(2.99)	(2.77)	(2.59)	(2.94)	(2.93)	(2.71)	(2.61)	(2.86)	(2.75)	(2.55)	(2.39)
Female	-16.17***	-16.45***	-14.54***	-17.10***	29.79***	29.43***	31.13***	28.86***	-9.84***	-10.12***	-8.11***	-10.55***
	(1.58)	(1.54)	(1.41)	(1.36)	(1.77)	(1.73)	(1.64)	(1.58)	(1.90)	(1.82)	(1.68)	(1.61)
Mother education:												
- lower secondary			25.09***	15.93***			28.59***	20.21***			32.20***	23.28***
			(4.23)	(4.01)			(3.89)	(3.52)			(4.14)	(3.90)
- medium professional			27.07***	12.55***			35.12***	21.39***			40.18***	26.02***
			(5.06)	(4.98)			(4.32)	(4.13)			(4.63)	(4.47)
- upper secondary			38.30***	19.40***			41.57***	24.20***			49.38***	30.89***
			(4.33)	(4.08)			(3.83)	(3.43)			(3.87)	(3.47)
- upper professional			29.06***	8.96*			37.24***	18.63***			45.00***	25.32***
			(5.14)	(4.91)			(4.29)	(4.04)			(4.54)	(4.27)
- university diploma			53.52***	25.54***			53.05***	27.39***			62.95***	35.27***
			(4.53)	(4.38)			(4.07)	(3.97)			(4.13)	(4.00)
Father education:												
- lower secondary			13.57***	8.01*			12.58***	7.29**			12.13***	6.67*
			(3.89)	(3.99)			(3.03)	(3.14)			(3.41)	(3.44)
- medium professional			20.42***	9.92***			19.84***	10.07***			17.79***	7.49**
			(3.75)	(3.90)			(3.65)	(3.64)			(3.55)	(3.64)
- upper secondary			27.27***	9.59**			28.02***	11.69***			25.08***	7.65**
			(4.44)	(4.53)			(3.61)	(3.67)			(3.64)	(3.72)
- upper professional			25.79***	9.05**			23.96***	8.40**			25.86***	9.30**
			(4.31)	(4.32)			(3.68)	(3.78)			(3.86)	(3.79)
- university diploma			44.93***	18.20***			40.27***	15.80***			43.00***	16.45***
			(4.60)	(4.74)			(3.33)	(3.56)			(3.87)	(4.01)
Highest parent occupation:												
- white collar low skilled				-12.38***				-15.03***				-14.02***
				(2.28)				(1.87)				(2.28)
- blue collar high skilled				-17.10***				-20.78***				-17.74***
				(2.43)				(2.54)				(2.50)
- blue collar low skilled				-19.68***				-22.36***				-20.71***
				(2.44)				(2.59)				(2.53)
Number of books:												
- 11-25				22.05***				17.78***				18.17***
				(3.63)				(3.24)				(4.35)
- 26-100				49.44***				44.22***				45.52***
				(3.38)				(3.50)				(4.02)
- 101-200				67.56***				56.59***				62.13***
				(3.76)				(3.64)				(3.77)
- 201-500				83.30***				69.52***				78.74***
				(3.72)				(3.23)				(3.97)
- 500 and more				85.63***				67.63***				79.80***
				(4.78)				(4.50)				(4.89)
Computer				28.38***				26.24***				28.47***
				(2.56)				(2.49)				(2.42)
Study place				5.31**				6.40**				5.66***
				(2.24)				(2.48)				(2.61)
Year 2006	-7.90**	-4.30	-2.46	-5.04*	-23.39***	-20.34***	-18.46***	-21.25***	-2.26	0.84	3.02	0.30
	(3.63)	(3.70)	(2.98)	(2.59)	(3.62)	(3.82)	(3.15)	(2.79)	(3.81)	(3.98)	(3.15)	(2.81)
Year 2009	-1.35	0.70	-2.14	-4.57*	0.64	2.70	-0.01	-2.75	1.32	3.21	-0.05	-2.68
	(3.62)	(3.58)	(2.88)	(2.51)	(3.70)	(3.70)	(3.16)	(2.85)	(3.55)	(3.61)	(2.83)	(2.52)
Regional fixed effects		Yes	Yes	Yes		Yes	Yes	Yes		Yes	Yes	Yes
Constant	215.07***	205.70***	163.15***	156.59***	228.61***	212.97***	168.41***	162.82***	188.97***	175.80***	126.83***	123.19***
	(49.02)	(46.67)	(42.35)	(39.55)	(46.32)	(46.11)	(42.09)	(40.73)	(44.82)	(43.33)	(40.05)	(38.40)
Adjusted R-sq	0.035	0.073	0.144	0.237	0.075	0.108	0.175	0.224	0.027	0.060	0.134	0.218

Notes: Number of observations – 37791. In parentheses standard errors corrected for sampling and measurement errors using balanced repeated replication weights and plausible values. * p-value<0.100, ** p-value<0.050, *** p-value<0.010.

Table 9: Differences in school inputs between immigrant and native students

	1	2	3
	Mean for native students	Difference in means between native and immigrant students	Difference in means between native and immigrant students corrected for individual characteristics
School ownership:			
- public	0.60	0.15***	0.12***
		(0.02)	(0.02)
- private group 1	0.31	-0.11***	-0.09***
		(0.01)	(0.01)
- private group 2	0.09	-0.04***	-0.03***
		(0.01)	(0.01)
Student-teacher ratio	12.92	-1.61***	-1.17***
		(0.15)	(0.16)
Class size	25.06	-0.44	-0.21
		(0.27)	(0.26)
Teaching load	-0.12	-0.27***	-0.19***
		(0.03)	(0.03)
Quality of educational resources	-0.04	0.03	0.05
		(0.04)	(0.04)
School size	728.62	-34.20***	-8.65
		(12.78)	(13.53)
City	0.41	0.05***	0.08***
		(0.02)	(0.02)
Streaming within school:			
- no streaming	0.27	0.02	-0.04**
		(0.02)	(0.02)
- for some classes	0.55	0.02	0.03
		(0.02)	(0.02)
- for all classes	0.18	-0.04***	0.01
		(0.01)	(0.01)
Proportion of immigrant peers	0.06	0.12***	0.11***
		(0.00)	(0.00)
Average peers' parent education	11.53	-0.04	0.01
		(0.06)	(0.06)
Native peers' parent education	11.48	-0.15**	-0.09
		(0.06)	(0.07)

Notes: In columns 2 and 3 the coefficients for immigrant dummies from regressions on corresponding school characteristics are shown. In parentheses standard errors corrected for sampling using balanced repeated replication weights. * p-value<0.100, ** p-value<0.050, *** p-value<0.010.

Table 10: Mathematics scores and school characteristics

	1	2	3	4	5	6	7	8
Immigrant	-8.81**	-7.82*	-6.22	-7.81*	-6.41	-7.65	-7.61	-8.00*
	(4.34)	(4.21)	(4.61)	(4.33)	(4.61)	(4.58)	(4.57)	(4.64)
Time abroad	-1.67***	-1.55***	-1.64***	-1.64***	-1.62***	-1.53***	-1.54***	-1.51***
	(0.45)	(0.45)	(0.41)	(0.45)	(0.44)	(0.44)	(0.44)	(0.45)
Proportion of immigrant peers			-30.72**		-17.47	-13.81	-12.02	-15.67
			(11.63)		(11.71)	(11.78)	(11.96)	(11.96)
School ownership:								
- private type 1				7.96***	7.35***		1.76	1.17
				(2.55)	(2.59)		(2.72)	(3.67)
- private type 2				13.31***	12.39***		1.30	0.37
				(4.25)	(4.22)		(4.30)	(5.37)
Native peers' parent education						5.45***	5.28***	4.66***
						(0.70)	(0.80)	(0.85)
Class size								-0.01
								(0.18)
Teaching load								-0.16
								(2.14)
Quality of educational resources								2.04*
								(1.18)
School size								0.02**
								(0.01)
School size squared								-0.00**
								(0.00)
City location								2.98
								(2.56)
Streaming within school:								
- for some classes								-3.03
								(2.62)
- for all classes								0.78
								(3.59)
School effects (by year)	No	Yes	No	No	No	No	No	No
Constant	156.59***	175.14***	157.21***	155.28***	155.75***	111.53***	112.31***	112.34***
	(39.55)	(33.53)	(39.47)	(39.47)	(39.37)	(41.14)	(41.87)	(42.50)
Adjusted R-sq	0.237	0.337	0.238	0.240	0.240	0.240	0.247	0.249

Notes: Number of observations – 37791. In parentheses standard errors corrected for sampling and measurement errors using balanced repeated replication weights and plausible values. * p-value<0.100, ** p-value<0.050, *** p-value<0.010. Individual and family characteristics, year and regional fixed effects are included in all estimations.

Table 11: Reading scores and school characteristics

	1	2	3	4	5	6	7	8
Immigrant	-7.81*	-8.08**	-5.17	-6.11	-5.32	-6.79	-6.57	-6.93
	(5.51)	(3.93)	(5.34)	(5.52)	(3.36)	(5.30)	(5.30)	(5.23)
Time abroad	-1.61***	-1.40***	-1.57***	-1.57***	-1.56***	-1.45***	-1.48***	-1.45***
	(0.54)	(0.41)	(0.43)	(0.54)	(0.54)	(0.54)	(0.54)	(0.53)
Proportion of immigrant peers			-31.46**		-9.91	-12.26	-4.23	-8.17
			(12.13)		(11.82)	(12.97)	(11.66)	(11.47)
School ownership:								
- private type 1				15.33***	14.98***		9.16***	6.93*
				(2.38)	(2.39)		(2.46)	(3.80)
- private type 2				15.17***	14.65***		3.09	1.28
				(4.62)	(4.61)		(4.98)	(6.32)
Native peers' parent education						6.18***	5.50***	4.85***
						(0.74)	(0.89)	(0.97)
Class size								0.23
								(0.25)
Teaching load								0.75
								(2.25)
Quality of educational resources								0.88
								(1.37)
School size								0.02**
								(0.01)
School size squared								-0.00***
								(0.00)
City location								5.32
								(3.22)
Streaming within school:								
- for some classes								-1.29
								(3.25)
- for all classes								3.15
								(4.22)
School effects (by year)	No	Yes	No	No	No	No	No	No
Constant	162.82***	174.09***	163.45***	158.43***	158.70***	111.60***	113.46***	106.29**
	(40.73)	(33.59)	(40.67)	(40.55)	(40.55)	(41.29)	(41.88)	(43.57)
Adjusted R-sq	0.224	0.357	0.231	0.237	0.237	0.243	0.247	0.247

Notes: Number of observations – 37791. In parentheses standard errors corrected for sampling and measurement errors using balanced repeated replication weights and plausible values. * p-value<0.100, ** p-value<0.050, *** p-value<0.010. Individual and family characteristics, year and regional fixed effects are included in all estimations.

Table 12: Science scores and school characteristics

	1	2	3	4	5	6	7	8
Immigrant	-7.93*	-6.90*	-4.93	-6.94	-5.08	-6.19	-6.13	-6.40
	(4.85)	(4.06)	(4.70)	(4.84)	(4.78)	(4.73)	(4.72)	(4.69)
Time abroad	-2.01***	-1.77***	-1.97***	-1.98***	-1.96***	-1.88***	-1.89***	-1.87***
	(0.53)	(0.44)	(0.52)	(0.53)	(0.53)	(0.52)	(0.53)	(0.53)
Proportion of immigrant peers			-35.65***		-23.32*	-20.73	-18.55	-22.38*
			(13.50)		(12.90)	(13.74)	(12.57)	(12.73)
School ownership:								
- private type 1				8.27***	7.44***		2.55	1.12
				(2.74)	(2.67)		(2.86)	(4.07)
- private type 2				11.65**	10.42**		0.70	-0.81
				(4.85)	(4.77)		(5.25)	(6.26)
Native peers' parent education						4.81***	4.62***	4.03***
						(0.76)	(0.91)	(1.01)
Class size								0.01
								(0.19)
Teaching load								0.57
								(2.03)
Quality of educational resources								1.62
								(1.22)
School size								0.02**
								(0.01)
School size squared								-0.00**
								(0.00)
City location								3.94
								(2.95)
Streaming within school:								
- for some classes								-2.72
								(2.81)
- for all classes								3.60
								(3.95)
School effects (by year)	No	Yes	No	No	No	No	No	No
Constant	123.19***	124.78***	123.90***	121.44***	122.07***	83.60**	84.02**	81.86**
	(38.40)	(35.35)	(38.25)	(38.38)	(38.32)	(39.89)	(40.60)	(42.83)
Adjusted R-sq	0.218	0.323	0.219	0.220	0.221	0.226	0.226	0.228

Notes: Number of observations – 37791. In parentheses standard errors corrected for sampling and measurement errors using balanced repeated replication weights and plausible values. * p-value<0.100, ** p-value<0.050, *** p-value<0.010. Individual and family characteristics, year and regional fixed effects are included in all estimations.

Table 13: Oaxaca-Blinder decomposition of the achievement gap between native and immigrant students

	1	2	3	4	5	6	7	8	9	10	11	12
	Mathematics				Reading				Science			
	O-B decomposition		OLS on subsamples of:		O-B decomposition		OLS on subsamples of:		O-B decomposition		OLS on subsamples of:	
			Natives	Immigrants			Natives	Immigrants			Natives	Immigrants
Natives	495.81***				487.05***				501.57***			
	(0.71)				(0.71)				(0.73)			
Immigrants	443.86***				442.37***				450.09***			
	(2.78)				(2.89)				(2.98)			
Difference	51.94***				44.68***				51.48***			
	(2.87)				(2.97)				(3.06)			
	Explained	Unexplained			Explained	Unexplained			Explained	Unexplained		
Total	53.49***	-1.54			37.57***	7.12			44.28***	7.20		
	(5.71)	(6.03)			(6.15)	(6.48)			(6.81)	(7.17)		
Individual characteristics:												
Time abroad	22.07***	-12.40*	-2.86***	-1.15**	11.99**	4.31	-1.69***	-1.90***	14.93**	3.28	-2.03**	-2.15***
	(5.44)	(7.14)	(0.60)	(0.58)	(5.91)	(7.48)	(0.63)	(0.54)	(6.62)	(8.21)	(0.80)	(0.60)
Female(1)	0.20	-0.36	-17.16***	-18.73***	-0.34	0.55	28.62***	29.41***	0.13	4.37*	-11.23***	-2.65
	(0.31)	(2.39)	(1.26)	(4.34)	(0.53)	(2.46)	(1.31)	(4.55)	(0.20)	(2.57)	(1.38)	(5.10)
Age	0.20	-18.23	14.87***	14.10	0.18	-80.76	13.22***	17.51*	0.22	-128.81	16.48***	23.52***
	(0.16)	(137.92)	(2.09)	(8.73)	(0.14)	(142.05)	(2.14)	(9.08)	(0.17)	(145.64)	(2.21)	(9.10)
Mother education(1)	0.41	-10.01	Yes	Yes	0.69**	-2.76	Yes	Yes	0.37	-15.49	Yes	Yes
	(0.31)	(8.99)	Yes	Yes	(0.30)	(9.16)	Yes	Yes	(0.36)	(10.75)	Yes	Yes
Father education(1)	-0.09	2.02			-0.16	9.03			-0.12	4.37		
	(0.17)	(9.07)			(0.15)	(10.37)			(0.17)	(11.01)		
Highest parent occupation(1)	1.31***	-1.89	Yes	Yes	1.54***	-5.33	Yes	Yes	1.47***	-3.80	Yes	Yes
	(0.27)	(6.19)			(0.29)	(6.08)			(0.29)	(6.88)		
Number of books(1)	21.84***	15.99	Yes	Yes	17.98***	4.98	Yes	Yes	20.87***	3.43	Yes	Yes
	(1.22)	(17.39)			(1.12)	(17.80)			(1.20)	(19.14)		
Computer(1)	2.02***	25.12***	28.37***	13.93**	1.82***	22.59***	25.67***	12.13*	2.01***	26.06***	28.03***	20.37***
	(0.43)	(2.32)	(2.34)	(6.55)	(0.40)	(2.37)	(2.39)	(7.12)	(0.43)	(2.42)	(2.43)	(6.84)
Study place(1)	0.23**	0.14	5.66***	6.41	0.30**	-0.42	7.44***	3.91	0.25**	0.04	6.20***	6.41
	(0.12)	(0.93)	(2.17)	(7.53)	(0.13)	(0.92)	(2.20)	(7.28)	(0.12)	(0.98)	(2.33)	(8.35)
School characteristics:												
School ownership(1)	-0.03	1.01	Yes	Yes	0.63**	-0.83	Yes	Yes	-0.13	0.22	Yes	Yes
	(0.30)	(3.21)			(0.30)	(3.17)			(0.30)	(3.30)		
Class size	0.01	-6.50	-0.01	-0.06	0.13	-4.56	0.23	0.09	0.03	-9.45	0.00	0.07
	(0.05)	(14.99)	(0.17)	(0.43)	(0.09)	(15.57)	(0.22)	(0.49)	(0.06)	(16.36)	(0.19)	(0.41)
Teaching load	-0.01	3.17	-0.25	3.58	0.27	1.75	0.66	1.36	0.29	1.39	0.66	0.36
	(0.29)	(2.02)	(1.86)	(4.95)	(0.26)	(1.85)	(2.03)	(4.37)	(0.28)	(1.98)	(1.85)	(4.36)
Quality of Educational Resources	-0.08	-0.04	2.50**	-3.15	-0.05	-0.04	1.30	-3.29	-0.06	-0.04	1.96	-2.57
	(0.12)	(0.17)	(1.12)	(2.32)	(0.07)	(0.17)	(1.33)	(2.35)	(0.09)	(0.15)	(1.21)	(2.45)
School size(1)	-0.18*	11.33	Yes	Yes	-0.27**	7.65	Yes	Yes	-0.15	3.70	Yes	Yes
	(0.10)	(9.58)			(0.11)	(9.68)			(0.10)	(11.62)		
Streaming within school(1)	0.13	-7.81	Yes	Yes	0.17*	2.36	Yes	Yes	0.22*	1.25	Yes	Yes
	(0.10)	(6.20)			(0.10)	(6.76)			(0.12)	(7.59)		
City(1)	-0.21**	0.20	2.98	5.98	-0.30**	5.20*	4.84*	14.78**	-0.29**	0.74	3.93	6.85
	(0.10)	(3.01)	(2.38)	(5.68)	(0.13)	(3.15)	(2.83)	(6.36)	(0.13)	(3.20)	(2.60)	(5.95)
Native peers' parent education	0.77**	1.56	4.74***	5.02***	0.77**	9.51	4.89***	4.36**	0.66**	6.68	4.10***	3.88*
	(0.34)	(21.85)	(0.78)	(1.90)	(0.34)	(21.15)	(0.92)	(1.99)	(0.29)	(22.06)	(0.94)	(2.07)
Proportion of immigrant peers	2.07**	-0.83	-15.64	-1.90	1.00	1.01	-6.73	-13.34	2.19**	2.34	-20.44	-28.79
	(1.05)	(3.68)	(12.73)	(22.00)	(0.98)	(3.82)	(13.57)	(21.54)	(1.08)	(3.90)	(13.76)	(22.71)
Other controls:												
Regional fixed-effects(1)	1.65***	-0.89	Yes	Yes	0.80**	-0.67	Yes	Yes	0.73**	0.17	Yes	Yes
	(0.41)	(2.70)			(0.32)	(2.85)			(0.34)	(2.87)		
Year(1)	1.14***	12.31*	Yes	Yes	0.42	8.21	Yes	Yes	0.67**	8.13	Yes	Yes
	(0.31)	(7.29)			(0.45)	(7.49)			(0.32)	(7.75)		
Constant		-15.42	107.88***	131.95		25.34	103.90***	76.88		98.62	84.81**	-16.54
		(137.86)	(34.85)	(139.84)		(146.89)	(35.47)	(145.72)		(151.19)	(37.36)	(150.47)

Notes: Number of observations – 37791. In parentheses standard errors corrected for sampling and measurement errors using balanced repeated replication weights and plausible values. (1) The coefficient refers to the total effect of the corresponding indicator variable(s). The results of the decomposition are invariant to the choice of the (omitted) base category (deviation contrast transformation).

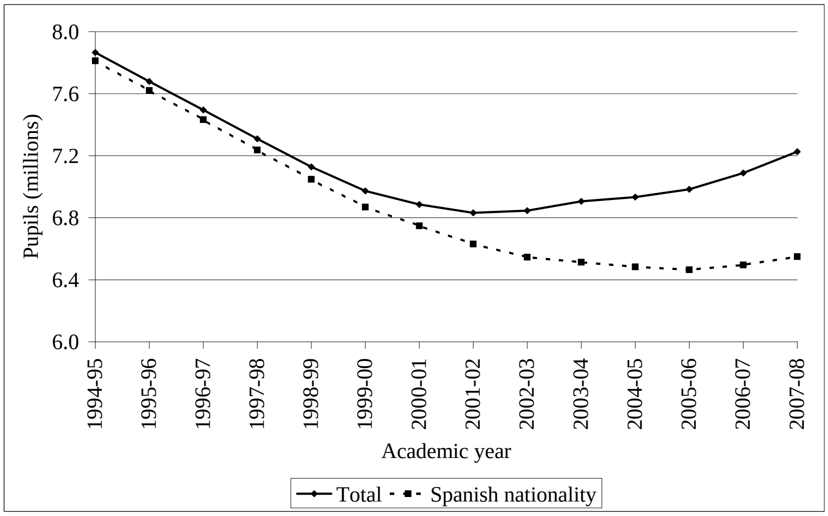

Figure 1: Number of students with Spanish nationality and the total number of students

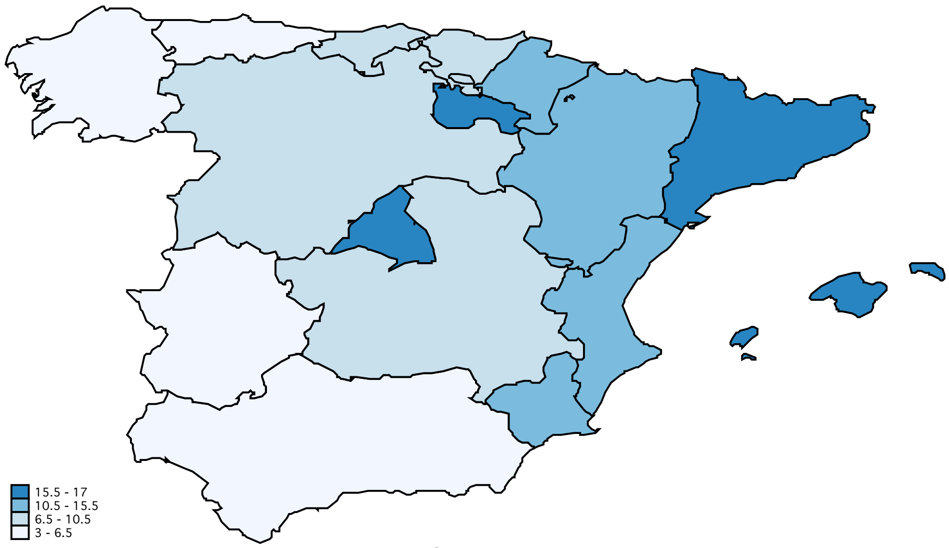

Figure 2: Share of foreign students in upper secondary education, 2008
Source: Ministry of Education.

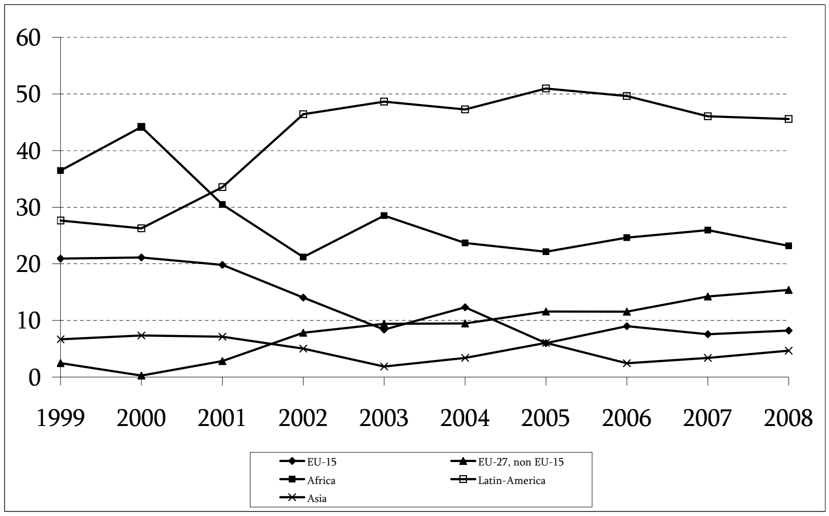

Figure 3: Immigrant population of age 0-16 by country of origin, percentage
Immigrants are defined as individuals whose both parents are born abroad. Country of origin corresponds to the country of origin of an individual's father.

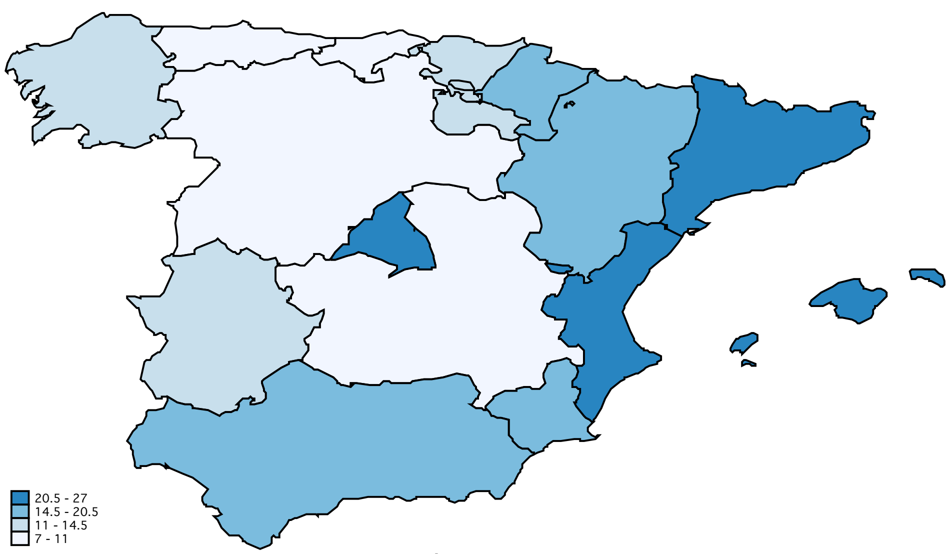

Figure 4: Immigrants segregation across public and private schools in upper secondary education, 2008
Data source: Ministry of Education. The Duncan and Duncan (1955) index is used to measure segregation.

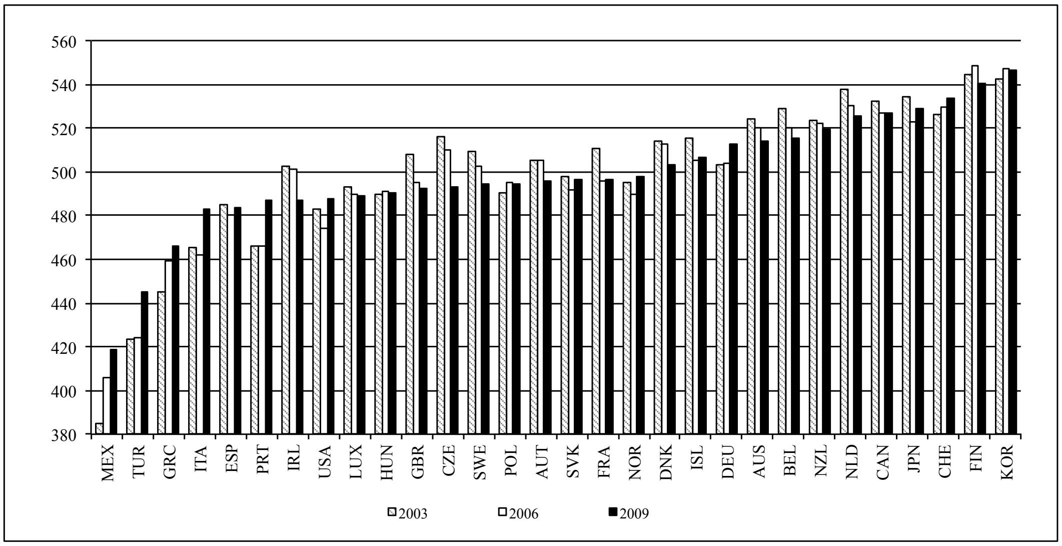

Figure 5: Average PISA score in mathematics, 2003, 2006 and 2009: OECD countries
Countries are ordered according to average PISA scores in mathematics in 2009. The average score for OECD is normalized to 500 and standard deviation to 100.

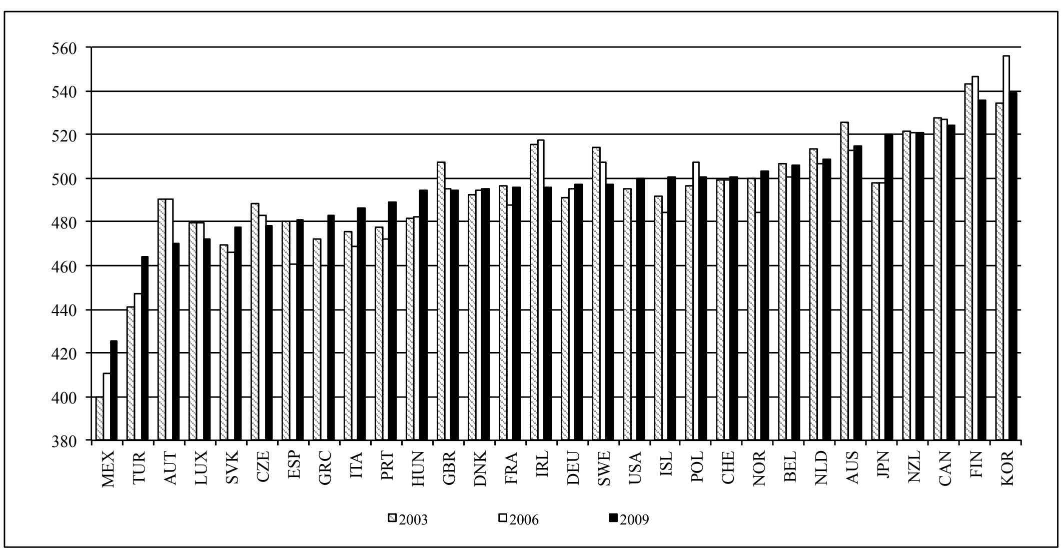

Figure 6: Average PISA score in reading, 2003, 2006 and 2009: OECD countries
Countries are ordered according to average PISA scores in reading in 2009. The average score for OECD is normalized to 500 and standard deviation to 100.

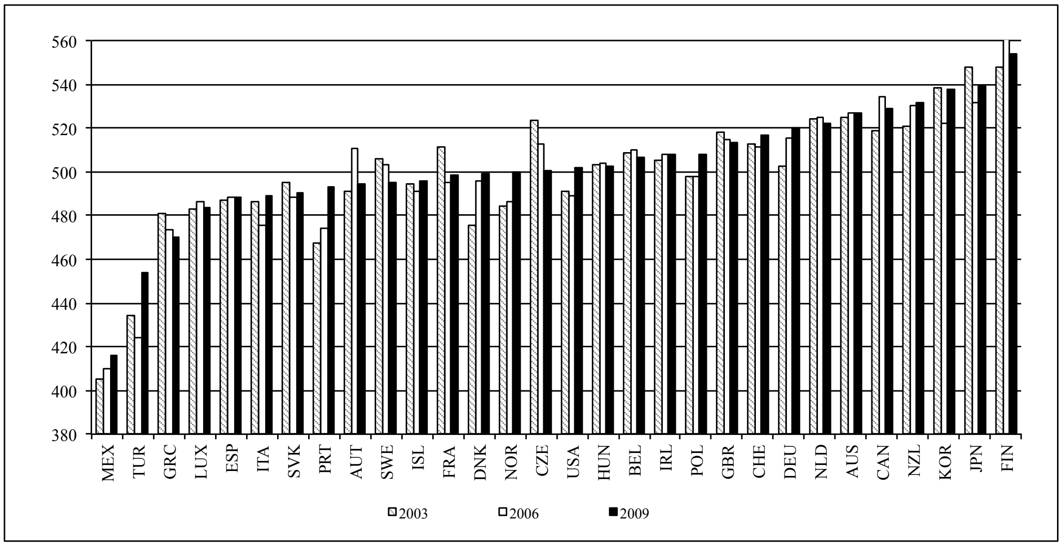

Figure 7: Average PISA score in science, 2003, 2006 and 2009: OECD countries
Countries are ordered according to average PISA scores in science in 2009. The average score for OECD is normalized to 500 and standard deviation to 100.

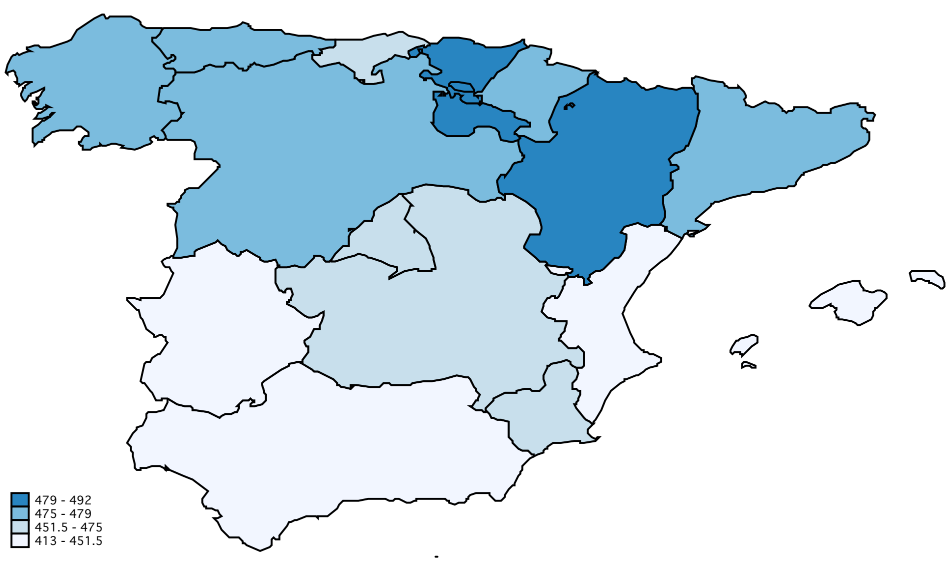

Figure 8: Average PISA score in reading, 2006
The average scores are computed using sample stratification weights.

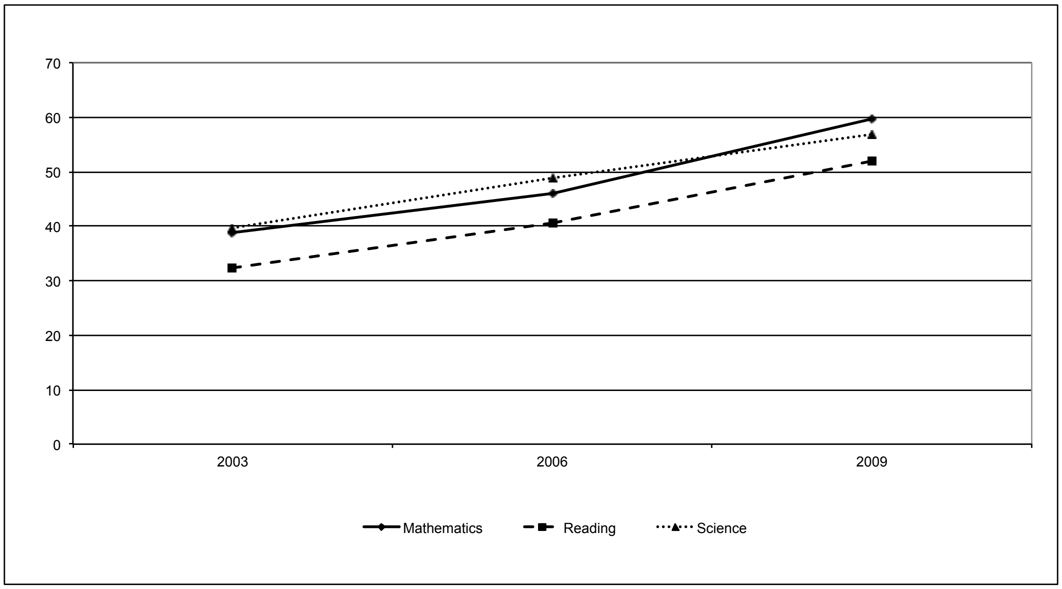

Figure 9: The average gap between native and immigrant students' PISA scores, by discipline and year

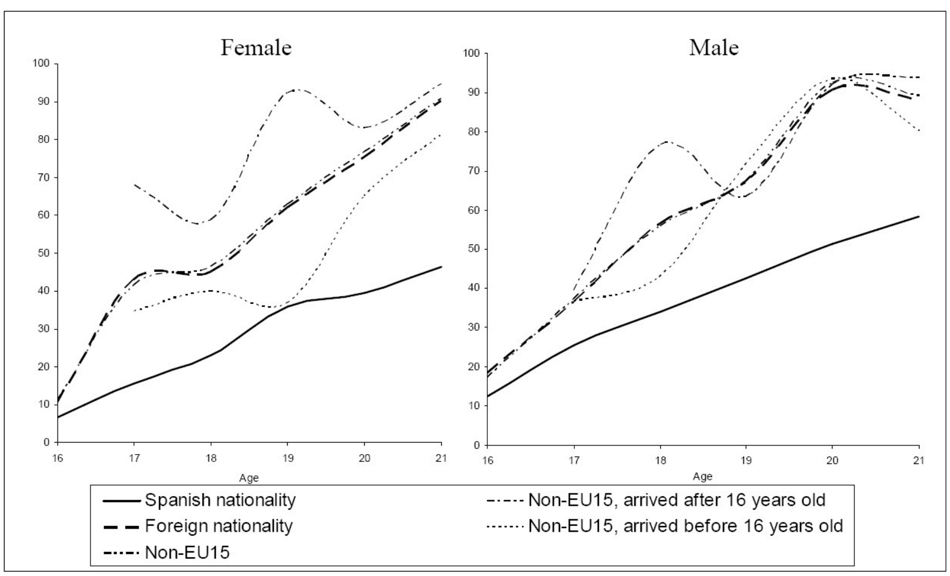

Figure 10: Share of individuals not in the educational system, by age and nationality
Source: Spanish Labor Force Survey (EPA, 2008, second quarter). Foreigners with double nationality are included.

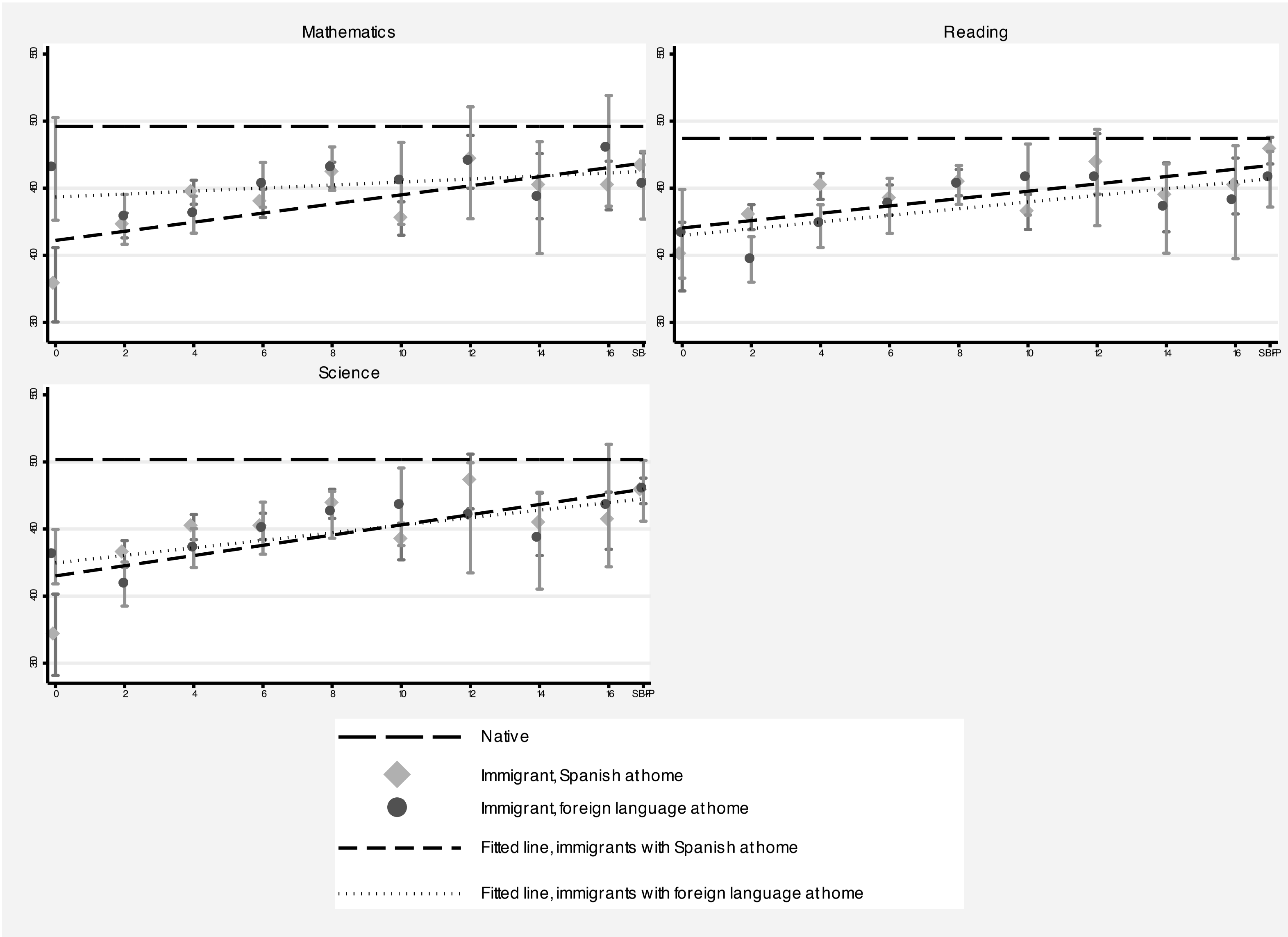

Figure 11: Immigrant students' performance in mathematics, by time spent in Spain and language spoken at home
Notes: SB-FP are students born in Spain from foreign-born parents

Table A-1: Definitions of the main variables

Variable	Description
Individual-level variables	
Female	"1 - female students. "0 - male students
Age	Age in years. Varies between 15.33 (15 years and 4 months) and 16.33 (16 years and 4 months). Note that targeted population in Spain differs by 1-2 months from the general PISA OECD design.
Origin:	
FB-FP	Indicator for foreign born students whose both parents are born abroad
FB-SP	Indicator for foreign born students with at least one parent born in Spain
SB-FP	Indicator for students born in Spain whose both parents are born abroad
SB-SP	Indicator for students born in Spain with at least one of the parents born in Spain
Time in Spain	For FB-FP student indicates the number of years that a student lived in Spain.
Time abroad	For FB-FP student indicates the number of years that a student lived abroad before moving to Spain. Equal to zero for the rest of students.
Language at home	"0 - for Spanish and other national languages, "1 - for foreign languages
Number of books at home	Reported value of the number of books at home: 1-10; 11-25; 26-100; 101-200; 201-500; more than 500.
Study place	Indicator of whether a student has a study place available for him/her at home
Computer	Indicator of whether a student has a computer available for him/her at home
Highest parental occupational status	Occupation of a parent with the highest occupational level: high skilled white collar, low skilled white collar, high skilled blue collar, and low skilled blue collar
Parental education	Constructed on the basis of ISCED educational levels reported for each parent. 'University diploma stands for the title obtained after a 3-year university degree. Instead, "University graduate stands for graduates from normal 4-5-year degrees.
School-level variables	
School size	Total number of students in the school
Class size	The average class size in the school.
Student-teacher ratio	Total number of students over the number of teachers. Part-time teachers are counted as a half of a full-time teacher.
Teaching load	The ratio between student-teacher ratio and class size, normalized to the population average. Indicates the ratio between the number of classes per teacher in a given school and the national average of the number of classes per teacher.
Quality of school's educational resources	PISA index of the quality of the school's educational resources, derived from school principals' reports on the lack of instructional materials, computers, software, calculators, library materials, audio-visual resources and science laboratory equipment etc. for the learning by 15-year olds. Positive values indicate that the learning of 15-year-olds was not hindered by the school's physical infrastructure, and negative values indicate the perception that the learning of 15-year-olds was hindered by the school's physical infrastructure.
City	"0 for village (less than 3 000 people), small town (3 000 to about 15 000 people) and town (15 000 to about 100 000 people) school locations; "1 - for city (100 000 to about 1 000 000 people) or large city (over 1 000 000 people) locations.
School ownership	"Public - stands for a public school, "Private type 1 - for a private school with more than 50 percent of the budget coming from the local or state government, "Private type 2 - for a private school with less than 50 percent of the budget coming from the local or state government.
Streaming	"0 - no steaming by ability is practiced in school, "1 - steaming by ability for some classes, "2 - streaming for all classes.
Proportion of immigrant peers	Share of immigrant students in the PISA sample of students from a given school. Calculated for each student using students' sample weights, excluding a given student's own contribution.
Native-peer parents' education	Average (highest) education of native peers' parents, in years. Calculated on the basis of PISA sample of students using students' sample weights, excluding a given student's own contribution.