The Effect of Immigration on Education

Giorgio Brunello, Department of Economics and Management, University of Padova

https://doi.org/10.1093/acrefore/9780190625979.013.664
Published online: 26 April 2021

Summary

Does a higher share of immigrants affect the school performance of both immigrants and natives? Do desegregation policies improve efficiency? The existing evidence suggests that a higher share of immigrants has a negative (and often sizable) effect on the school performance of immigrants and a negative but probably small effect on the performance of natives. When average school performance is considered, this asymmetry generates concave peer effects, a key condition for the efficiency of desegregating policies. The broad message from the empirical literature is that these policies are not only equitable, in that they provide better opportunities to individuals with relatively low parental background, but also efficient.

Keywords: immigration, education, natives, segregation, school performance

Introduction

Immigration flows have changed the composition of students in the classes and schools of receiving countries. The integration of immigrants is often problematic, and these flows sometimes trigger the flight of natives from schools that have a high share of immigrants.

A key question is whether the increased share of immigrants in schools and classes has a negative effect on the school performance of immigrants and natives. In the economics literature, this type of effect is called “peer effect.” The influence of immigrant students on their native classmates is a particular type of peer effect: immigrants are peers with a different culture, a different way to interact with others, and, most often, limited language proficiency.

Due to economic conditions, immigrant pupils usually concentrate in less affluent neighborhoods, where housing prices are lower.[1] Typically, the schools in these neighborhoods are attended both by immigrants with limited language proficiency and by natives with relatively poor parental background. Because some natives with more affluent parental background may leave schools and neighborhoods that have a high share of immigrants, school segregation is likely to increase. Some schools will attract mainly natives and other schools will attract immigrants. If a higher share of immigrants has a negative effect on the school performance of natives and immigrants, school segregation increases the dispersion of educational outcomes.

Equality considerations suggest that appropriate policies should be designed to reduce segregation and improve equality of opportunity. However, are desegregation policies also justified on efficiency grounds? Redistributing students from schools with a higher share of immigrants to schools with a lower share may improve performance in the former at the price of reducing performance in the latter. Efficiency increases if adding up gains and losses results in a net gain, for instance because average performance increases.

This article addresses these questions from an economic perspective. The first section documents the changes in the share of immigrants in the schools of Europe, the United States, and Australia, and introduces a measure of school segregation, the index of dissimilarity. It shows how segregation has changed over 15 years (2003–2018) and how the changes relate to school performance, which is measured by the standardized test scores of 15-year-old students.

The second section considers how an increased inflow of immigrant pupils can trigger the flight of natives from schools, thereby exacerbating school segregation by immigrant status. This flight is clearly encouraged when school enrollment is not based exclusively on residence criteria.

The third section looks in some detail at both the equity and the efficiency implications of school segregation, and establishes under what conditions policies that reallocate students from schools with a high share of immigrants to schools with a low share can improve efficiency, which is measured by total (or average) school performance. These conditions require that immigrant peer effects are not only negative but also nonlinear and concave, meaning that the marginal gain from reducing the share of immigrants in a school with many immigrants dominates the marginal loss from increasing the share in a school with few immigrants. Concavity occurs for instance when peer effects are negative and linear but higher for immigrant than for native pupils.

The fourth section reviews selected empirical evidence on the effects of the share of immigrants on school performance of natives and immigrants, without pretending to cover all existing contributions. The fifth section concludes.

Immigrant Students and School Segregation

What the International Data Show

The flow of immigrants into Organisation for Economic Co-operation and Development (OECD) member countries increased sharply in the early 21st century. In 2017, more than five million new permanent legal immigrants reached their destination (OECD, 2018). Migration is affecting the receiving countries in many ways, including their classrooms and schools. An estimate of the evolution of the share of immigrant pupils in OECD (secondary) schools can be obtained using the Programme for International Student Assessment (PISA).[2]

Table 1 shows the average share of immigrant students in the schools of several European countries, Australia, and the United States, both in 2003 and 2018. In 2003, this share was highest in Australia (22.7%) and Switzerland (20%) and lowest in Finland (1.9%) and Italy

(2.1%). Fifteen years later, the share of immigrants has increased everywhere, with the exception of France and Latvia. The increase has been highest in Switzerland (+12.8%), Ireland (+13.8%), and the United Kingdom (+10.5%).

Table 1. Average Share of Immigrants in OECD Schools

Country	Average Share of Immigrants in Schools—2018	Average Share of Immigrants in Schools—2003	Change in the Share Between 2003 and 2018
Austria	22.4	13.3	9.1
Belgium	17.6	11.8	5.8
Switzerland	32.8	20.0	12.8
Czech Republic	4.09	1.3	2.8
Germany	19.0	15.4	3.6
Denmark	10.4	6.5	3.9
Spain	11.8	3.4	8.4
Finland	5.6	1.9	3.7
France	14.0	14.3	-0.3
Great Britain	18.5	8.0	10.5
Greece	11.5	7.4	4.1
Hungary	2.5	2.3	0.2
Ireland	17.3	3.5	13.8
Italy	9.7	2.1	7.6
Latvia	4.3	9.4	-5.1
The Netherlands	13.3	11.0	2.3
Norway	11.8	5.6	6.2
Portugal	6.5	5.0	1.5
Sweden	19.8	11.5	8.3

Country	Average Share of Immigrants in Schools—2018	Average Share of Immigrants in Schools—2003	Change in the Share Between 2003 and 2018
United States	22.3	14.4	7.9
Australia	24.6	22.7	1.9

Note: Average share measured as the percentage of total enrollment of 15-year-old students.

Source: OECD PISA.

Measures of School Segregation by Immigrant Status

An important issue is how the increasing share of immigrants is distributed across schools. Due to economic conditions, immigrants usually concentrate in less affluent neighborhoods, where housing prices are lower. In the traditional catchment area model, students are assigned to a school in their neighborhood. Thus, whenever housing is highly segregated, schools tend to be segregated as well. The schools perceived to be of better quality are often located in areas where property prices and rents are higher. Good quality schooling has an implicit price in the housing market and migrant students from low socioeconomic backgrounds may not have access to it (OECD, 2010).

Typically, the schools in poorer neighborhoods are attended both by immigrant students with limited language proficiency and by native students with a relatively poor parental background. School segregation by immigrant status occurs when immigrants and natives concentrate in specific schools. A measure of segregation is the unevenness of the distribution of the share of immigrant pupils among schools. A popular indicator for an uneven or imbalanced distribution is the *dissimilarity index* (D; or Duncan index), which measures the proportion of a certain group of students who would have to be reassigned to other schools in order to achieve the same proportion in each school as for the whole area (Duncan & Duncan, 1955).

The dissimilarity index D is defined as follows:

$$\mathrm{D} = \frac{1}{2} \sum_{\mathrm{s}} \left| \frac{\mathrm{M_s}}{\mathrm{M}} - \frac{\mathrm{N_s}}{\mathrm{N}} \right|, \tag{1}$$

where $\mathrm{M_s}$ and $\mathrm{N_s}$ are the number of immigrants and natives in school s and M and N are the total number of immigrant and native students. This index adds across schools the absolute difference between the share of immigrants $\frac{\mathrm{M_s}}{\mathrm{M}}$ and the share of natives $\frac{\mathrm{N_s}}{\mathrm{N}}$, and is equal to 0 in the case of equal distribution and to 1 with full segregation.

Compared to alternative indices of polarization, which are closely related to the Herfindhal index, the dissimilarity index is a natural choice when there are two complementary groups. The index is computed using data from PISA 2018, which focuses on 15-year-old students. Figure 1 plots D against the contemporaneous average share of immigrants in schools. The correlation between these two variables is—as expected—negative.[3] This indicates that when immigrant students are more numerous, they are more evenly distributed across schools. The dissimilarity (or Duncan) index is highest in Lithuania and lowest in Ireland, Croatia, and Switzerland.

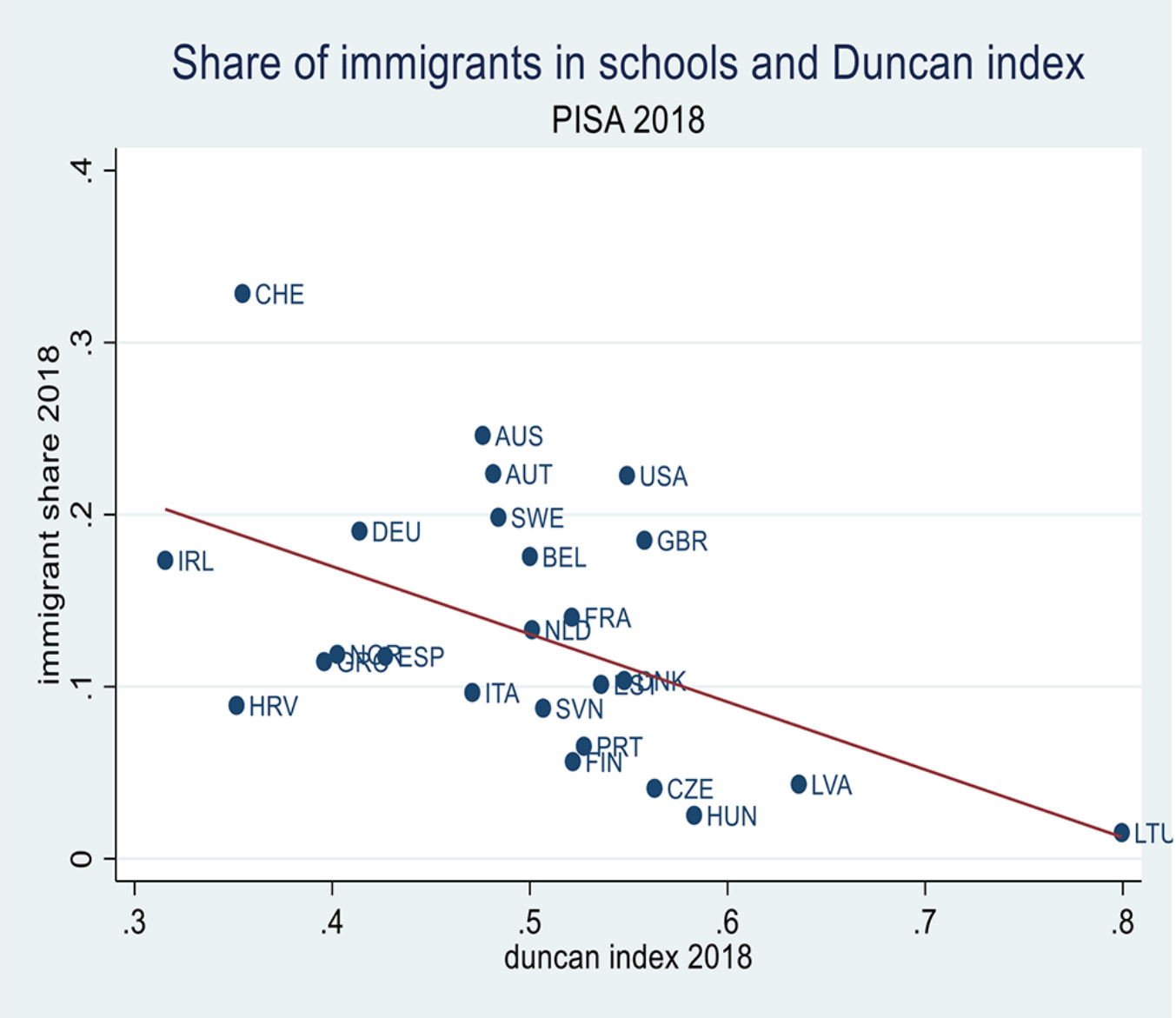

Figure 1. Country-specific segregation and share of immigrants.

Notes: AUS: Australia; AUT: Austria; BEL: Belgium; CHE: Switzerland; CZE; Czech Republic; DEU: Germany; DNK: Denmark; ESP: Spain; EST: Estonia; FIN: Finland; FRA: France; GBR: Great Britain; GRC: Greece; HRV: Croatia; HUN: Hungary; IRL: Ireland; ITA: Italy; LVA: Latvia; LTU: Lithuania; NLD: Netherlands; NOR: Norway; PRT: Portugal; SVN: Slovenia; SWE: Sweden; USA: United States.

Source: PISA (2018). Author's computations using original and publicly available data.

Figure 2 shows how the measure of segregation changed between 2003 and 2018. The dissimilarity index increased in Australia, Hungary, and Latvia, and decreased in all other countries, especially in Greece, Italy, and the Czech Republic.

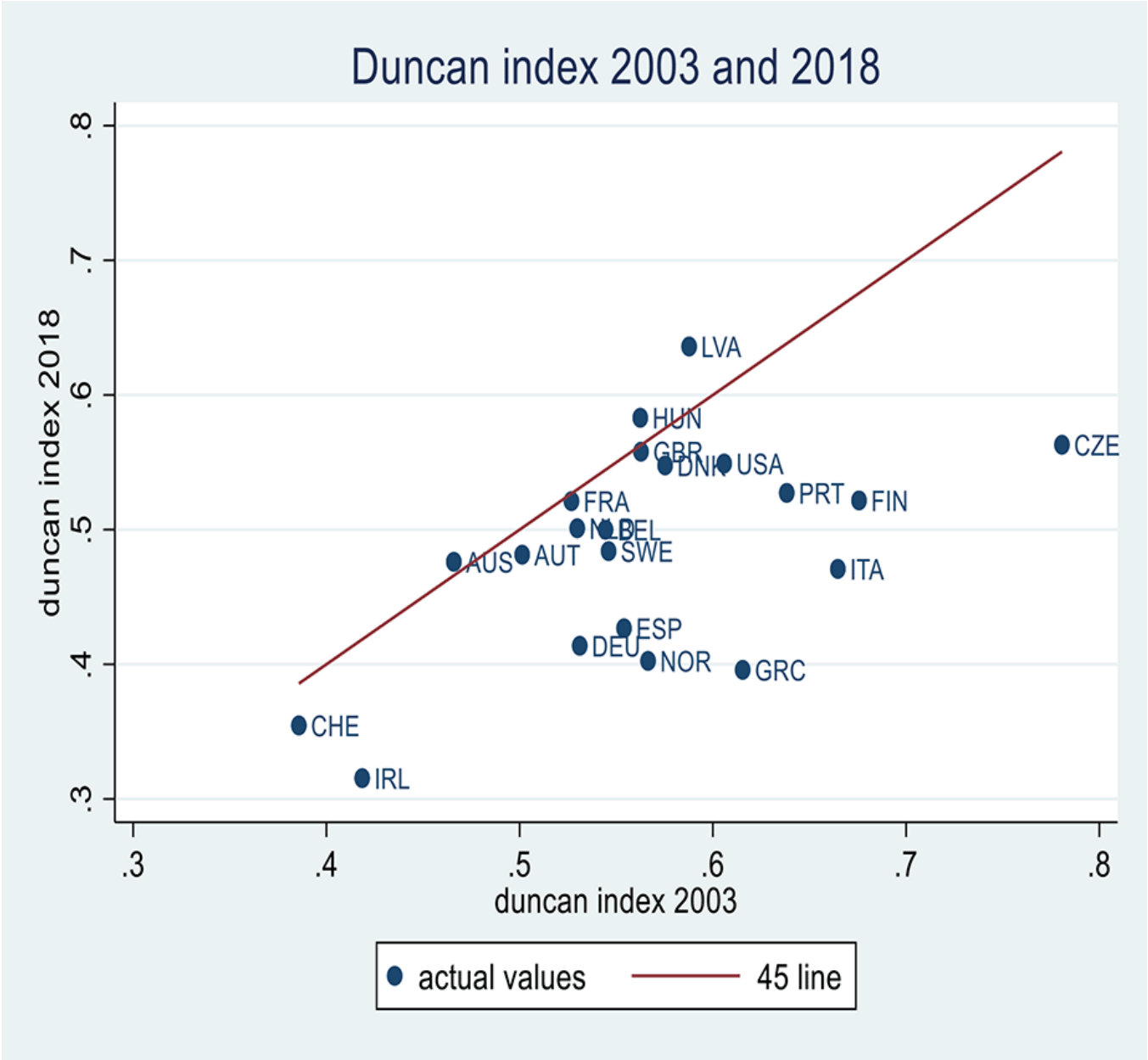

Figure 2. Country-specific segregation in 2003 and 2018.

Notes: AUS: Australia; AUT: Austria; BEL: Belgium; CHE: Switzerland; CZE; Czech Republic; DEU: Germany; DNK: Denmark; ESP: Spain; FIN: Finland; FRA: France; GBR: Great Britain; GRC: Greece; HUN: Hungary; IRL: Ireland; ITA: Italy; LVA: Latvia; NLD: Netherlands; NOR: Norway; PRT: Portugal; SWE: Sweden; USA: United States.

Source: PISA (2003 and 2018). Author's computation using original and publicly available data.

Segregation and School Performance

A key question is whether school segregation, and in particular the concentration of immigrants in some schools, affects both total student achievement—an important predictor of economic growth according to Hanushek and Woessmann (2010)—and the average achievement of immigrants and natives. Figure 3 looks at the simple correlation between the index D and average math test scores at age 15 in 2018. The evidence suggests absence of correlation: for instance, Ireland and the Czech Republic exhibit very similar average test scores but substantially different indices of segregation.

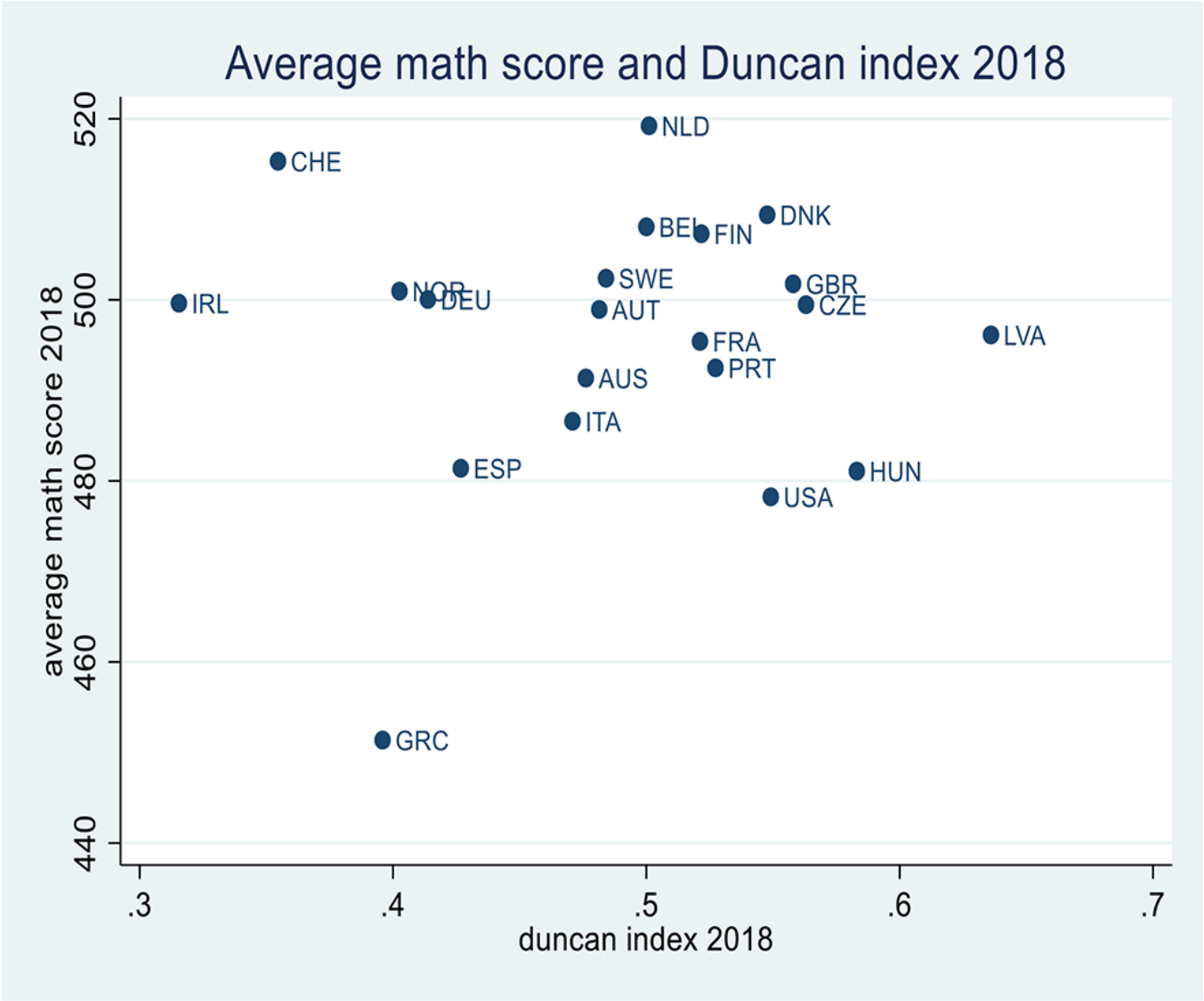

Figure 3. Country-specific segregation and math test scores in 2018.

Notes: AUS: Australia; AUT: Austria; BEL: Belgium; CHE: Switzerland; CZE; Czech Republic; DEU: Germany; DNK: Denmark; ESP: Spain; FIN: Finland; FRA: France; GBR: Great Britain; GRC: Greece; HUN: Hungary; IRL: Ireland; ITA: Italy; LVA: Latvia; NLD: Netherlands; NOR: Norway; PRT: Portugal; SWE: Sweden; USA: United States.

Source: OECD PISA. Author's computation using original and publicly available data.

Needless to say, correlation is not causation, because many factors are likely to affect both average test scores and the distribution of immigrants in schools. For instance, countries with higher test scores—and possibly higher income—may attract more immigrants, which is likely to reduce the index of segregation and to induce a negative bias in the estimated correlation. Identifying the causal effect of segregation on average test scores would require sources of exogenous variation that affect the allocation of immigrants in schools without any direct effect on test scores. An example would be an unexpected event that changes the share of immigrant pupils and its distribution. Finding this variation using cross-country data is a difficult task.

There are several factors that could affect ethnic segregation in schools. One is the combined effect of demographic trends and residential segregation (see OECD, 2010). Since the 1970s, immigrants in most industrialized countries have been concentrating in metropolitan areas

and in certain districts within those areas. At the same time, the number of native residents has been falling. By consequence, the proportion of immigrant students has increased and the proportion of native students has fallen. Second, parental choice matters. Two dimensions of this choice are discussed in the next section: the flight of natives from schools with a high immigrant share and the removal of residence-based admission criteria.

The Flight of Natives From Schools

One of the consequences of the increased share of immigrants in local schools is that natives may abandon these schools and flee to institutions with fewer or no immigrants, and by so doing exacerbate school segregation. This phenomenon has been denoted by Betts and Fairlie (2003) as “native flight,” or the tendency of native-born Americans to leave public schools for private alternatives following an influx of immigrants, who are perceived to affect the school performance of natives. This flight does not necessarily involve only moves from public to private schools, as is typical in the United States, but could occur also from the local public school to another public school within the same municipality or even outside it.

The flight of natives from schools with a high share of immigrants has also been investigated in the European context. Using data from Copenhagen school registers and other sources, Rangvid (2010) asked whether Danes were more likely to opt out of their local public school if it had a large concentration of immigrant pupils. She found that the opting out decisions of natives were not affected until the immigrant concentration reached the 35% tipping point. Above that point, however, Danes opted out to a private school or to another public school within the municipality. Interestingly, Danish-speaking immigrants also opt out of schools with high immigrant concentrations, but to a much lower extent than natives. Rangvid concluded that ethnic segregation in schools is increased by the differential behavior of natives and immigrants.

School choice, which allows students to apply for admission to schools located outside their neighborhood, can increase efficiency by making local schools more responsive to parental preferences. However, this may come at the cost of increasing school segregation, as students get sorted by ability, ethnicity, and parental background, with the most disadvantaged students becoming isolated in the worst schools.

In countries allowing for school choice, the concentration of students along sociodemographic lines is sometimes reinforced by the choices that parents make regarding the school in which they enroll their children. Research shows that native parents are more likely than migrant parents to use school choice and opt out of schools with a high concentration of migrants, thus reinforcing school segregation (OECD, 2010).

Soderstrom and Uusitalo (2010) investigated the effects of a large-scale admission reform that occurred in Stockholm upper secondary schools in 2000. Even prior to the reform, students could apply to any school within Stockholm, but school assignment was based on residence if the school was oversubscribed. The 2000 reform abolished all residence-based admission criteria, and admission became based on previous grades only. The intention was to undo the effects of residential segregation and to give the opportunity of attending the most prestigious schools in downtown Stockholm to all students, irrespective of where they lived.

Soderstrom and Uusitalo (2010) found that the distribution of students among schools changed dramatically after the reform, with an increase in sorting students into schools based on ability and in the segregation between immigrants and natives.

School Segregation: Efficiency and Equity Issues

Should public policy intervene to desegregate schools? This question can be answered from various perspectives. From an economic perspective, public intervention is typically justified in the presence of "market failures" that limit individual choice and hinder the possibility of attaining the optimal allocation of (scarce) resources. At least since Milton Friedman, a Nobel laureate economist, it has been widely recognized that disadvantaged individuals may lack the economic resources to fully implement school choice and may therefore remain trapped in the worst schools.

In several OECD countries, the access of migrant students to high-quality education tends to be restricted by residential segregation, liquidity constraints, and poor parental background (or "long-term liquidity constraints" in the parlance of Carneiro & Heckman, 2002). In addition, their education is often interrupted because they tend to drop out and leave school before completion more frequently than natives.

An important question is whether desegregating schools improves efficiency, which is defined as total student achievement. The answer to this question depends on the nature of the interactions between natives and immigrants in school. It seems clear that if the share of immigrants (natives) in a school has negative effects *only* on native (immigrant) students, total segregation may improve average performance. However, if each group has positive effects only on members of the other group, having mixed classes is likely to be optimal. When the share of immigrants has negative effects on the school performance of both immigrants and natives—that is, when peer effects are negative—two concepts are important to establishing whether desegregation improves average school performance (see Andersen & Thomsen, 2011): nonlinear peer effects and asymmetric peer effects.

Nonlinear Peer Effects

Consider a prototype society with two schools, 1 and 2, that differ in their share of immigrant pupils, s_1 and s_2, and assume that $\mathrm{s}_1 > \mathrm{s}_2$. Let average pupil performance in each school $\mathrm{p}_\mathrm{i}, \mathrm{i} = 1, 2$, be a linearly decreasing function of the share s_i, so that $\mathrm{p}_\mathrm{i} = \beta_0 - \beta_1 \mathrm{s}_\mathrm{i}$, where the peer effect β_1 is constant across schools. This is equivalent to assuming that a higher share of immigrants negatively affects school performance and that peer effects, or the effects of the share of immigrants on school performance, are linear and constant across schools. On the one hand, reducing the share of immigrants in school 1 by 10% (0.1) increases performance in that school by $0.1\,\beta_1$. On the other hand, increasing the share in school 2 by 10% reduces performance in that school by $0.1\,\beta_1$.

Further denote $\mathrm{T}_\mathrm{i} = \mathrm{I}_\mathrm{i} + \mathrm{N}_\mathrm{i}$ as the total number of students in school i, with I for immigrants and N for natives, and let $\mathrm{T} = \mathrm{T}_1 + \mathrm{T}_2$ and $\mathrm{t} = \mathrm{T}_1/\mathrm{T}$. With this notation, total student performance in the two schools, W, is given by

$$W = T_1 p_1 + T_2 p_2 = T\left[t p_1 + (1-t) p_2\right] = T\left\{\beta_0 - \beta_1\left[t s_1 + (1-t) s_2\right]\right\}, \tag{2}$$

where $[ts_1 + (1-t)s_2]$ is the weighted share of immigrant students.

Consider a policy that reallocates immigrant students from school 1 to school 2 up to the point when the share of immigrants in each school is equal to $ts_1 + (1-t)s_2$. It is clear from (2) that, by reallocating students in this way, the policy eliminates segregation without any effect on total performance: by reducing the share of immigrants in school 1, performance in that school increases, but this increase is equal to the reduction in the performance of pupils in school 2, where the share of immigrants has increased. In this case, desegregating schools does not lead to efficiency gains because total performance is unchanged, but it does generate equity gains because equality between schools increases.

Assume that the negative effects of the share of immigrants on student performance increase with the share itself, or, alternatively, that the negative peer effect of an extra immigrant student is not constant as before but higher in school 1, which has many immigrants, than in school 2. Under this assumption, peer effects are nonlinear, and the function relating school performance to the share of immigrants, $p_i = f(s_i)$, is concave in s_i.[4] As in the previous thought experiment, consider a reallocation of immigrants from school 1 to school 2, such that the share of immigrants in the two schools becomes equal to $ts_1 + (1-t)s_2$. Before reallocation, total school performance was equal to $T\left[tf(s_1) + (1-t)f(s_2)\right]$. After reallocation, it is given by $T\left[f(ts_1 + (1-t)s_2)\right]$. A property of the concavity of $f(s_i)$ is that

$$T\left[f(ts_1 + (1-t)s_2)\right] > T\left[tf(s_1) + (1-t)f(s_2)\right]. \tag{3}$$

In this case, desegregating schools improves not only equality but also overall school performance, because the gain to school 1 induced by the reduction in its share of immigrants is larger than the loss to school 2 due to the increase in its share. Desegregation benefits the school with many immigrants at the expense of the school with few immigrants, but the balance of gains and losses is positive.[5] Under the assumption that higher total performance is conducive to higher output per head and higher GDP growth, the entire economy benefits from redistribution. Concavity of the relationship between school performance and the share of immigrants implies that average performance when both schools have the average share of immigrants is higher than average performance when schools have different shares of immigrants.

Finally, consider the case when the negative peer effect of an extra immigrant student is lower in school 1, which has many immigrants, than in school 2. In this case, the function $f(s_i)$ associating school performance to the share of immigrants is convex, and school desegregation, which redistributes immigrants from school 1 to school 2, reduces overall performance because school 2 loses more than what school 1 gains from the reallocation of students.[6]

The discussion in the previous paragraphs clarifies why it is important not only to establish whether the share of immigrants reduces school performance but also to understand the nature of this eventual relationship, in particular whether it is linear or nonlinear. It is important to stress that evidence that peer effects are linear precludes the efficiency gains of redistribution but does not rule out desegregation policies, which can still be justified on equity grounds. To illustrate, assume that the objective function of the policy maker is to increase total school performance and decrease in the variance of performance across schools. In this case, although desegregation with linear peer effects may be not justified on sole efficiency reasons—no effect on total performance—it is still justified on equity reasons because it reduces the variance of school performance.

A special case (see Andersen & Thomsen, 2011) is when the negative effect of the share of immigrants in the school on average school performance occurs only above a threshold or tipping point s_t. In this case, when both s_1 and s_2 are below the threshold, the share of immigrants has no effect on school performance and desegregation policies have no impact on efficiency. However, if s_1 is above the threshold and s_2 is below it, reallocating immigrants from school 1 to school 2 so that both schools are below the tipping point improves both school performance in school 1 and total performance.

Asymmetric Linear Peer Effects

In the discussion of the previous section, it was assumed that the relationship between pupil performance in the school and the share of immigrants $p_i = \beta_0 - \beta_1 s_i$ does not vary across different groups of students. Yet one cannot exclude that the educational performance of immigrant students is more affected by the concentration of immigrants than the performance of natives. Assume for instance that immigrants suffer more than natives because of the higher share of immigrants—that is, $\beta_{1I} > \beta_{1N}$. Then the average school performance in school i is given by

$$p_i = s_i(\beta_0 - \beta_{1I} s_i) + (1 - s_i)(\beta_0 - \beta_{1N} s_i) = \beta_0 - \beta_{1N} s_i - (\beta_{1I} - \beta_{1N}) s^2{}_i. \quad (4)$$

Therefore, while the relationship between performance and the share of immigrants is linear for each group within the school, it is nonlinear for the average student in the school. In particular, if the (negative) impact of a higher share of immigrants is stronger for immigrant than for native students, equation (4) is concave, and reallocations of immigrants from a school with many immigrants to a school with fewer immigrants increases overall school performance.

In summary, when the share of immigrants negatively affects the school performance of immigrants and natives, desegregating schools by redistributing immigrants typically affects the equality of school outcomes but can also affect efficiency, depending on whether (a) peer effects are nonlinear; or (b) they are linear but asymmetric across natives and immigrants in the same school. Therefore, empirical evidence on the existence and the shape of the

relationship between the share of immigrants and school performance is essential to draw policy implications and to evaluate, from an economic perspective, policies that affect school segregation.

The Effect of the Share of Immigrants on the School Performance of Immigrants and Natives

In the economic and social literature, it is well known that peers represent an important educational input. Pupils are affected by their schoolmates, and these effects can be positive or negative. For instance, schoolmates can create either a disruptive or a collaborative and stimulating environment. They can be supportive in studying activities and share valuable information. Peers can also contribute to the formation of values and aspiration and serve as positive or negative role models.

The effects originated from the interactions among schoolmates are commonly referred to as “peer effects” and have been analyzed at length by the economic and sociological literature. Nonetheless, the literature investigating the specific question of whether class composition by ethnicity or immigrant status affects educational outcomes is relatively small and new.

Individual school performance can be affected by the share of students with an immigrant background in several ways. On the one hand, a high share of immigrant students may create a particularly problematic learning environment and adversely influence both native and immigrant students because of differences in initial skills and attitudes. A high share of students who do not master the language of instruction may hamper teaching activities. Immigrant children who attend a school with a high share of immigrant pupils face reduced exposure to native students, with potentially negative consequences both on their integration in the host country and on their educational outcomes. On the other hand, the cultural diversity of mixed classes and schools may generate a stimulating atmosphere with positive effects on learning processes. A high share of immigrant students might also help teachers and school authorities to recognize specific learning difficulties (“salience”) and undertake decisions aimed at overcoming them (Schneeweis, 2015).

Understanding the nature and the magnitude of peer effects in education is crucial for school design. If peer effects are at work, individual educational outcomes are affected by how children with an immigrant background and children of native parents are arranged across classes. Average outcomes are likely to be affected as well.

Empirical Issues

Largely, the empirical research done by economists in this area aims at establishing causal effects. Yet, the identification of the causal impact of school composition on educational outcomes is not straightforward because students and their parents choose their schools and consequently their peers. Immigrants typically locate in poorer areas and, consequently, their children attend schools with many lower-achieving native students. In addition, given their residential decision, households might have some degree of freedom in school choice and select schools based on expected peer characteristics and perceived quality.

Furthermore, the allocation of immigrant students among classes is not random, but is decided by the school administration. This implies that studies of peer effects based on simple econometric models that regress individual school outcomes on their own individual characteristics (measures of ability, family background, and so on) as well as on peer outcomes and characteristics are plagued by serious problems. One such problem is that it is impossible to separate the effects of peer outcomes from those of peer characteristics (the well—known “reflection” problem).

Another problem is self-selection. Since peers are not assigned randomly but are chosen, it is very likely that a student’s characteristics are correlated with those of their peers. If some of these characteristics are omitted from the analysis because they are not observed by the analyst, the resulting estimates of peer effects are biased. The induced bias can be either downward or upward. On the one hand, the fact that immigrant students self-select into schools attended by native students with low unobserved ability leads to overestimating the negative effect of the share of immigrants on performance because of the negative spurious correlation between the educational attainment of native students and the share of immigrant students in the school. On the other hand, the effect of the share of immigrants is likely to be underestimated if school authorities assign classes with a high share of immigrant pupils to better teachers.

To overcome these problems, the existing empirical literature has adopted various strategies: instrumental variables, aggregation of data at levels (the country, city, metropolitan area, or school) at which sorting is reduced or eliminated, and school fixed effect models that exploit the variation in the composition of immigrant within schools and between grades.

U.S. and European Evidence

While U.S. empirical research has often focused on racial minorities, European research has paid more attention to immigrants. Examples of U.S. research include Guryan (2004), who showed that the racial desegregation of American school districts in the 1970s–1980s benefited Black students by reducing their dropout rate. Angrist and Lang (2004) investigated the effects of the “Metco” school racial desegregation program, which sends mostly Black students from Boston schools to more affluent suburbs. They found no effect of “Metco” students on the test scores of White students in receiving districts, but a negative impact on the reading and language scores of their Black peers.

Hoxby (2000) used an identification strategy that relied on the variation in the ethnic composition of cohorts within schools and showed that the share of Black students in class has negligible effects on the performance of White students, but a negative impact on the test scores of Black students. The estimated negative effect is about four times larger for Black than for White students. In a similar fashion, Hanushek and Rivkin (2009), Hanushek, Kain, & Rivkin (2009), and Cooley (2014) found that immigrant peer effects are stronger for immigrant than for native pupils. In contrast, Friesen and Krauth (2011) studied the effects of the language spoken at home on educational attainment and found that the “within-group” effects are weaker than the “across-groups” effects.

Diette and Uwaifo Oyelere (2014) used education data from North Carolina between 1998 and 2006 and employed school by year fixed effects methods to control for potential selection into schools and over time. They estimated “Limited English” student peer effects on native students and found no significant effect on females in reading and math but negative effects for both Black and White males.

European evidence includes papers that focus exclusively on the effects of the share of pupils with an immigrant background on native students (Ballatore et al., 2018; Brunello & Rocco, 2013; Hardoy & Schøne, 2013), and others that also consider the impact of this share on immigrant students (Andersen & Thomson, 2011; Jensen & Rasmussen, 2011; Ohinata & Van Ours, 2013; Schneeweis, 2015).

Overall, results have been mixed. The estimated negative effects of the share of immigrants on native children range from sizable (Ballatore et al., 2018; Gould et al., 2009; Hardoy & Schøne, 2013), to small (Brunello & Rocco, 2013), to virtually zero (Geay et al., 2013; Ohinata & Van Ours, 2013; Schneeweis, 2015). While Jensen and Rasmussen (2011) found negative effects of ethnic concentration on both native and immigrant students, Ohinata and Van Ours (2013) and Schneeweis (2015) found no sizable effect on native students and negative effects on immigrant students.

Evidence on Nonlinear Peer Effects

Schneeweis (2015) allowed for a quadratic relationship between the share of immigrants and the educational outcomes of immigrants and natives, which includes the selection of an academic track after primary school and grade repetition in primary school, but found no support for such a relationship. However, when she restricted the share of immigrants to those belonging to the same country of origin, she found that a quadratic (and convex) specification fits the data for immigrants but not for natives. Schneeweis’s estimates suggest that the negative effects of ethnic concentration decline as the share of the own immigrant group becomes larger. This could depend on the fact that when the share of students from a specific ethnic group increases their specific needs become easier to identify and teachers and school administrators are able to manage them more effectively. In fact, students from the same ethnic group are more homogenous compared to the entire group of students with an immigrant background.

Gould et al. (2009) also investigated whether the effect of the share of immigrants on the performance of natives is nonlinear by adopting a quadratic specification. When their outcome variable was the dropout rate before completing 12th grade, they found no significant (linear or nonlinear) effect of the share of immigrants. This share, however, affects the probability that natives pass the matriculation exam, a requirement for access to college. Interestingly, the effect is nonlinear and convex,[7] indicating that the impact of the share on matriculation is smaller in schools with more immigrants. They estimated that increasing the immigrant concentration from 0% to 10% reduces the probability that a native student passes the matriculation rate by 4.2 percentage points. Adding an additional 10 points to the concentration—from 10% to 20%—reduces this probability by “only” 1.9% points.

These results, and those by Schneeweis (2015), suggest that the adverse effects of immigrants on the educational outcomes of natives are higher at lower levels of immigrant concentration. As previously noted, this could be due to the presence of returns to scale in the ability of schools to absorb immigrants and deal with their needs or the fact that the integration of immigrant students is easier in a context where there is a sufficiently high number of similar peers. In any case, convex nonlinear peer effects implies that redistributing immigrants from schools with a high share to schools with a low share of immigrants reduces total school performance and therefore reduces efficiency.

Results pointing in the opposite direction were found by Szulkin and Jonsson (2007), Andersen and Thomson (2011), Hardoy and Schøne (2013), and Brunello and Rocco (2013). Szulkin and Jonsson (2007) used Swedish data and regressed test scores on a set of dummy variables indicating arbitrarily sized bins of the share of immigrants. They found evidence that a critical threshold in their data is a 40% share of immigrant students: there is virtually no effect of the share on test scores in schools that do not reach this threshold. In schools with a share above the threshold, the estimated impact of the share becomes negative and sizable.

Andersen and Thomson (2011) found a slightly higher threshold, at 50%. They conducted a separate analysis for native Danish and immigrant students and found that the latter are more negatively affected by the share of immigrant students than the former. This is an example of asymmetric peer effects. Since the negative impact of the share is larger in absolute values for immigrant students, the relationship between average school performance (of natives and immigrants) and the share of immigrants is concave. Hardoy and Schøne (2013) found instead that the share of immigrants has no negative effects on student outcomes below 5% and negative effects above this threshold.

Overall, the evidence on nonlinear peer effect is mixed. Although there is some evidence—for Austria and Israel—that the relationship between immigrant concentration and educational outcomes is convex, most of the existing studies point to a concave relationship. Concavity is also confirmed by the multicountry study by Brunello and Rocco (2013).

As discussed in the section on “School Segregation: Efficiency and Equity Issues,” a concave relationship between the share of immigrants and educational outcomes suggests that the redistribution of immigrants from schools with a high share of immigrants to schools with a lower share not only improves equality of outcomes but also fosters economic efficiency.

Conclusion

This article has reviewed the economics literature on the school segregation of immigrants and on the effects of a higher share of immigrants on the performance of both immigrants and natives. Two questions have been discussed: (a) whether the share of immigrants in classes and schools has any effect on the performance of natives and immigrants; and (b) whether the shape of the relationship between the share of immigrants and average school performance can inform about the efficiency implications of desegregation policies.

The evidence suggests that the effects of a higher share of immigrants on school performance can be negative (and often sizable) for immigrants and negative but probably small for natives. Even assuming that peer effects are linear, this evidence points to an important asymmetry. When average school performance is considered, this asymmetry generates concave peer effects, a key condition for the efficiency of desegregation policies.

The evidence on nonlinear peer effect is not conclusive but broadly points to concavity. There is also evidence that tipping points—or thresholds in the share of immigrants—exist, and that the negative effect of the share of immigrants increases in absolute value above these points. Unfortunately, the estimated values of tipping points vary perhaps too broadly to provide useful policy recommendations, from 5% to 50%. Overall, the message seems clear: desegregation policies are not only equitable—they provide better opportunities to individuals with relatively low parental socioeconomic background—but also efficient.

Several desegregation policies have been implemented in the United States and in Europe, including admission lotteries, busing students from schools with a high share of immigrants to schools with low shares, additional resources to schools with a high share of immigrants, parental information, and the introduction of ceilings to the share of immigrants in classes and schools. Unfortunately, only some of these policies have been accurately evaluated, especially in the United States.

While the bulk of the evidence of admission lotteries suggests limited or no effects, there is some evidence for the United States and Denmark that busing policies may work in improving the school performance of immigrants. Similarly, there is evidence that providing more resources to schools with a high share of immigrants improves performance. However, which policy is better? There is very little research providing a comparative analysis of the costs and benefits of each policy. Clearly, more needs to be done to evaluate the policies in place and provide a comparative assessment of alternative policies.

Acknowledgment

This article draws from previous work of the author with Maria De Paola. See Brunello and De Paola (2017).

References

Andersen, S., & Thomsen, M. (2011). Policy implications of limiting immigrant concentration in Danish Public Schools. *Scandinavian Policy Studies*, *34*(1), 27–52.

Angrist, J., & Lang, K. (2004). Does school integration generate peer effects? Evidence from Boston's Metco Program. *American Economic Review*, *94*(5), 1613–1634.

Ballatore, R., Fort, M., & Ichino, A. (2018). The Tower of Babel in the classroom: Immigrants and natives in Italian schools. *Journal of Labor Economics*, *36*(4), 885–921.

Betts, J., & Fairlie, R. (2003). Does immigration induce "native flight" from public schools into private schools? *Journal of Public Economics*, *87*, 987–1012.

Brunello, G., & De Paola, M. (2017). *School segregation of immigrants and its effects on educational outcomes in Europe_<http://www.eenee.de/dms/EENEE/Analytical_Reports/*

EENEE_AR30.pdf> (Analytical report no. 30). European Expert Network of Economics in Education.

Brunello, G., & Rocco, L. (2013). The effect of immigration on the school performance of natives: Cross country evidence using PISA test scores. *Economics of Education Review*, *32*, 234–246.

Carneiro, P., & Heckman, J. (2002). The evidence on credit constraints in post-secondary schooling *<https://ideas.repec.org/a/ecj/econjl/v112y2002i482p705-734.html>*. *Economic Journal*, *112*(482), 705–734.

Cooley, J. (2014). Can achievement peer effect estimates inform policy? A view from inside the black box. *Review of Economics and Statistics*, *96*(3), 514–523.

Diette, T., & Uwaifo Oyelere, R. (2014). Gender and race heterogeneity: The impact of students with limited English on native students' performance. *American Economic Review*, *104*(5), 412–417.

Duncan, O., & Duncan, B. (1955). A methodological analysis of segregation indexes. *American Sociological Review*, *20*(2), 210–217.

Friesen, J., & Krauth, B. (2011). Ethnic enclaves in the classroom. *Labour Economics*, *18*(5), 656–663.

Geay, C., McNally, S., & Telhaj, S. (2013). Non-native speakers of English in the Classroom: What are the effects on pupil performance? *Economic Journal*, *123*(570), F281–F307.

Gould, E., Lavy, V., & Paserman, D. (2009). Does immigration affect the long-term educational outcomes of natives? Quasi-experimental evidence. *Economic Journa*l, *119*(540), 1243–1269.

Guryan, J. (2004). Desegregation and black dropout rates. *American Economic Review*, *94*(4), 919–943.

Hanushek, E., & Woessmann, L. (2010). Education and economic growth. In P. Peterson, E. Baker, & B. McGaw (Eds.), *International encyclopedia of education* (Vol. 2, pp. 245–252). Elsevier.

Hanushek, E., & Rivkin, S. (2009). Harming the best: How schools affect the black-white achievement gap. *Journal of Policy Analysis and Management*, *28*(3), 366–393.

Hanushek E., Kain, J., & Rivkin, S. (2009). New evidence about brown v. board of education: The complex effects of school racial composition on achievement, *Journal of Labor Economics*, *27*(3), 349–383.

Hardoy, H., & Schøne, P. (2013). Does the clustering of immigrant peers affect the school performance of natives? *Journal of Human Capital*, *7*(1), 1–25.

Hoxby, C. (2000). *Peer effects in the classroom: Learning from gender and race variation* (Working paper no. 7867). National Bureau of Economic Research.

Jenkins, S., Micklewright, J., & Schnepf, S. (2006). Social segregation in secondary schools: How does England compare with other countries? (Discussion paper 1959). Institute for the Study of Labor.

Jensen, P., & Rasmussen, A. (2011). The effect of immigrant concentration in schools on native and immigrant children's reading and math skills. *Economics of Education Review*, *30*(6), 1503–1515.

Ohinata, A., & van Ours, J. C. (2013). How immigrant children affect the academic achievement of native Dutch children. *Economic Journal*, *123*, F308–F331.

Organisation for Economic Co-operation and Development. (2010). *Equal opportunities? The labour market integration of the children of immigrants* <https://doi.org/10.1787/9789264086395-en>. Paris.

Organisation for Economic Co-operation and Development. (2018). *International Migration Outlook 2015* <https://doi.org/10.1787/migr_outlook-2014-en>. Paris.

Organisation for Economic Co-operation and Development. (2003). *Learning for Tomorrow's World – first PISA 2003 results* <http://www.oecd.org/pisa/pisaproducts/learningfortomorrowsworldfirstresultsfrompisa2003.htm>.

Organisation for Economic Co-operation and Development. (2018). *PISA 2018 Results* <https://www.oecd.org/pisa/publications/pisa-2018-results.htm>.

Rangvid, B. (2010). School choice, universal vouchers and native flight from local schools. *European Sociological Review*, *26*(3), 319–335.

Schneeweis, N. (2015). Immigrant concentration in schools: Consequences for native and migrant students. *Labour Economics*, *35*, 53–76.

Soderstrom, M., & Uusitalo, R. (2010). School choice and segregation: Evidence from an admission reform. *Scandinavian Journal of Economics*, *112*(1), 55–76.

Szulkin, R., & Jonsson, J. (2007). *Ethnic segregation and educational outcomes in Swedish comprehensive schools: A multilevel analysis* [Unpublished manuscript]. The Stockholm University Linnaeus Center for Integration Studies.

Notes

1. In this article the term "immigrant pupil or student" is synonymous with "pupil or student with an immigrant background" and "native pupil or student" as synonymous with "pupil or student with a native background."

2. The share is calculated using the final student weights supplied by PISA. These weights take into account both the sampling of schools with probability proportional to size and the simple random sampling of students. They also take into account levels of response by both schools and pupils within schools. See Jenkins et al. (2006).

3. Brunello and Rocco (2013) showed that the correlation is negative by construction.

4. An example of performance as concave function of the share of immigrants is $\mathrm{p_i} = \beta_0 - \beta_1 \mathrm{s_i}^2$.

5. The net gain could be used to compensate the school that loses from redistribution.

6. An example of convex function is $\mathrm{p_i} = \beta_0 - \beta_1 \ln\ \mathrm{s_i}$.

7. With convexity, when the coefficient associated with the share of immigrants is negative, the one associated to the square of the share of immigrants is positive.

Related Articles

The Economics of International Wage Differentials and Migration