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ORIGINAL

Differential Impact of School Segregation in the Performance of Native and Non-Native Students in Spain

F. Javier Murillo and Guillermina Belavi

UNESCO Chair on Education for Social Justice, Autonomous University of Madrid, Spain

ABSTRACT

There is evidence of the impact of school segregation on students' academic achievement, but it is debated whether the extent of this impact is dependent on students' socioeconomic status, or on their native or non-native condition. This research addresses the problem in Spain, seeking to determine how immigrant and socioeconomic segregation affect the academic achievement of native and non-native students. With this aim, the PISA study database was specially exploited by means of two-tier Multilevel Models, estimating school segregation through the Hutchens Square Root Index. Specifically, the study estimates the influence of school segregation on students' academic achievement in the subjects of Mathematics, Language and Science. The results confirm that school socioeconomical and immigrant segregation affect students' academic achievement differently. Whereas socioeconomic segregation negatively affects both groups in all three subjects, immigrant segregation affects non-native students more strongly. Thus, data shows school segregation on socioeconomic grounds is always significant, and always has a considerable impact on achievement, regardless of students' national origin. School segregation reproduces and accentuates conditions of social injustice. To counter its harmful effects, it is necessary to act first and foremost on socioeconomic segregation, as this causes the most devastating effects in education, particularly for non-native students.

Keywords SCHOOL SEGREGATION, ACADEMIC ACHIEVEMENT, IMMIGRATION, SOCIO-ECONOMIC STATUS, PISA

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Corresponding Author
F. Javier Murillo,
javier.murillo@uam.es

Despacho III-302, Calle Tomás y Valiente, 3, 28049 (Spain)

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1 INTRODUCTION

School segregation reproduces and accentuates conditions of social injustice, as its negative consequences have greater impact on groups whose academic development faces adverse conditions (poverty, social deprivation, exclusion, etc.). Recognising the problem of segregation and taking the right measures to address it requires an understanding of how it affects the academic achievement of various student groups and which groups are more vulnerable to each type of segregation. This research endeavours to contribute toward gaining this

understanding. Particularly, it aims to learn how socioeconomic segregation and immigrant segregation affect the achievement in Mathematics, Language and Science of native and non-native students in Spain.

School segregation can be defined as the unequal distribution of students in schools according to certain personal or group characteristics that affect their performance, among which are students' national origin and their families' socioeconomic and cultural status (Murillo & Martínez-Garrido, 2018; Murillo, Martínez-Garrido, & Belavi, 2017). School segregation is usually regarded on a national regional scale, but segregation may also be implemented at school level. Thus, a school is understood as being segregated when it is comprised of more or less students with certain characteristics than average for the area, region or country.

Empirical research to analyse the impact of socioeconomic segregation in schools on students' academic performance (Agirdag, Van Houtte, & Van Avermaet, 2012; Ammermueller & Pischke, 2009; Brännström, 2008; Van Ewijk & Sleegers, 2010) has unanimously shown that segregation exerts a strong and negative impact on the academic outcomes of students from families with low socioeconomic status. The discussion focuses on how this influence operates. Among the leading explanations given, some authors argue that socioeconomic segregation is directly related to the peer effect on students' individual achievement (Ammermueller & Pischke, 2009), either because it is associated to low expectations on behalf of students and their parents (Polidano, Hanel, & Buddelmeyer, 2013) or due to the manner in which such a "sense of futility" permeates the school culture (Agirdag et al., 2012). Some authors, however, maintain that the effects of social composition on student achievement are indirect, as they are exerted through the resources available at the school and the school's organisational and structural characteristics. For instance, higher staff mobility is found at centres with greater socioeconomic segregation (Hanushek, Kain, & Rivkin, 2004). Spanish researchers have also addressed this issue, albeit not in profusion. In this case, the findings coincide with international studies in which socioeconomic segregation has a strong influence on performance (Lizasoain, Joaristi, Lukas, & Santiago, 2007; Mancebón-Torrubia & Pérez-Ximénez, 2008, 2010), although the explanations predominantly feature the peer effect (Cordero, Crespo, & Pedraja, 2013).

There is abundant literature, although the conclusions are less than clear, addressing the impact of immigrant segregation on the academic achievement of native and non-native students (Chachashvili-Bolotin, Lissitsa, Shavit, & Ayalon, 2016; Danzer & Yaman, 2016; Izquierdo, 2010; Tonello, 2016) . Certain papers focus their attention on the influence of non-native peers on the performance of native students (Brunello & Rocco, 2013; Ohinata & Van Ours, 2013; Szulkin & Jonsson, 2007) . Other studies draw a comparison between the peer effect in both groups (Contini, 2013; Entorf & Lauk, 2008; Felouzis, 2003; Jensen & Rasmussen, 2011; Kao & Thompson, 2003; Schneeweis, 2015; Westerbeek, 1999). Thus, Dronkers and Van Der Velden (2010) argues that the concentration of highly diverse ethnicity at schools has a strong negative impact on the academic achievement of native and non-native students alike, while Jensen and Rasmussen (2011) found that the impact on native students' performance only occurs when the percentage of immigrants exceeds

50%. Notwithstanding, Ohinata and Van Ours (2013) conclude that the concentration of non-native students does not have a negative effect on performance in either group.

This point has also been examined by research conducted in Spain (Calero, Álvaro Choi, & Waisgrais, 2009; Calero & Oriol Escardíbul, 2016; Cebolla-Boado, 2007; Cebolla-Boado & Medina, 2011; Garrido-Medina & Cebolla-Boado, 2010; Zinovyeva, Felgueroso, & Vazquez, 2014). Thus, Calero et al. (2009) , using the PISA-2006 database, found that while the concentration of immigrant students in schools does not have a statistically significant impact on immigrant students' achievement, it does have a negative, non-linear impact on native students' performance when the proportion of immigrants exceeds 20%. Garrido-Medina and Cebolla-Boado (2010), also based on PISA-2006 data, found a negative correlation between students' performance in both groups and the concentration of immigrants at schools. However, Zinovyeva et al. (2014), from the analysis of data from several PISA studies, did not find immigrant student concentration to have negative effects on performance in any group. The debate, therefore, remains open.

A comparative analysis makes it possible to ask how different types of segregation affects students' performance and whether one type is significantly more influential than another. This information is of value to addressing the problem, but few research studies make this comparison for native and non-native students. On an international level, the study by Park and Kyei (2010) on how both types of segregation influence achievement in Mathematics of native and non-native students in 18 different countries stands out. Using two-tier multilevel models, these authors found that the achievement gap between the two groups in the different countries studied was systematically related to the levels of school segregation by family socioeconomic status but was not related to school segregation based on country of origin.

Agirdag et al. (2012), moreover, studied the influence of ethnic and socioeconomic composition of schoolchildren in Belgium on the achievement in mathematics, using multilevel analysis. In their findings, both segregation types were seen to impact student performance, but by controlling the influence of variables such as family socioeconomic status and previous academic achievement, the ethnic composition of student groups lost significance regarding performance while the socioeconomic composition remained influential throughout. These authors upheld that the above was true both for native and non-native students. Related to this, Hansen and Gustafsoon (2019) studied SES-achievement relationship in Sweden and on this basis they calculated the relationship with the native or non-native condition. In their research, they found that the socioeconomic equality in school outcomes deteriorated between 1998 and 2014 in Sweden, and that this impact affected differently immigrant and non-immigrant groups. While for the latter the development of educational inequality was quite stable over the time, the immigrant group was affected by a linear trend of increased overall educational inequality.

Other international studies have shown that socioeconomic composition has a greater impact on performance than ethnic composition in student groups (Dumay & Dupriez, 2008; Rumberger & Palardy, 2005; Ryabov & Van Hook, 2007; Van der Slik, Driessen, & De Bot, 2006). However, there is no research from which to draw information or compar-

isons on how these types of segregation affect students in Spain.

This study, therefore, seeks to determine the differential impact of socioeconomic segregation and immigrant segregation on the academic achievement of native and non-native students in Spain.

2 MATERIAL AND METHODS

With this aim, the Program for International Student Assessment (PISA) database 2015 was specially exploited by means of Multilevel Models.

The PISA study surveyed the skills of 15-year-old students (2nd year in Compulsory Secondary Education) in Reading, Mathematics and Science. In addition to measuring academic performance, PISA gathers information on students and their families, on teachers and managers through a range of questionnaires. In this manner, the study provides useful information for estimating school segregation and its relation to achievement, and the right context for the findings.

To conduct this research, data for the entire Spanish State was used. The sample is made up of 6,577 15-year-old students at 201 schools across the country. Sample selection was conducted on a two-stage stratified cluster design: first, schools were selected randomly within each Autonomous Region and, subsequently, students were selected randomly from each of the schools participating.

Four variable types were used in the research:

Selection variable: Student's national origin: native or immigrant. Native students are those born in Spain with at least one Spanish-born parent. Non-native students are students born in another country whose parents were also born abroad.

1. Dependent variables or variables of interest: Achievement in Reading, Achievement in Mathematics and Achievement in Science. Scores obtained in the PISA study through Item Response Theory and escalations with a mean of 500 and a standard deviation of 100.
2. Control variables: Socioeconomic and cultural status of students' families, and gender. The former is calculated by PISA from the information given by the following variables: the International Socio-Economic Index of Occupational Status (ISEI), the highest educational level reached by the student's parents converted into years of schooling, family wealth index, home educational resources index and index of culture-related possessions at the family home. Qualified variable. Student gender is a dummy variable.
3. Explanatory variables: magnitude of segregation at each educational centre by national origin and socioeconomic status. As explained further below, both of these are estimated by means of the Hutchens Square Root Index from the number of non-native and native students at each school and in the national total; on the number of students in the 25% of families with the lowest socioeconomic status (Q1) at each school, and on the state total and the remaining number of students at each school and the nationwide total.

Table 1 presents a summary of the sample and its characteristics. The table shows that immigrant student performance in all three subjects analysed in the Pisa study is poorer than that of their native classmates. Likewise, their average socioeconomic and cultural status is lower. The four differences described are statistically significant (sig = 0.000 in all four).

Table 1 Sample and sample characteristics

	Total	Native students	Non-native students
Number of students	6577	6021	556
Centres	201	-	-
% of women*	50.67%	50.89%	51.82%
Average socioeconomic status	0.0000	0.0430	- 0.4383
Achievement in Mathematics*	490.41	495.72	443.86
Achievement in Reading*	500.14	505.35	456.22
Achievement in Science*	497.74	503.14	452.58
Socioeconomic segregation	0.1734	-	-
Immigrant segregation	0.2535	-	-

Note: * Weighted data.
Source: Compiled by the author from Pisa-2015.

As mentioned, the Hutchens Square Root Index was used to estimate the magnitude of segregation at each school (Hutchens, 2001, 2004). The reason for choosing this index is that, in contrast with other indices such as Dissimilarity (Duncan & Duncan, 1955), Gorard (Gorard & Taylor, 2002), Insulation (Lieberson, 1981) or Socioeconomic Inclusion (Murillo, 2016), to mention the most popular, this is the only index with the capacity for additive decomposition of its elements. It is also the only index that meets the seven requirements for a school segregation index: invariable scale, group symmetry, movement between groups, insensitivity to proportional divisions, aggregate measure and additive decomposition, symmetry among groups and range (Hutchens, 1991, 2001).

The Hutchens index estimates segregation at each school based on the gap between the school and distributive equity; that is, the distance between the geometrical mean of participations by students of different national origins in the absence of segregation, and the geometrical mean of real participations (Jenkins, Micklewright, & Schnepf, 2008). Thus, a school with the same percentage of individuals in the minority group as in the country or the Region has a segregation value of 0. Segregation will be positive if the percentage is greater, and if it is smaller segregation will be negative. This approach makes it possible to determine each school's degree of implication with regard to its obligation to enrol people from different minorities.

The Hutchens index, at each school, is estimated using the following formula:

$$H = \left(\frac{x_1}{X_1}\right) - \sqrt{\frac{x_2}{X_2}\frac{x_1}{X_1}} \quad (1)$$

In which, x_1 and x_2 represent the number of students in the minority and majority group, respectively, and X_1 and X_2 are the total number of minority and majority students at all

schools across the country or region. The Hutchens index for the country is the sum of indexes for all schools.

This research appreciates two school segregation types. On the one hand, the socioeconomic status of students' families, considering in this case the minority group to be 25% of students with low socioeconomic and cultural status, and on the other hand, immigrant segregation, considering as minority group the non-native students defined above.

The strategy for analysing data involves two-tier (student and school) Multilevel Models. In effect, given that performance scores are available for each student, while segregation renders a score per school, it is not possible to apply simple regression. Thus, it is appropriate to use multilevel analysis where a distinction is made between the first level (students) and the second (educational centres). The multilevel model is as follows:

$$\text{Achievement}_{ij} = \beta_{0j} + \beta_{1j} SES_{ij} + \beta_{2j}\ \text{Gender}_{ij} + \beta_3 H_{\text{SES}_j} + \tag{1}$$

$$+ \beta_4 H\_\text{NOrigin}_j + \varepsilon_{ij} \tag{2}$$

$$\beta_{0j} = \beta_0 + \mu_{0j} \tag{3}$$

$$\mu_{0j} \sim N\left(0, \sigma^2_{\mu 0}\right) \tag{4}$$

$$\varepsilon_{ij} \sim N(0, \sigma^2_{\varepsilon}) \tag{5}$$

Where β_0 represents the means core for achievement in each of the subjects surveyed (Reading, Mathematics and Science), β_{1j} is the variable gradient 'socioeconomic status' at each school *j*, β_{2j} is the gradient for the variable 'gender' at each school *j*, β_3 is the gradient for the variable 'socioeconomic segregation', β_4 is the gradient for the variable 'immigrant segregation', ε_{ij} is the error associated to each student and, lastly, μ_{0j} the error associated to each school *j*.

To determine the influence of school segregation by socioeconomic status and national origin in the achievement of native and non-native students, the percentage variance in achievement is estimated at school level, with explanatory variables for native and non-native students and in each of the three areas of achievement studied.

3 RESULTS

The multilevel modelling processes will be shown for non-native students followed by those for native students, in each of the areas of achievement studied. For greater clarity the results

for each of these areas of achievement are presented separately.

3.1 Achievement in Mathematics

The multilevel modelling process for non-native students in Mathematics (Table 2) shows, first of all, that the degree of segregation in the school has an impact on its students' achievement in Mathematics. Impact is measured by socioeconomic segregation, by national origin and both of these combined.

It can be seen that the contribution of socioeconomic segregation on the initial model (model 2) is statistically significant and accounts for 15.7% of the variance in non-native students' achievement at the school level. Equally significant is the contribution of school segregation based on origin, but the variance thus explained is substantially smaller at 4.9%. The final model in the multilevel modelling process indicates that the joint contribution of both explanatory variables is significant and accounts for up to 19.6% of variance at school level.

Furthermore, it can be observed that both control variables (family socioeconomic and cultural status and student gender) fulfil their function in this model (and in all those estimated in this research). In particular, for every standard deviation above or below the socioeconomic and cultural level, achievement in Mathematics was found to be 23.5 points above or below, and women obtained 16.36 fewer points on average. In the following models it was observed that the impact of socioeconomic status was similar, independently of the collective or the subject analysed (between 22 and 24 points), but the impact of gender was completely different for each discipline, ranging from 16 to 18 negative points in Mathematics to 17 to 18 positive points in Reading and 8 to 9 negative points in Science.

Table 2 Impact of school segregation on achievement in Mathematics among non-native students in Spain Results of the two-tier multilevel modelling process

	Model 1	Model 2	Model 3	Final model
	B (EE)	B (EE)	B (EE)	B (EE)
Fixed part				
Intercept	506.02 (2.73)	509.09 (2.71)	507.75 (2.79)	510.44 (2.75)
Family SES	23.49 (1.34)	22.69 (1.35)	23.37 (1.35)	22.58 (0.54)
Gender (male/female)	-16.36 (2.71)	-16.32 (2.71)	-16.35 (2.70)	-16.31 (1.36)
SES segregation		-3304 (994.61)		-3178.53 (982.71)
Immigrant segregation			-1083.16 (430.35)	-938.41 (431.41)
Random part				
Among schools	433.29 (75.88)	365.15 (54.40)	412.00 (79.97)	348.54 (56.78)
Among students	3649.39 (194.89)	3647.72 (194.33)	3648.65 (194.90)	3647.24 (194.36)
% variance of interest at school level	0.00	15.73	4.91	19.56

Source:Compiled by the author from Pisa-2015.

The modelling process for native students yields different results (table 3). Both the degree of segregation at the school by socio economic status and by national origin, and segregation by these two combined, contribute significantly to the model with control variables

(model 1). Nevertheless, in this case achievement variance at the school level is smaller, explained by socioeconomic segregation (12.1 versus 15.7) and school variance is greater, explained by immigrant segregation (9.5 versus 4.9). The variance explained by both segregation types combined is statistically insignificant (22 points on average, with a standard error of 51.9 on average).

Table 3 Impact of school segregation on achievement in Mathematics among native students in Spain. Results of the two-tier multilevel modelling process

	Model 1	Model 2	Model 3	Final model
	B (EE)	B (EE)	B (EE)	B (EE)
Fixed part				
Intercept	506.96 (2.03)	509.41 (2.03)	508.93 (2.04)	511.02 (2.05)
Family SES	23.23 (0.88)	22.42 (0.91)	23.08 (0.89)	22.29 (0.91)
Gender (male/female)	-17.65 (1.96)	-17.64 (1.96)	-17.65 (1.96)	-17.63 (1.96)
SES segregation		-3141.72 (696.64)		-2939.59 (682.76)
Immigrant segregation			-1548.47 (368.57)	-1408.72 (368.46)
Random part				
Among schools	444.84 (56.37)	390.99 (50.30)	402.70 (53.82)	355.28 (47.12)
Among students	3504.38 (124.46)	3502.40 (124.31)	3503.73 (124.48)	3502.11 (124.35)
% variance of interest at school level	0.00	12.11	9.47	20.13

Source:Compiled by the author from Pisa-2015.

3.2 Achievement in Reading

The results for the differential impact of school segregation on achievement in Reading in non-native and native students is similar in many ways to the previous analysis but show certain differentiating features.

The multilevel modelling process to explain achievement in Reading among non-native students indicates, first of all, that students' gender and socioeconomic status both have a significant impact (model 1). On examining their effects, we see that socioeconomic segregation at the school where non-native adolescents are enrolled gives rise to a significant contribution. In concrete terms, the percentage variance in Reading achievement at school level explained by socioeconomic school segregation is 8.4.

By contrast, immigrant segregation does not give rise to a significant contribution to the model (model 3), rendering its effects statistically insignificant. With these data, the model that uses both segregation types jointly is no longer useful, as it would coincide with model 2.

The modelling process for achievement in Reading among native students yields different results to those found for non-native students. The control variables fulfilled their functions in similar magnitudes, but the contribution per segregation type differed.

The contribution from socioeconomic segregation was significant, accounting for 8.4% of variance at school level. The immigrant likewise generated a significant contribution, accounting for 7.7% of variance at school level.

Table 4 Impact of school segregation on achievement in Reading among non-native students in Spain Results of the three-tier multilevel modelling process

	Model 1	Model 2	Model 3
	B (EE)	B (EE)	B (EE)
Fixed part			
Intercept	500.25 (2.93)	502.46 (3.04)	501.50 (2.98)
Family SES	22.56 (1.41)	21.90 (1.42)	22.45 (1.42)
Gender (male/female)	17.65 (2.73)	17.62 (2.73)	17.66 (2.73)
SES segregation		-2,452 (910.40)	
Immigrant segregation			-792.40 (474.43)*
Random part			
Among schools	438.96 (82.96)	403.36 (83.84)	428.40 (86.48)
Among students	3918.74 (189)	3917.46 (189.38)	3918.27 (189.35)
% variance of interest at school level	0.00	8.11	0.00

Note: Weighted data. * Not significant at 0.05.
Source: Compiled by the author from Pisa-2015.

This shows that the influence of socioeconomic segregation is slightly greater among native students (8.54% as opposed to 8.11%), but these differences are not significant. The influence of immigrant segregation is greater among native students (7.7% variance of interest), given that its effects are not significant for non-native students.

Table 5 Impact of school segregation on achievement in Reading among native students in Spain Results of the three-tier multilevel modelling process

	Model 1	Model 2	Model 3	Final model
	B (EE)	B (EE)	B (EE)	B (EE)
Fixed part				
Intercept	498.36 (2.25)	500.70 (2.30)	500.36 (2.22)	502.35 (2.29)
Family SES	21.90 (0.91)	21.23 (0.93)	21.75 (0.92)	21.11 (0.93)
Gender (male/female)	17.74 (1.94)	17.75 (1.95)	17.75 (1.94)	17.76 (1.95)
SES segregation		-2958.18 (733.27)		-2747.12 (718.73)
Immigrant segregation			-1582.09 (517.38)	-1448.07 (517.18)
Random part				
Among schools	575.95 (83.05)	527.37 (80.85)	531.42 (71.26)	489.12 (70.24)
Among students	3730.57 (127.24)	3729.28 (127.27)	3730.13 (127.23)	3729.08 (127.26)
% variance of interest at school level	0	8.44	7.73	15.08

Note: Weighted data.
Source: Compiled by the author from Pisa-2015.

3.3 Achievement in Science

The results of the multilevel process for achievement in Science are similar to those found for achievement in Reading. Having ascertained that both family socioeconomic status and student gender fulfilled their function as control variables for non-native and native students, the influence of socioeconomic segregation on achievement in Science was found to

be significant, and strong in both cases. For non-native students, this accounts for 10.4% of the variance in school achievement (table 6) and for native students 9.7% (table 7). The contribution from immigrant segregation, however, was found to be insignificant for non-natives and significant for native students, explaining up to 7.0% of variance.

Thus, the impact of socioeconomic segregation is high and similar for native and non-native individuals, whereas immigrant segregation only affects native students and has considerably lower impact than socioeconomic segregation.

Table 6 Impact of school segregation on achievement in Science among non-native students in Spain Results of the three-tier multilevel modelling process

	Model 1	Model 2	Model 3
	B (EE)	B (EE)	B (EE)
Fixed part			
Intercept	511.16 (2.95)	513.65 (3.05)	512.42 (3.03)
Family SES	24.28 (1.45)	23.49 (1.47)	24.17 (1.46)
Gender (male/female)	-8.44 (2.87)	-8.41 (2.87)	-8.43 (2.86)
SES segregation		-2772.66 (984.63)	
Immigrant segregation			-795.60 (421.12)*
Random part			
Among schools	438.32 (84.00)	392.54 (54.40)	427.95 (88.21)
Among students	4356.35 (211.04)	4354.63 (210.91)	4355.67 (211.02)
% variance of interest at school level	0.00	10.44	0.00

Note: Weighted data. * Not significant at 0.05.
Source: Compiled by the author from Pisa-2015.

Table 7 Impact of school segregation on achievement in Science among native students in Spain Results of the three-tier multilevel modelling process

	Model 1	Model 2	Model 3	Final model
	B (EE)	B (EE)	B (EE)	B (EE)
Fixed part				
Intercept	509.87 (2.17)	512.12 (2.22)	509.87 (2.17)	513.57 (2.24)
Family SES	23.78 (0.94)	22.97 (0.97)	23.62 (0.95)	22.82 (0.98)
Gender (male/female)	-8.86 (2.09)	-8.85 (2.10)	-8.86 (2.09)	-8.84 (2.09)
SES segregation		-2931.19 (735.73)		-2754.71 (714.82)
Immigrant segregation			-1399.65 (480.49)	-1271.79 (464.66)
Random part				
Among schools	483.00 (69.80)	436.36 (66.25)	449.11 (63.11)	407.34 (60.25)
Among students	4148.72 (138.74)	4146.98 (138.75)	4148.06 (138.74)	4146.84 (138.76)
% variance of interest at school level	0.00	9.66	7.01	15.67

Note: Weighted data.
Source: Compiled by the author from Pisa-2015.

4 DISCUSSION AND CONCLUSIONS

This research helps to explain the impact of school segregation on the basis of socioeconomic status and national origin on the academic achievement of native and non-native students in Spain. The findings confirm that the problem affects the academic achievement of the two groups differently, while highlighting that socioeconomic segregation has a greater and more widespread influence on both population groups.

Among non-native students, both socioeconomic and immigration segregation negatively affect achievement in Mathematics, with a combined influence of 19.6%. These results, however, indicate that immigrant segregation only affects achievement among non-natives in this subject, while in Language and Science no statistically significant relation was found. The impact of socioeconomic segregation was nevertheless found to be significant in all subjects, reaching higher impact levels in Mathematics and Science than those observed in native students. Therefore, the immigrant student group is shown to be more sensitive to the harmful effects of segregation in the educational system.

Achievement among native students, moreover, is somewhat less affected by socioeconomic segregation in the subjects of Mathematics and Science, but in Language the impact is greater. In addition, and in contrast to non-native students, native students' achievement is sensitive to immigrant segregation in all three subjects examined. In all cases, however, immigrant segregation has less influence than segregation by socioeconomic status on achievement among native students, reaching a difference of 2.6% in Mathematics and 2.7% in Science.

These results are in line with previously conducted research. In coincidence with national and international findings, this study has also shown that socioeconomic segregation has negative repercussions on student achievement levels in Spain. This affects native and non-native students alike. As for immigrant segregation, the research results coincide in large measure with those obtained by Calero et al. (2009). As in the results of the above researchers, immigrant segregation was not found to affect non-native students' achievement in Language and Science but did prove to have an impact on native students' achievement in all three subjects surveyed. In the case of Mathematics, however, the results of this study match those of Garrido-Medina and Cebolla-Boado (2010), in that segregation on the grounds of origin affects achievement in both population groups.

Knowledge of the subtle ways in which segregation influences in student achievement helps us to understand this phenomenon, but the results show that certain types of school segregation are generally harmful to all students' performance. This is such a serious matter that it outweighs any differences between population groups and calls for urgent political action. Indeed, school segregation on socioeconomic grounds is always significant, and always has a considerable impact on achievement, regardless of students' national origin or the field of knowledge in question. This is probably the principal outcome of this research. A field of study is thus revealed, that has hardly been addressed in Spain but that, nevertheless, is key to assuring the pertinence of the political measures adopted, as resources may be being ill-spent on researching and taking action on a type of segregation with lower impact on students' achievement than socioeconomic segregation. These results are in line with

those obtained internationally (Agirdag et al., 2012; Dumay & Dupriez, 2008; Park & Kyei, 2010; Rumberger & Palardy, 2005; Ryabov & Van Hook, 2007; Van der Slik et al., 2006). In Spain, there is also a systematic (and negative) influence between socioeconomic segregation and students' academic achievement, while this does not hold to the same extent under immigrant segregation.

This research, therefore, confirms some of the results gathered from a number of Spanish research studies and, further, allows a comparison to be drawn for these two population groups (as well as between them) between socioeconomic and origin-based variables. At the same time, it gives a warning of the influence exerted by the socioeconomic variable and helps to put into perspective the generally accepted discourse that blames the diverse national provenance of the students in the classroom for poorer-than-expected results. Now we know that the influence of immigrant segregation is far smaller than the influence exerted by students' family socioeconomic and cultural status. It is clear, however, that these two are deeply interrelated.

Quantitative studies conducted with large data samples provide an invaluable overall perspective, but not an understanding of the phenomenon. However, although this research opens the door to further studies of this type, an awareness of the context and the findings of international studies will give us an insight into some of the reasons. The proportion of students with a low socioeconomic status impinges on the students' own expectations, as well as their parents' and their teachers', regarding academic achievement. This impact is so powerful and sustained that it permeates school culture and becomes part of the behaviour patterns at school. This leads to predominantly low expectations with regard to students' performance, and the feeling or belief that participants have no control over educational success. The 'peer effect' works on the individual level and (what is worse) also at school level, when this belief becomes institutionalised in the behaviour patterns of academic culture (Agirdag et al., 2012) .

This line of research should be enlarged, but its consequences respecting policy planning are immediate. The principal problem in the relationship between segregation and academic achievement is of a socioeconomic nature, hence research in this field contributes to guiding educational policies toward a variable that has greater influence on students' performance. Should it be confirmed, furthermore, that the impact of segregation operates chiefly through the peer effect and the 'sense of futility' at schools, the problem will not be resolved with minor decisions. It is likely that making changes in the conditions within those schools by concentrating greater numbers of students with a low socioeconomic status (for instance, organisational innovations or increased resources) may mitigate the effects of the problem but will not solve it. We should not overlook that research on segregation yields empirical evidence of the fact that resources and learning opportunities at schools are not neutral with respect to their social composition (Rumberger & Palardy, 2005).

This research has strengths that deserve attention, including, for instance, the use of data that are current, reliable and statistically representative at student level. For this type of analyses, PISA provides essential information. It also encourages the use of multilevel analysis, which yields complex and rigorous information. Likewise, the use of the Hutchens Square

Root segregation index, which clearly improves on earlier estimates focused on the percentage of non-native students, as it contextualises this data linking it to distributive equity. Among the weaknesses of the study is the small number of students per school which, in addition to the low percentage of non-native students, may give rise to some reliability problems. This problem, specific to PISA, is compensated for in the size and representativeness of the sample.

Building a fairer and more comprehensive society demands an educational system that features these same traits. School segregation is an inequity factor that undermines equal opportunities, since studying at a school with a high concentration of disadvantaged population directly affects students' academic achievement. Segregation in the educational system has disastrous consequences and affects native and non-native students alike. It is essential to take measures to counter the rising trend in segregation, and to address socioeconomic segregation more urgently than immigrant segregation as it affects both population groups and has a particularly strong impact on the more vulnerable population group.

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