IESE Business School University of Navarra

Public-Private Sector Research Center

Què diuen els resultats de PISA 2022 sobre els Sistemes Educatius Català i Espanyol?

Presentació de l'estudi

Els Sistemes Educatius Català i Espanyol:

Una Anàlisi Quantitativa Basada en PISA 2018 i 2022

Antonio Ciccone Walter Garcia-Fontes

Introducció de Xavier Vives

Director acadèmic del Public-Private Sector Research Center

Introducció

Xavier Vives

"Recentment ha sonat l'alarma pel declivi de la qualitat de l'educació a Catalunya (i Espanya)." "Existeix la percepció generalitzada que el sistema educatiu de Catalunya, i d'Espanya, té un rendiment baix." Aquestes afirmacions sobre el context i impacte que van causar els resultats de l'informe PISA podrien ser perfectament del 2023 i fer referència a PISA 2022. Tanmateix, van ser escrites fa 15 anys i feien referència als resultats de l'informe PISA del 2006 en el llibre *Competitiveness in Catalonia* de Pankaj Ghemawat i Xavier Vives, publicat pel PPSRC l'any 2009.[1] Ens preguntàvem aleshores: "quins són els factors darrera del poc rendiment dels estudiants espanyols i catalans? Són els factors ambientals i de procedència com l'educació dels pares o el nivell d'immigració, o més aviat la qualitat intrínseca del sistema educatiu?"

El PPSRC va encarregar aleshores als professors Antonio Ciccone i Walter Garcia-Fontes fer un estudi per intentar donar resposta a aquestes preguntes o, com a mínim, eliminar factors de la possible explicació. Ara els hi hem demanat que actualitzin l'estudi amb els resultats més recents de PISA 2018 i de PISA 2022. Per l'estudi de PISA 2006, els factors ambientals en què es van centrar els autors van ser el nivell educatiu dels pares, la immigració i la despesa per alumne. Els mateixos autors actualitzen l'anàlisi de les preguntes en l'informe "Els Sistemes Educatius Català i Espanyol: Una Anàlisi Quantitativa Basada en PISA 2018 i 2022", i afegeixen factors com la ràtio de professor per alumne, la mida de les classes i el tipus de centre (privat/concertat o públic).[2]

Quan l'estudi original es va dur a terme, Espanya i Catalunya es trobaven clarament per sota la mitjana de l'OECD. No obstant això, Espanya en aquell moment tenia un nivell d'educació dels pares per sota la mitjana. Quan aquesta condició es tenia en compte, Espanya pujava fins apropar-se, o fins i tot superar, la mitjana de l'OECD. Amb els resultats actuals es pot veure que la pujada del rendiment dels estudiants espanyols s'explica completament per l'alça del nivell educatiu dels seus pares. Per tant, l'aportació del sistema educatiu en si és nul·la. En el cas català, el nivell educatiu dels pares no explicava significativament el baix rendiment comparat amb la resta de regions d'Espanya.

El 2006 hi havia preocupació per diversos factors que podien potencialment explicar el mal rendiment, molts dels quals encara s'assenyalen. En aquell moment, per exemple, hi havia preocupació per la migració i els efectes que tenia en l'educació catalana. Llavors Ciccone i Garcia-Fontes van demostrar que l'efecte de la concentració d'immigrants no explicava canvis significatius en els resultats. Concretament, a PISA 2006, la immigració explicava 5 punts de

---

[1] Competitiveness in Catalonia: Selected Topics (Pankaj Ghemawat and Xavier Vives), *Reports of the Public-Private Sector Research Center*, 2009, 2 (traducció al castellà a https://www.iese.edu/media/research/pdfs/ESTUDIO-107.pdf)

[2] Els resultats preliminars de l'estudi van ser discutits en una taula rodona organitzada pel PPSRC i en la que van participar Caterina Calsamiglia (investigadora ICREA), Joan Cuevas (director general d'Innovació, Digitalització i Currículum del Departament d'Educació de la Generalitat), Alex Martínez de Mingo (docent de secundària i impulsor de Clam Educatiu) i Meritxell Ruiz (exconsellera d'Educació i secretària general de la Fundació Escola Cristiana de Catalunya), amb la moderació de Xavier Vives.

diferència entre Catalunya i La Rioja dels 14 en lectura, 28 en ciències i 38 en matemàtiques que els diferenciaven (Catalunya per sota). A PISA 2022 torna a haver-hi una petita part de la puntuació que s'explica pel fet que a Catalunya hi ha més immigrants que a altres comunitats, però aquesta diferència no és significativa. A més, l'efecte de la concentració més gran d'alumnes nascuts fora d'Espanya en els resultats de les escoles catalanes en relació a Espanya és quantitativament petit.

En el cas de Catalunya una conclusió principal de l'estudi es que "els resultats de PISA de Catalunya no es poden explicar per les característiques de l'alumnat, com ara l'educació dels pares o l'historial de migració internacional de les seves famílies ... el resultat PISA de Catalunya l'any 2022 en comparació amb la resta d'Espanya reflecteix el valor afegit del sistema educatiu català i no les característiques de l'alumnat". Factors com la despesa per alumne, la ràtio de professor per alumne o la mida de la classe no explica tampoc les diferències en resultats entre Catalunya i altres CCAAs. De fet, la ràtio professor/alumne a Catalunya és superior a la de la majoria de les comunitats autònomes i la mida de les classes és menor.

L'estudi troba que hi ha hagut una caiguda important dels resultats de PISA 2022 en comparació amb PISA 2018. Mentre que els resultats de PISA de Catalunya el 2018 estaven per sobre la mitjana espanyola, el 2022 van baixar per sota la mitjana, i aquesta baixada prové dels centres públics catalans. Aquests centres experimenten una forta caiguda de resultats tant en comparació amb els centres públics d'altres CCAA com en comparació amb els centres privats de Catalunya. A més, a l'estudi es mostra que la bretxa en resultats entre centres públics i privats a Catalunya es manté substancialment després de tenir en compte els factors socioeconòmics individuals dels estudiants. Els centres públics a Catalunya van estar menys proactius en l'assignació de tasques als estudiants durant el període de tancament per la COVID-19 que els centres públics de la resta d'Espanya.

Una altra de les preocupacions era el sistema d'immersió lingüística a l'escola. La falta de dades d'altres comunitats bilingües va fer que el 2009 no es poguessin trobar resultats robustos sobre aquest efecte. Així i tot, els mateixos autors van defensar que si això fos un factor rellevant, Catalunya tindria pitjors resultats en lectura que en altres assignatures respecte a altres comunitats, i no era el cas. Ara les dades de PISA 2022 són prou completes per a comparar Catalunya amb altres comunitats amb sistemes bilingües. Això permet als autors arribar a la conclusió que no és un factor significatiu.

Les conclusions de l'estudi actual no són massa diferents de les de 2009. Aleshores, Ghemawat i Vives ja apuntaven a algunes qualitats intrínseques del sistema educatiu català com responsables del seu baix rendiment, i afirmàvem que "L'escenari més propici per a la qualitat de l'educació és l'autonomia escolar subjecte a l'avaluació de resultats". Així mateix, Ciccone i García-Fontes argumenten que la literatura acadèmica ha trobat que el rendiment escolar és millor quan es combina l'autonomia escolar amb responsabilitat externa. Altres factors clau per a la millora educativa són la selecció del professorat en funció de les seves habilitats dins l'aula i la creació d'incentius en funció de capacitats docents. De fet la creació d'incentius és un dels punts que el grup d'experts del Departament d'Educació proposa com a clau.

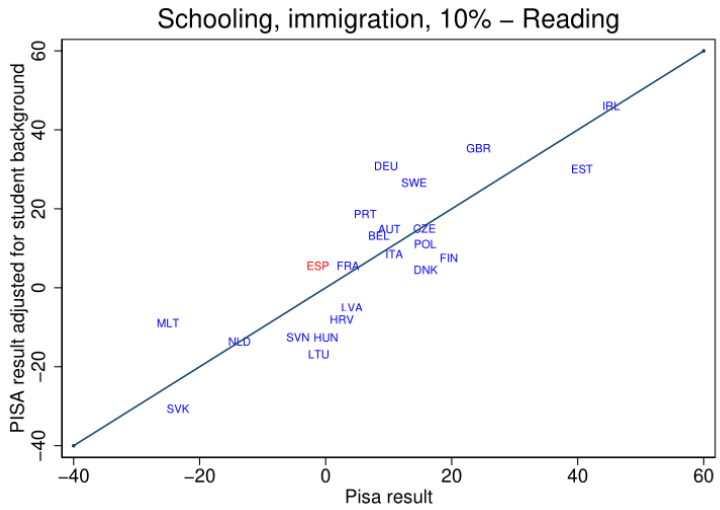
Resum executiu

En aquest informe analitzem els resultats de Catalunya i Espanya en el Programa per a l'Avaluació Internacional dels Estudiants (PISA) de l'OCDE l'any 2022. Per posar aquests resultats en perspectiva, comparem els resultats de PISA 2022 entre països i comunitats autònomes (CCAA) i amb PISA 2018 i 2006. També considerem possibles explicacions per als resultats de PISA 2022. Per exemple, diferències en la resposta a la COVID-19 entre els sistemes educatius de les CCAA o diferències en les proporcions de professors/alumnes i la mida de les classes. El nostre enfocament és quantitatiu amb un focus en el valor afegit dels sistemes educatius. Per avaluar el valor afegit, tenim en compte diferències socioeconòmiques entre els estudiants de diferents sistemes educatius. Les principals variables socioeconòmiques en què ens centrem són l'educació dels pares dels estudiants i l'historial de migració internacional de les seves famílies, però també considerem factors addicionals.

Les nostres principals conclusions per a Espanya són les següents.

1. **A les proves PISA 2022, els resultats per a Espanya es troben al voltant de la mitjana dins de la Unió Europea i això continua sent el cas quan tenim en compte diferències socioeconòmiques entre els estudiants dels diferents països.** A la Gràfica 1 es mostren els resultats en lectura. A l'eix horitzontal es mostra la diferència amb la mitjana europea del resultat PISA sense ajustar, mentre que a l'eix vertical es mostra aquesta diferència un cop ajustada per l'educació dels pares, l'historial de migració internacional i la concentració d'alumnes nascuts fora d'Espanya a l'escola, Com es pot apreciar, el punt de la gràfica corresponent a Espanya és proper a 0 tant a l'eix horitzontal com vertical, cosa que mostra que es troba al voltant de la mitjana, fins i tot quan ajustem per les condicions socioeconòmiques dels alumnes. Els resultats per a lectura i matemàtiques són semblants.

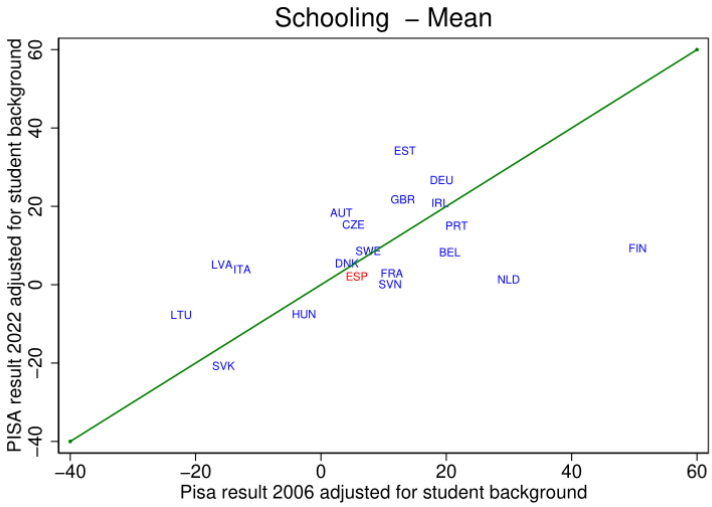
Gràfica 1



2. En comparació amb l'any 2006, els resultats PISA d'Espanya han millorat. Tanmateix, aquesta millora es pot atribuir en exclusiva a l'augment dels nivells educatius dels pares dels estudiants espanyols. Els nivells educatius dels pares a Espanya estaven substancialment per sota de la mitjana de la Unió Europea el 2006, però des de llavors han convergit. A la

Gràfica 2 mostrem una comparació dels resultats mitjans de la prova PISA entre 2006 i 2022, un cop ajustats per l'educació dels pares. El punt corresponent a Espanya es troba a prop de 0 en ambdós eixos i a prop de la línia diagonal. Tenint en compte l'educació dels pares, el valor afegit del sistema educatiu espanyol se situa al voltant de la mitjana de la Unió Europea des de l'any 2006.

Gràfica 2



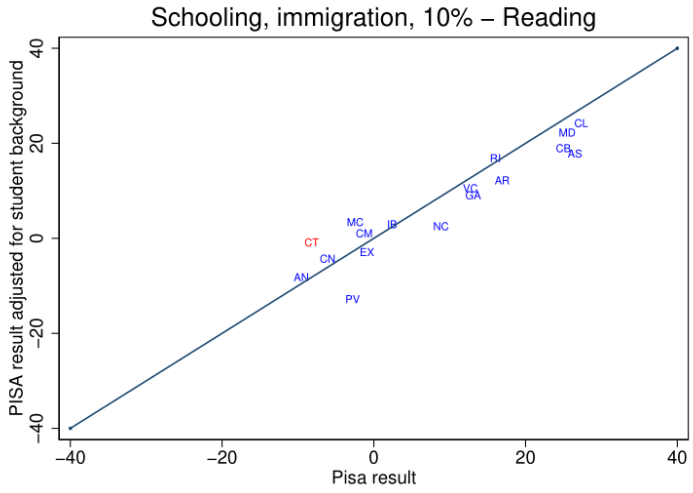
3. Trobem una associació positiva dels resultats de PISA amb la despesa en l'educació secundària per alumne. Quantitativament però, l'efecte és bastant petit. Examinem si els resultats PISA de 2022 dels països de la Unió Europea estan relacionats amb les despeses per alumne, les ràtios professor/alumne o la mida de les classes. Les nostres estimacions impliquen que augmentar la despesa en 1/5 de la mitjana de la Unió Europea augmenta els resultats PISA al voltant d'1/10 de la diferència entre els països del grup superior i inferior de la Unió Europea.

4. No hi ha evidència que els resultats PISA millorin amb proporcions més altes de professor/alumnat o classes més petites. Per tant, arribem a la conclusió que per augmentar el valor afegit del seu sistema educatiu, Espanya no pot confiar a augmentar la ràtio professor/alumne i disminuir la mida de les classes.

5. La literatura acadèmica documenta estructures institucionals i organitzatives que estan associades amb un major valor afegit dels sistemes educatius. En primer lloc, l'autonomia de les escoles combinada amb la responsabilitat externa, per exemple en forma de proves externes, tant de les escoles com dels professors. En segon lloc, la selecció del professorat i incentius al professorat en funció de les seves capacitats com a docents. En tercer lloc, la flexibilitat dels centres per donar resposta a les fortaleses o dèficits de la seva població estudiantil, tant pel que fa als seus mètodes docents com a la selecció del professorat.

6. Trobem que els resultats de PISA 2022 de Catalunya no es poden explicar per les característiques de l'alumnat, com ara l'educació dels pares o l'historial de migració internacional de les seves famílies, ni per la concentració a les escoles d'alumnat nascut a fora d'Espanya. Per als resultats PISA de Catalunya l'any 2022, la nostra comparació és amb altres comunitats autònomes espanyoles. El resultat PISA de Catalunya l'any 2022 en comparació amb la resta d'Espanya reflecteix el valor afegit del sistema educatiu català i no les característiques de l'alumnat. Una part del resultat PISA català l'any 2022 en comparació amb la mitjana espanyola es pot atribuir a la concentració més gran d'alumnes nascuts fora d'Espanya en alguns centres educatius catalans. Tanmateix, quantitativament, aquest efecte és bastant petit. Els alumnes nascuts fora d'Espanya estan més concentrats en alguns centres a Catalunya que a la resta d'Espanya i aquests centres de mitjana aconsegueixen resultats PISA més baixos, però la diferència en resultats és reduïda i no sembla augmentar substancialment si augmenta la concentració d'alumnes nascut a fora d'Espanya. - En conseqüència, el potencial de millora substancial dels resultats PISA de Catalunya mitjançant la reducció de la concentració d'alumnes nascuts a l'estranger en alguns centres és limitat. Segons els nostres càlculs, eliminar completament la concentració elevaria com a molt els resultats PISA de Catalunya al voltant de la mitjana espanyola. La Gràfica 3 correspon als càlculs per a Catalunya que es van mostrar a la Gràfica 1 per a Espanya. A la gràfica es pot veure que el resultat de lectura sense ajustar per a Catalunya està uns 10 punts per sota de la mitjana. Un cop ajustem per les condicions socioeconòmiques dels alumnes, mirant l'eix vertical veiem que el resultat per a Espanya queda a prop de la mitjana. Els resultats per a les proves de ciència i matemàtiques són semblants.

Gràfica 3



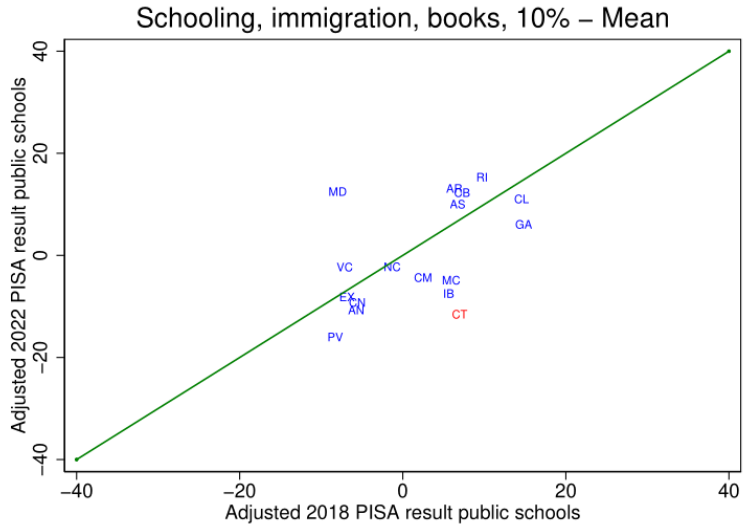
Aquests càlculs s'han d'interpretar com un límit superior que podria no ser assolible. Això es deu al fet que les dades disponibles per al sistema educatiu català no ens permeten identificar les causes subjacents del rendiment inferior a la mitjana dels centres amb una proporció superior a la mitjana d'alumnes nascuts a l'estranger. Per tant, encara no està clar si aquests centres educatius millorarien si disminuís la proporció d'estudiants nascuts a l'estranger.

7. Com en el cas de la Unió Europea, no trobem que una proporció més gran de professor/alumnat a les CCAA s'associï a un millor rendiment PISA, i tampoc hi ha evidència que

la mida de classe més baixa a les CCAA estigui associada a un millor rendiment PISA. A més, no hi ha cap associació entre la despesa per alumne de les CCAA i el rendiment que tenen a PISA 2022. Això fa pensar que per millorar el valor afegit del seu sistema educatiu, Catalunya no pot confiar a augmentar la ràtio professor/alumne i disminuir la mida de les classes.

8. Una quarta troballa per a Catalunya és que hi ha hagut una caiguda substancial del resultat de PISA 2022 en comparació amb PISA 2018, l'última avaluació de PISA abans de l'esclat de la COVID-19. Trobem que aquesta baixada prové íntegrament dels centres educatius públics catalans. Aquests centres van experimentar una forta caiguda dels seus resultats PISA entre el 2018 i el 2022, tant en comparació amb els centres públics d'altres CCAA com en comparació amb els centres privats de Catalunya. Per exemple, mentre que els centres privats catalans ja van superar els centres públics catalans a PISA 2018, la bretxa en els resultats de PISA gairebé es va duplicar el 2022. I mentre que els centres públics catalans van aconseguir un resultat PISA proper a la mitjana dels centres públics espanyols el 2018, només dues CCAA espanyoles tenen escoles públiques de menor rendiment en PISA 2022. A la Gràfica 4, es pot veure que l'any 2018 el resultat mitjà a les proves PISA a Catalunya per als centres públics estava uns 10 punts per sobre de la mitjana, però a l'any 2022 està gairebé 20 punts per sota de la mitjana, tot i que els resultats s'ajusten per l'educació dels pares, l'historial de migració internacional, el nombre de llibres al domicili i la concentració a l'escola d'alumnes no nascuts a Espanya,

Gràfica 4



9. Els centres públics catalans semblen haver estat menys proactius respecte a les tasques escolars durant el període de tancament d'edificis escolars per la COVID-19 que els centres públics de la resta d'Espanya. També fem servir les dades de PISA 2022 per examinar la resposta dels sistemes educatius de les CCAA espanyoles a la COVID-19. En el qüestionari dels estudiants, es va preguntar als estudiants sobre el grau d'implicació dels seus centres respecte a les tasques assignades durant el període en què els edificis escolars estaven tancats a causa de la COVID-19. Les tres preguntes que es van fer als estudiants són: (i) amb quina freqüència a la setmana se'ls enviaven tasques escolars; (ii) amb quina freqüència a la setmana els seus centres consultaven amb ells per assegurar-se que s'havien completat les tasques escolars; i

(iii) amb quina freqüència a la setmana els seus centres els van demanar que enviessin les tasques escolars completades. Segons les respostes dels estudiants a aquestes tres preguntes, observem que els centre públics a Catalunya semblen haver estat menys proactius. Per exemple, el 46% dels estudiants dels centres públics a Espanya diuen que el seu centre els va demanar que enviessin tasques escolars realitzades gairebé cada dia de la setmana. A la Comunitat de Madrid---que no va veure una caiguda dels resultats de PISA el 2022 respecte al 2018---la quota se situa substancialment per sobre de la mitjana espanyola, amb un 53%. En canvi, a Catalunya, la quota és només del 38%.

10. Els nostres resultats indiquen que el castellà parlat a casa no és un determinant estadísticament significatiu dels resultats de PISA a Catalunya, tant el 2022 com el 2018. A més, els resultats són similars quan comparem Catalunya, d'una banda, amb les Illes Balears i la Comunitat Valenciana, de l'altra. Per tant, no hi ha evidència empírica que els resultats PISA dels estudiants de Catalunya es vegin afectats significativament pel fet de parlar castellà o català a casa. Les dades de PISA 2022 i les dades de PISA 2018 ens permeten examinar com es relacionen els resultats de PISA segons la llengua oficial d'Espanya que es parla principalment a les llars dels estudiants. Ens centrem en les tres CCAA espanyoles on el català o el valencià és llengua oficial: les Illes Balears, Catalunya i la Comunitat Valenciana. Analitzem els resultats d'alumnes de pares nascuts a Espanya i que parlen castellà, català o valencià a casa. Segons PISA, a Catalunya, la llengua principal que parla a casa el 50% d'aquests alumnes és el castellà i el 9% dels alumnes que parlen principalment castellà a casa fan la prova PISA en castellà. D'altra banda, a les Illes Balears i a la Comunitat Valenciana en mitjana el 65% dels estudiants parlen principalment castellà a casa i el 45% dels estudiants que parlen principalment castellà a casa fan la prova en castellà. Com a conseqüència, l'estudiant mitjà que parla castellà a casa té cinc vegades més probabilitats de fer la prova PISA en castellà a les Illes Balears i a la Comunitat Valenciana que a Catalunya. Relacionem els resultats PISA dels alumnes amb el seu centre escolar i les seves característiques socioeconòmiques, a més de quina llengua oficial parlen a casa. Els nostres resultats a aquestes comunitats autònomes no troben diferències estadísticament significatives dels resultats en les proves PISA entre els alumnes segons la llengua oficial que es parla a casa i la llengua de les proves.

Conclusions

Els resultats catalans de PISA 2022 han estat decebedors. En això sembla estar d'acord tothom a Catalunya, ja sigui el govern català, els partits polítics, els sindicats o els mitjans de comunicació. Especialment preocupants són els resultats extremadament pobres dels alumnes de les escoles públiques catalanes, que van experimentar un fort descens en PISA 2022 en comparació amb PISA 2018. Sembla que el sistema educatiu català està fallant especialment per als estudiants de les escoles públiques.

Les desavinences comencen quan es tracta de les raons del mal funcionament del sistema educatiu català, especialment dels seus centres públics, i de què s'ha de fer al respecte. Alguns argumenten que el sistema educatiu català posa en desavantatge aquells que tenen com a

llengua principal el castellà. Tanmateix, no trobem cap evidència empírica que això sigui així. Una altra part del debat se centra en els pobres resultats PISA 2022 dels centres públics en comparació amb els privats. Alguns veuen els motius d'aquesta bretxa de rendiment en la selecció d'alumnes amb més recursos familiars als centres privats. No obstant això, els nostres resultats indiquen que es manté una bretxa substancial després de tenir en compte una sèrie de factors socioeconòmics. Una part principal del debat se centra en la necessitat de recursos addicionals per augmentar la ràtio professor/alumne i reduir la mida de les classes. En tot cas, la ràtio professor/alumne a Catalunya és superior a la de la majoria de les comunitats autònomes i la mida de les classes és menor. L'única comunitat autònoma amb una ràtio professor/alumne més alta i una mida de classes més petita és Andalusia, que a PISA 2022 té resultats pitjors que Catalunya, fins i tot quan es tenen en compte les diferències de formació d'estudiants. Això és coherent amb l'evidència empírica que les proporcions professor/alumne i la mida de la classe no són factors clau del rendiment escolar. Finalment, també hi ha un debat que se centra en els factors institucionals i organitzatius més que en els recursos de l'escola o en les variables individuals de formació de l'alumnat. La literatura acadèmica ha trobat que el rendiment escolar és generalment millor on l'autonomia escolar es combina amb la responsabilitat externa; on la selecció del professorat i els incentius al professorat es basa en les seves capacitats docents; i on les escoles tenen la flexibilitat per respondre als punts forts o dèficits de la seva població estudiantil. Sembla que el sistema educatiu català pot millorar en aquestes dimensions.

En contrast amb els resultats catalans de PISA 2022, els resultats espanyols s'han mantingut estables al voltant de la mitjana de la Unió Europea. Això és cert des del PISA 2006, quan es té en compte l'educació dels pares espanyols. Això fa pensar que les mesures adoptades des del 2006 per millorar el sistema educatiu espanyol en comparació amb altres països de la Unió Europea no van donar el resultat desitjat. Que el sistema educatiu espanyol no ha de romandre estancat on està, es pot comprovar pels resultats de Portugal a PISA. Els resultats PISA 2022 de Portugal són uns 15 punts superiors als d'Espanya ---això correspon a més d'un terç de la diferència entre els països del grup superior i inferior de la Unió Europea--- quan es té en compte l'educació dels pares dels estudiants. Aquesta bretxa existeix des de PISA 2006. Al mateix temps, els dos països són molt semblants pel que fa a la despesa real de secundària per alumne i la despesa en educació com a proporció del PIB.

The Catalan and Spanish Education System: A Quantitative Analysis Based on PISA 2018 and 2022

Antonio Ciccone* Walter Garcia-Fontes†

March 2024

*University of Mannheim and CEPR
†Universitat Pompeu Fabra and Barcelona School of Economics

1 Introduction

In this report, we analyse the results of Catalonia and Spain in the OECD's *Programme for International Student Assessment* (PISA) in the year 2022. To put these results into perspective, we compare PISA results across countries and Spanish Autonomous Communities (CCAAs) and look back to PISA 2018 and 2006. We also consider potential explanations. For example, differences in the response to COVID-19 across the education systems of Spanish CCAAs or differences in teacher-to-student ratios and class size. Our approach is quantitative with a focus on the value added of education systems. To assess value added, we account for differences in student background across education systems. The main student background variables we focus on are parental education and international migration history but we also consider additional factors.

Our main findings for Spain are as follows. In PISA 2022, the results for Spain are around average within the European Union and this continues to be the case when we account for an array of student background variables. Compared to the year 2006, Spanish PISA results have improved. However, this improvement can be *entirely* attributed to the increase in the education levels of Spanish parents. These education levels were substantially below the average of the European Union in 2006 but have since converged. Accounting for the education of Spanish parents, the PISA results of Spain in 2022 are the same as in 2006 when compared to the European Union average. That is, the value added of the Spanish education system has been around average within the European Union in 2006 and continues to be around average in 2022. We also find that the COVID-19 pandemic does not appear to have had a differential effect on the PISA results of Spain. Compared to the average of the European Union, the Spanish PISA result in 2022 is very similar to the result in 2018, the last PISA evaluation before the outbreak of COVID-19. Summarizing, the value added of the Spanish education system has been around the average of the European Union since 2006 and was not affected differentially by COVID-19.

We also examine whether the 2022 PISA results of countries in the European Union are related to expenditures per student, teacher-to-student ratios, or the size of classes. We find a positive association of PISA results with secondary-school expenditures per student. However, quantitatively, the effect is rather small. For example, our estimates imply that increasing expenditures by 1/5 of the European Union average raises PISA results by around 1/10 of the difference between the countries in the top and bottom group of the European Union. Moreover, there is no evidence that PISA results improve with higher teacher-to-student ratios or smaller class sizes. These findings mirror the results of the multivariate approach

based on earlier PISA results in Fuchs and Woessman (2007). Our results are consistent with the weak link between school performance and school resources documented in the broader academic literature (Hanushek, 2020; Holzberger et al., 2020).

We therefore conclude that Spain cannot rely on increasing the teacher-to-student ratio and decreasing class size to improve the value added of its education system. On the other hand, the academic literature documents institutional and organizational arrangements associated with better school performance (Hanushek, 1996, 2020; Chetty et al., 2014a,b). First, school autonomy combined with external accountability, for example in the form of outside testing, of both schools and teachers. Second, the selection of teaching staff based on their classroom skills and teacher incentives based on classroom teaching. Third, the flexibility of schools to respond to strengths or deficits of their student populations, both in terms of their teaching methods and the selection of teaching staff.

For the PISA results of Catalonia in 2022, our comparison is with other Spanish Autonomous Communities (CCAAs). We find that the PISA results of Catalonia cannot be accounted for by student background characteristics, like the education of their parents or the international migration history of their family. This is because the student background characteristics in Catalonia are similar to the Spanish average. Put differently, the Catalan PISA result in 2022 compared to the rest of Spain reflects the value added of the Catalan education system, not the background of students.

Another finding for Catalonia is that students born outside Spain are more concentrated in some schools than in the rest of Spain. As these schools achieve lower PISA results on average, some of the Catalan PISA result in 2022 compared to the Spanish average can be accounted for by the greater concentration of students born outside Spain in Catalan schools. However, quantitatively, this effect is rather small when compared to the difference between the CCAAs in the top and bottom group in PISA 2022. As a result, the potential for improving in the Catalan PISA results substantially by reducing the concentration of students born abroad in some schools is limited. For example, eliminating the concentration completely would, according to our counterfactual calculations, raise the Catalan PISA results at most to around the Spanish average. Our counterfactual calculation should be interpreted as an upper bound that might not be achievable. This is because the data available for the Catalan education system does not allow us to identify the underlying causes for the lower average PISA performance of schools with an above-average share of students born abroad. It remains therefore unclear whether these schools would actually improve if the share of students born abroad were to decrease.

We also examine whether the 2022 PISA results of different Spanish CCAAs are related to expenditures per student, teacher-to-student ratios, or the size of classes. As in the case of the European Union, we do not find that a greater teacher-to-student ratio in CCAAs is associated with better PISA performance, nor is there evidence of lower class sizes in CCAAs being associated with better PISA performance. This suggests that Catalonia cannot rely on increasing the teacher-to-student ratio and decreasing class size to improve the value added of its education system. Moreover, there is no association between secondary-school expenditures per student across CCAAs and how well they do in PISA 2022.

A fourth finding for Catalonia is that there has been a substantial drop in the PISA 2022 result when compared to PISA 2018, the last PISA evaluation before the outbreak of COVID-19. While the Catalan PISA result in 2018 was above the Spanish average, it dropped clearly below average in 2022. We find that this drop comes *entirely* from Catalan public schools. These saw a sharp drop in their PISA results between 2018 and 2022. This drop is evident both compared to public schools in other CCAAs and compared to private schools in Catalonia. For example, while Catalan private schools already outperformed Catalan public schools in PISA 2018, the gap in PISA results almost doubled in 2022. And while Catalan public schools achieved a PISA result close to the average of Spanish public schools in 2018, only two Spanish Autonomous Communities have lower performing public schools in 2022.

We also use the PISA 2022 data to examine the response of the education systems of Spanish CCAAs to COVID-19. In the PISA student questionnaire, students were asked about how active their schools were regarding assignments during the period when school buildings were closed because of COVID-19. The three questions students were asked are: (i) how often per week they were sent assignments; (ii) how often per week their schools checked with them to ensure that assignments were completed; and (iii) how often per week their schools asked them to submit completed school assignments. According to the students' answers to these three questions, Catalan public schools appear to have been less proactive regarding assignments during the period of COVID-19 school building closures than public schools in the rest of Spain. For example, 46% of public school students in Spain answered that their school asked them to submit a completed assignment almost every day of the week. In the Community of Madrid—which did not see a drop in PISA results in 2022 compared to 2018—the share is substantially above the Spanish average at 53%. In contrast, in Catalonia, the share is only 38%.

The PISA 2022 data and the PISA 2018 data allow us to examine how PISA results relate to which of the official languages of Spain is spoken in students' homes. We focus on the three Spanish CCAAs where Catalan or

Valencian is an official language: the Balearic Islands, Catalonia, and the Community of Valencia. Our analysis focuses on students whose parents are born in Spain and who speak either Spanish, Catalan, or Valencian at home. According to PISA, in Catalonia, the main language spoken at home of 50% of these students is Spanish and 9% of the students speaking mainly Spanish at home take the PISA test in Spanish. On the other hand, the average for the Balearic Islands and Community of Valencia is that 65% of students mainly speak Spanish at home and 45% of the students speaking mainly Spanish at home take the test in Spanish. As a result, the average student speaking Spanish at home is five times more likely to take the PISA test in Spanish in the Balearic Islands and Community of Valencia than in Catalonia. We relate the PISA results of students within schools to standard family characteristics, plus whether they speak Spanish at home rather than Catalan or Valencian. Our results indicate that Spanish spoken at home is not a statistically significant determinant of PISA results in Catalonia both in 2022 and 2018. Moreover, results are similar when we compare Catalonia on the one hand with the Balearic Islands and Community of Valencia on the other hand. Hence, there is no empirical evidence that the PISA results of students in Catalonia are significantly affected by whether students speak Spanish or Catalan at home.

2 Empirical Methods

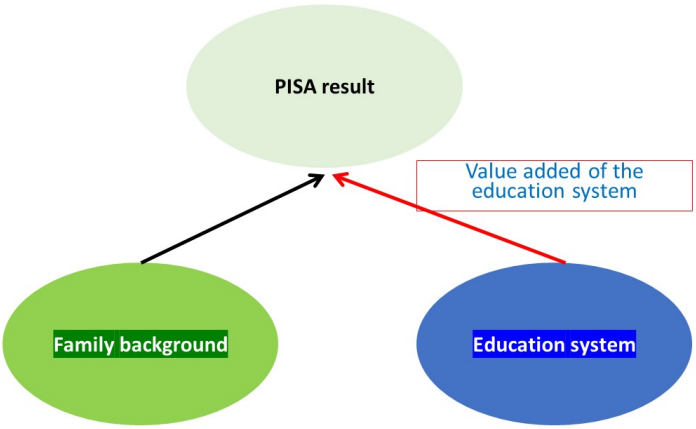
Conceptually, the PISA results of students within an education system reflect both the family background of students and the value added of the education system. This is illustrated in Figure 1. Of course, there may be more factors affecting the PISA results obtained by students within an education system. But these are two main factors that can be studied quantitatively using PISA.

As we want to focus on the value added of the education system, we need to account for differences in PISA results that are generated by family background. We do so using two different approaches. The first approach assumes that the effect of student background is homogeneous across the education systems being studied. Our model for the PISA result of student i in education system c is

$$\text{PISA}(i,c) = \alpha_c + \sum_{j=1}^{J} \beta_j \times X(j,i,c) + u(i,c) \tag{1}$$

where $j = 1,..,J$ refers to the different student background variables (e.g. parental education, migration history) and β_j is the effect of these variables on the PISA result; $u(i,c)$ summarizes the effect of factors that are

Figure 1: Value added of an education system



orthogonal to the included student background variables. We estimate (1) using the least-squares method and then obtain the parameter estimates to obtain the counterfactual PISA result of an education system as

$$\widehat{\text{PISA}}(c) = \widehat{\alpha_c} + \sum_{j=1}^{J} \widehat{\beta_j} \times \overline{X}(j) \tag{2}$$

where $\widehat{\alpha_c}$ and $\widehat{\beta_j}$ denote coefficient estimates and $\overline{X}(j)$ the average of background variable j across *all* the education systems studied. The interpretation of (2) is the counterfactual PISA result of education system c if students had the same background as the average student in the group of education systems being studied.

We also use a more flexible approach where we allow the effect of student background on the PISA result to be heterogeneous across the education systems being studied. In this case, the model for the PISA result of student i in education system c is

$$\text{PISA}(i,c) = \alpha_c + \sum_{j=1}^{J} \beta_{jc} \times X(j,i,c) + u(i,c) \tag{3}$$

where β_{jc} is the effect of student background variable j on the PISA result in education system c. We then obtain the counterfactual PISA result of an education system as

$$\widehat{\text{PISA}}(c) = \widehat{\alpha_c} + \sum_{j=1}^{J} \widehat{\beta_{jc}} \times \overline{X}(j) \tag{4}$$

where $\widehat{\alpha_c}$ and $\widehat{\beta_{jc}}$ denote least-squares coefficient estimates and $\overline{X}(j)$ the average of background variable j all the education systems studied. In empirical practice, the difference between (2) and (4) will be small, which is why we mostly use the simpler approach in (2).

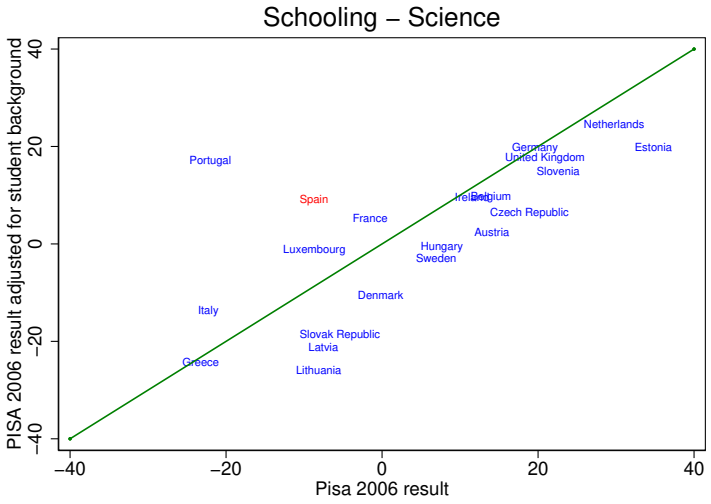
The main student background variables we use are for *parental education* and *individual international migration history*. In the case of parental education, we have five education levels for mothers and fathers (no studies; primary education, lower secondary education, upper secondary education, university education). For individual migration history, we use two indicator variables capturing whether (i) the student was born in the country but at least one of the parents of the student was born outside the country (ii) at least one of the parents and the student were born outside the country. For part of the analysis we will also use the student background variables *books at home*. This is a categorical variable that can take seven values.

3 Spain in PISA 2006 and 2022

3.1 PISA 2006

Figures 2, 3, and 4 apply our empirical framework to the PISA 2006 results, which we had examined in Ciccone and Garcia-Fontes (2008). The figures differ in the PISA subject tested (science, reading, mathematics). On the horizontal axis we always measure the PISA result for 2006 as published for a set of European countries (without any adjustments). On the vertical we have the counterfactual PISA results if the student background in these countries had been equal to the average of the European countries in the figures. The student background variables we account for in these figures is solely parental education; see Ciccone and Garcia-Fontes (2008) for results with additional student background variables). All PISA results are relative to the average across all the countries studied. Finland and Romania are not shown in the figure for readability. It can be seen on the horizontal axis that in PISA 2006 Spain performs below average in all three tested subjects. In the figure for reading, only Greece has a lower PISA result. In math, only three countries have lower PISA results. On the vertical axis we have the counterfactual PISA result for each country if parental education was the same and equal to the EU average. Now Spain performs about average when one consider the average of the three PISA subjects studied. In reading it is at the level of Austria. In mathematics it performs better than the UK. The conclusion is that the Spanish education system was about average in 2006 once parental education was accounted for. That Spain improves when parental education is taken into account is not too

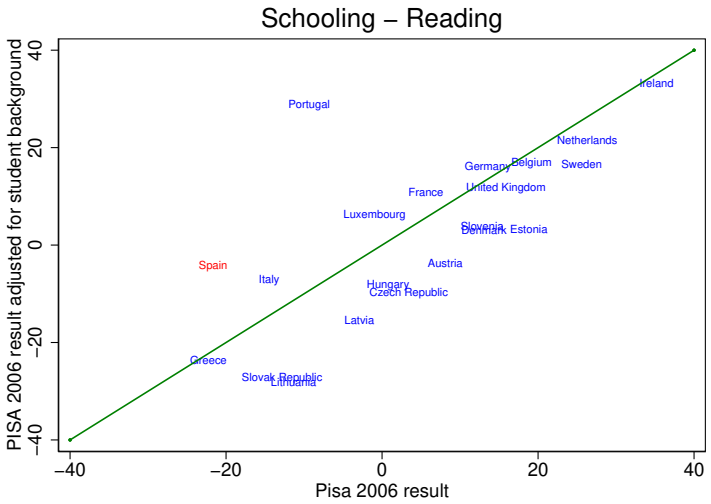
Figure 2: 2006 PISA science result in EU and UK adjusted for parental education



Notes: PISA results adjusted assuming homogeneous effects of student background variables. Finland and Romania not shown for readability.

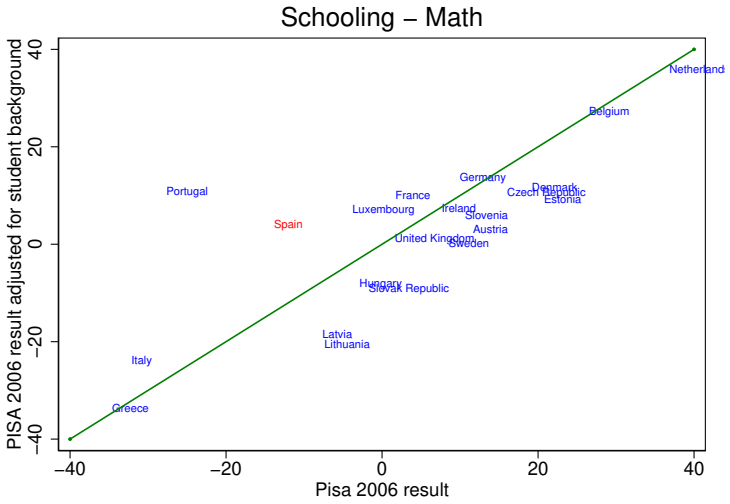
surprising as the education levels of Spanish parents were low in 2006 compared to many other European countries. Something similar, but even stronger, happens for Portugal. At the same time, note that not all low PISA results can be explained by parental education. In the case of Greece, for example, the PISA result does not improve much after the adjustment for parental education.

Figure 3: 2006 PISA reading result in EU and UK adjusted for parental education



Notes: PISA results adjusted assuming homogeneous effects of student background variables. Finland and Romania not shown for readability.

Figure 4: 2006 PISA mathematics result in EU and UK adjusted for parental education



Notes: PISA results adjusted assuming homogeneous effects of student background variables. Finland and Romania not shown for readability.

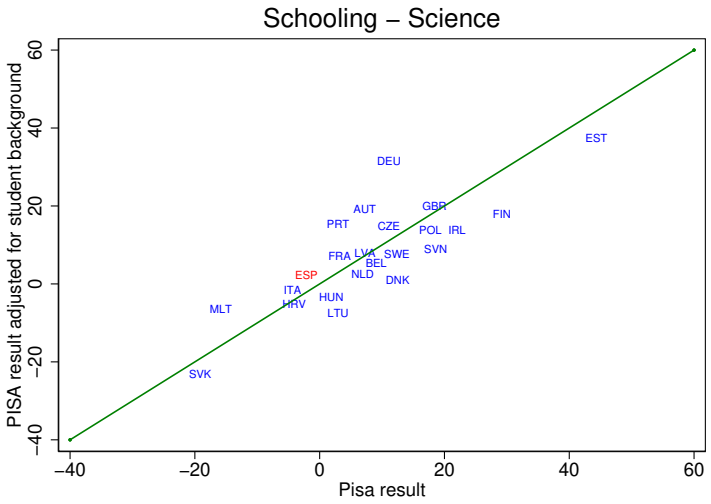
3.2 PISA 2022

Figures 5, 6, and 7 perform the exact same analysis for PISA 2022 as Figures 2, 3, and 4 for PISA 2006. We continue to have demeaned PISA results on the horizontal axis and demeaned PISA results adjusted for parental education on the vertical axis. The figures contain more countries than in 2006 as the European Union had more members (Bulgaria, Croatia, Romania). The names of countries are now abbreviated, see Appendix Table A.1 for an explanation. Note that the figure includes the UK, although it is no longer in the European Union in 2022, to facilitate comparisons with PISA 2018 further below. Now Spain does around average whether we do not adjust or do adjust for parental education. The reason is that, by 2022, Spain has become much more similar to the European average in terms of parental education and other student characteristics. The comparison of the PISA result of Spain in 2022 with the result in 2006 indicates that Spain did improve somewhat between 2006 and 2022 relative to the average in the European Union. However, the comparison of the PISA result of Spain adjusted for parental education in 2022 with the result in 2006 indicates that this improvement is entirely explained by the education levels of Spanish parents having largely converged to the average of the European Union. In terms of the value added of the Spanish education system, there has been no change.

Figures 8, 9, and 10 show that the main findings of Figures 5, 6, and 7 do not change at all when we also adjust for the migration history of students. In Figures 11, 12, and 13, we include an additional control for the individual PISA results: an indicator variable for whether the student is in a school where strictly more than 10% of students in the tested cohort are first-generation immigrants (have been born abroad with at least one parent born abroad). We do this to have a first impression of whether the concentration of first-generation immigrants in some schools might account for some of the differences in PISA results across countries. To do so, the counterfactual PISA result for each country in Figures 11, 12, and 13 assumes that the share of schools with more than 10% first-generation immigrants is the same in each country and equal to the average of the European Union. It can be seen that the main findings of Figures 5, 6, and 7 do not change at all with this additional adjustment.

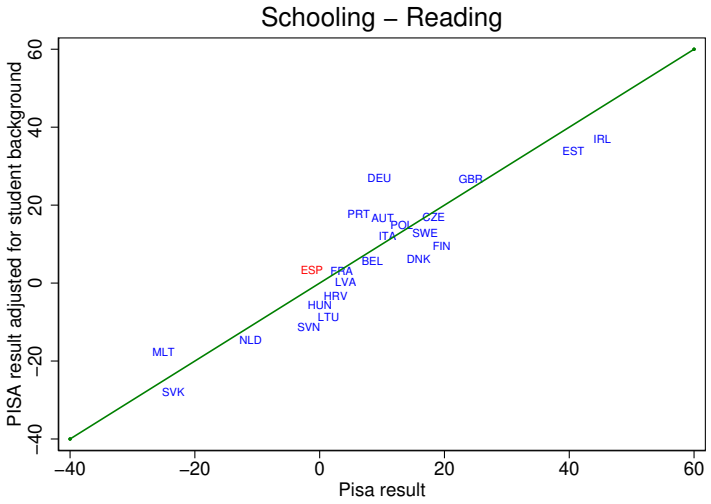
Finally, Figures 14, 15, and 16 repeat the analysis of Figures 11, 12, and 13 but allowing for country-specific effects of student background variables on their PISA scores. It can be seen that the changes are minimal, which indicates that the main findings are robust with respect to the method used to account for student background (see Appendix Table A.1 for a direct comparison of the results with the two different methods).

Figure 5: 2022 PISA science result in EU and UK adjusted for parental education



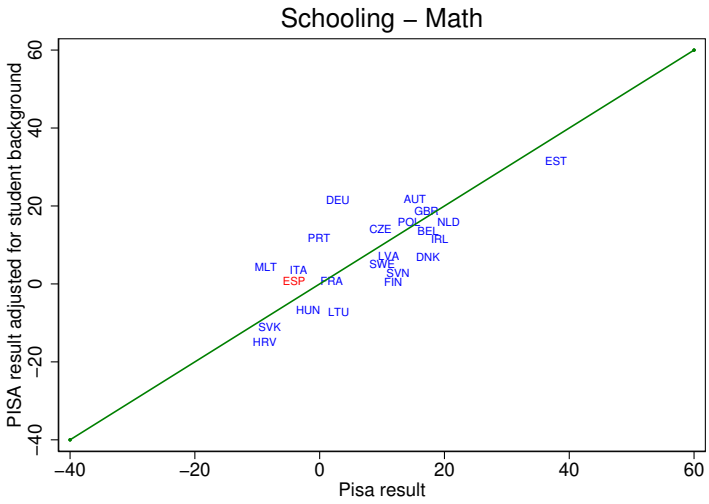
Notes: PISA results adjusted assuming homogeneous effects of student background variables. Bulgaria, Romania, and Greece not shown for readability.

Figure 6: 2022 PISA reading result in EU and UK adjusted for parental education



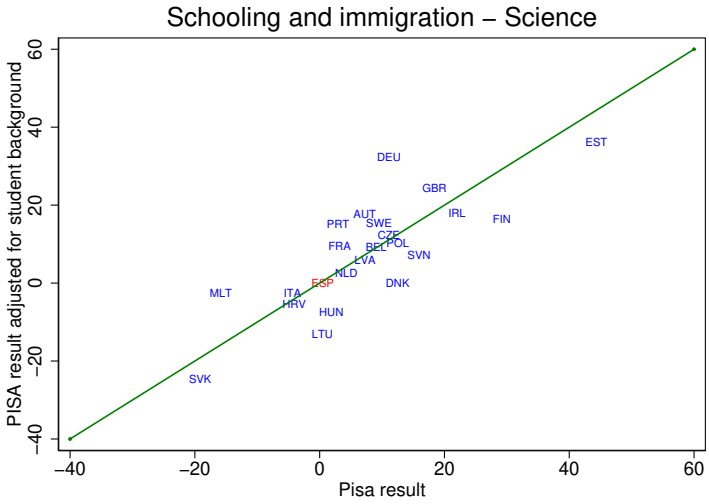
Notes: PISA results adjusted assuming homogeneous effects of student background variables. Bulgaria, Romania, and Greece not shown for readability.

Figure 7: 2022 PISA mathematics result in EU and UK adjusted for parental education



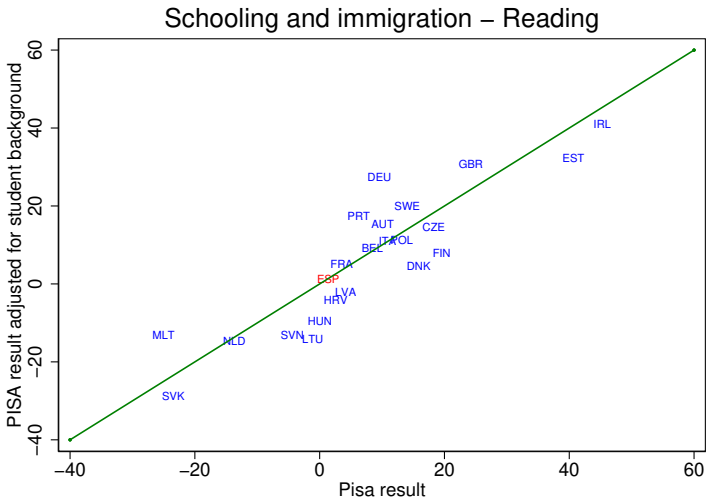
Notes: PISA results adjusted assuming homogeneous effects of student background variables. Bulgaria, Romania, and Greece not shown for readability.

Figure 8: 2022 PISA science result in EU and UK adjusted for parental education and migration history



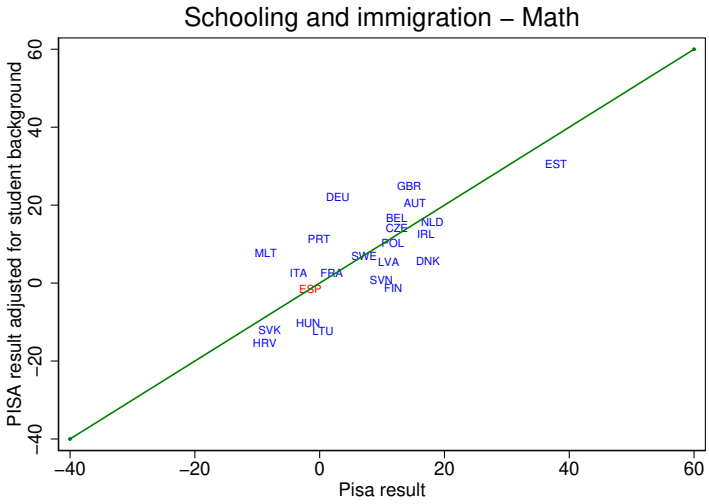
Notes: PISA results adjusted assuming homogeneous effects of student background variables. Bulgaria, Romania, and Greece not shown for readability.

Figure 9: 2022 PISA reading result in EU and UK adjusted for parental education and migration history



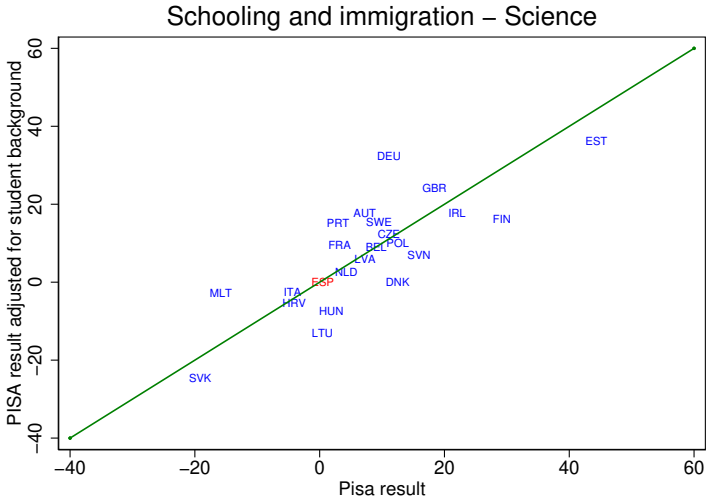
Notes: PISA results adjusted assuming homogeneous effects of student background variables. Bulgaria, Romania, and Greece not shown for readability.

Figure 10: 2022 PISA mathematics result in EU and UK adjusted for parental education and migration history



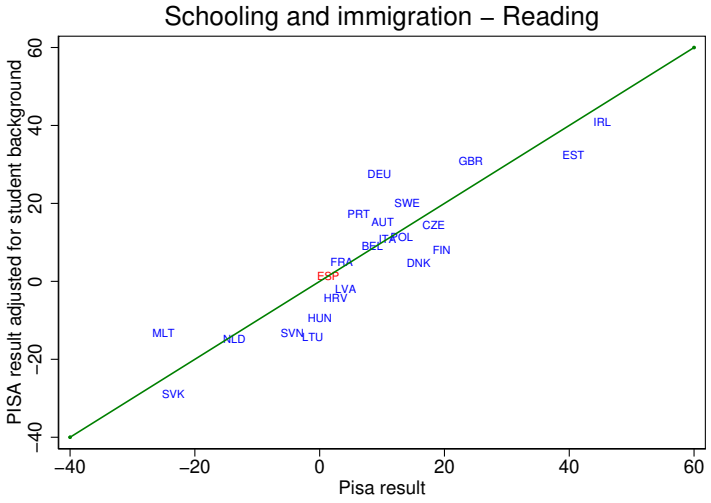
Notes: PISA results adjusted assuming homogeneous effects of student background variables. Bulgaria, Romania, and Greece not shown for readability.

Figure 11: 2022 PISA science result in EU and UK adjusted for parental education, migration history and share of first-generation immigrants in the school



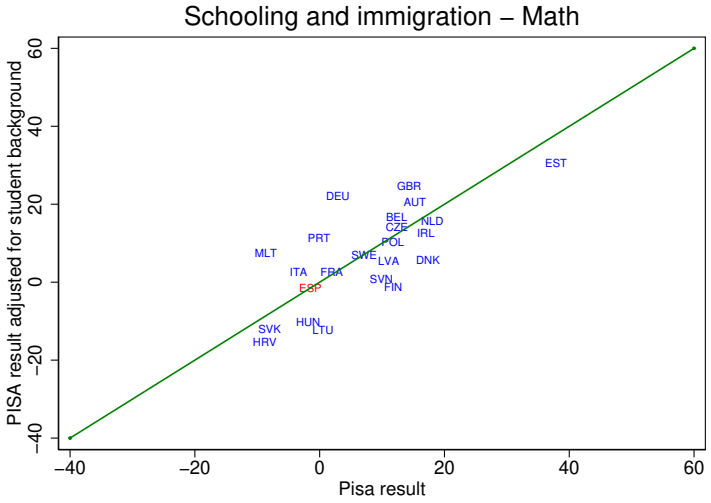
Notes: PISA results adjusted assuming homogeneous effects of student background variables. Bulgaria, Romania, and Greece not shown for readability.

Figure 12: 2022 PISA reading result in EU and UK adjusted for parental education, migration history and share of first-generation immigrants in the school



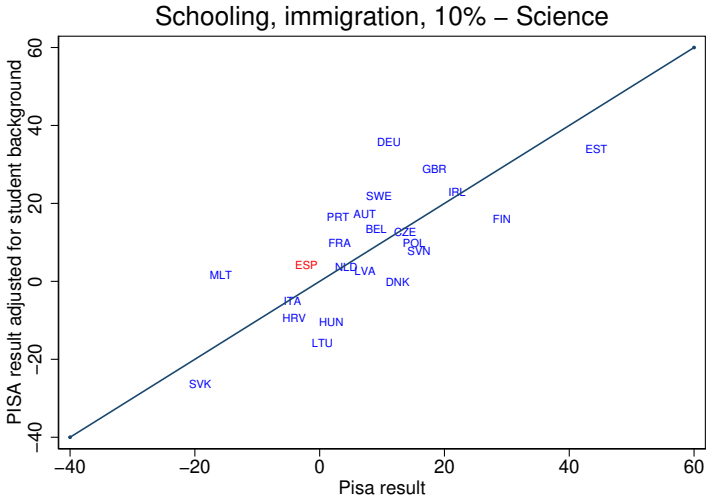
Notes: PISA results adjusted assuming homogeneous effects of student background variables. Bulgaria, Romania, and Greece not shown for readability.

Figure 13: 2022 PISA mathematics result in EU and UK adjusted for parental education, migration history and share of first-generation immigrants in the school



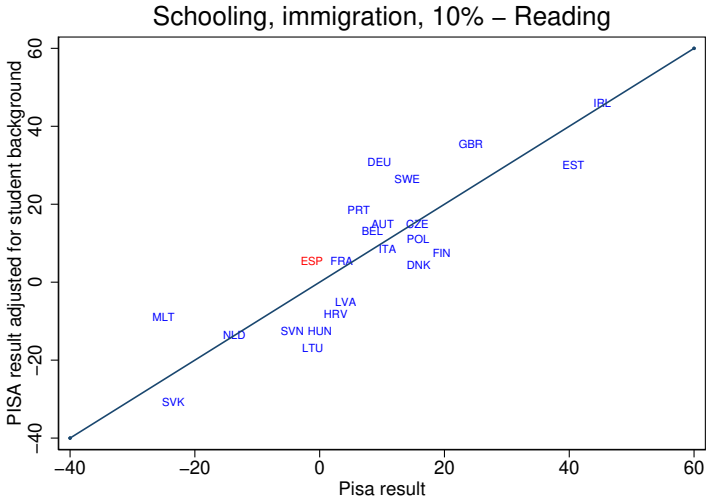
Notes: PISA results adjusted assuming homogeneous effects of student background variables. Bulgaria, Romania, and Greece not shown for readability.

Figure 14: 2022 PISA mathematics result in EU and UK adjusted for parental education, migration history and share of first-generation immigrants in the school



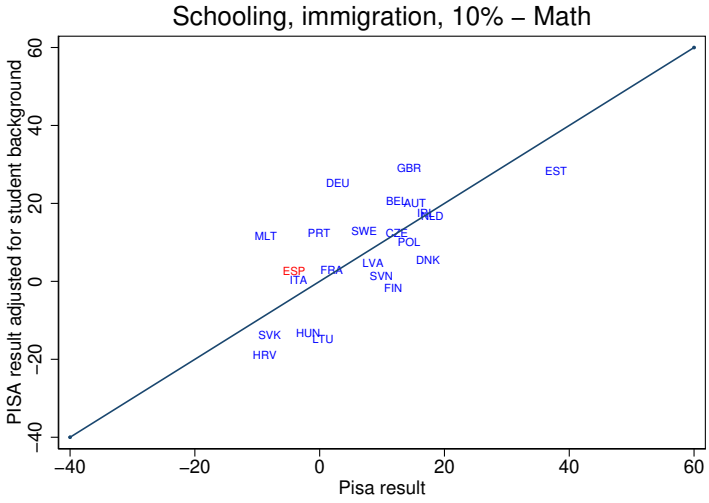
Notes: PISA results adjusted assuming country-specific effects of student background variables. Bulgaria, Romania, and Greece not shown for readability.

Figure 15: 2022 PISA mathematics result in EU and UK adjusted for parental education, migration history and share of first-generation immigrants in the school



Notes: PISA results adjusted assuming country-specific effects of student background variables. Bulgaria, Romania, and Greece not shown for readability.

Figure 16: 2022 PISA mathematics result in EU and UK adjusted for parental education, migration history and share of first-generation immigrants in the school



Notes: PISA results adjusted assuming country-specific effects of student background variables. Bulgaria, Romania, and Greece not shown for readability.

3.3 PISA 2022 & secondary-school expenditure, teacher-to-student ratios, and class size

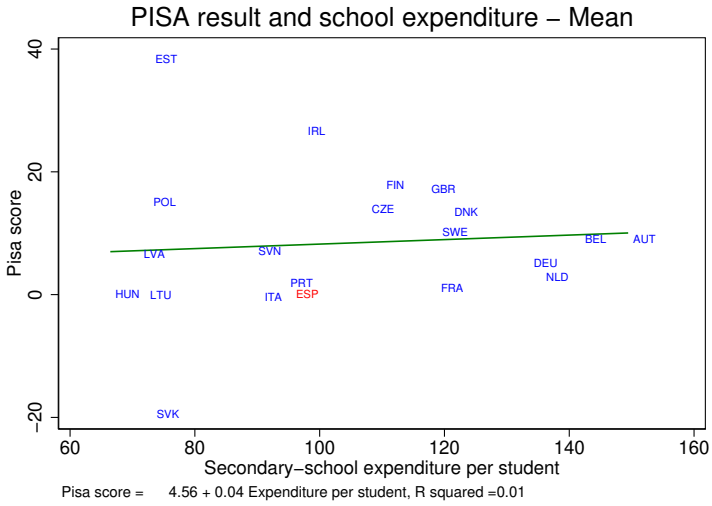
It is popular to link the PISA results of education systems to variables like expenditures per student, teacher-to-student ratios, and class size. Needless to say, using these variables to make a convincing point about factors explaining the relative performance of education systems in PISA is complex. Figures 17-24 show simple associations (bivariate scatter plots) for the most popular variables mentioned in the media or sometimes policy reports: expenditures per student, teacher-to-student ratios, and class size. The expenditure data is adjusted for differences in prices and comes from the OECD (OECD, 2023) while class size and teacher-to-student ratio are taken from PISA 2022. For each variable we first show the association with the PISA result without any adjustments and then also the association with the PISA result adjusted for parental education and individual migration history. In the case of expenditures per student and teacher-to-student ratios, the PISA results refer to an average across all three subjects tested. For class size we have measures for mathematics and reading classes. As a result, we show the association of the class size in mathematics and reading with the corresponding PISA result.

In Figures 17 and 18, it can be seen that PISA results across countries in the European Union show a small positive association with real (PPP-adjusted) secondary-school expenditures per student. Interestingly, the association becomes stronger when we control for student background to focus on the value added of the education system. However, quantitatively, the effect is rather small. For example, our estimates imply that increasing expenditures by 1/5 of the European Union average raises PISA results by around 1/10 of the difference between the countries in the top and bottom group of the European Union (around 40 PISA points). However, there is no positive association between PISA results and teacher-to-student ratio in Figures 19 and 20. Also, it can be seen in Figures 21-24 that smaller classes are not associated with better PISA results in countries of the European Union.

The associations we document in Figures 17-24 mirror the results of the multivariate approach based on earlier PISA results in Fuchs and Woessman (2007). They also find that smaller classes and higher teacher-to-student ratio are not associated with better PISA results, while higher expenditures per student show a positive relationship with better PISA results across countries. More generally, our results are consistent with the weak link between school performance and school resources documented in the broader academic literature (Hanushek, 2020; Holzberger et al., 2020).

We therefore conclude that Spain cannot rely on increasing the teacher-

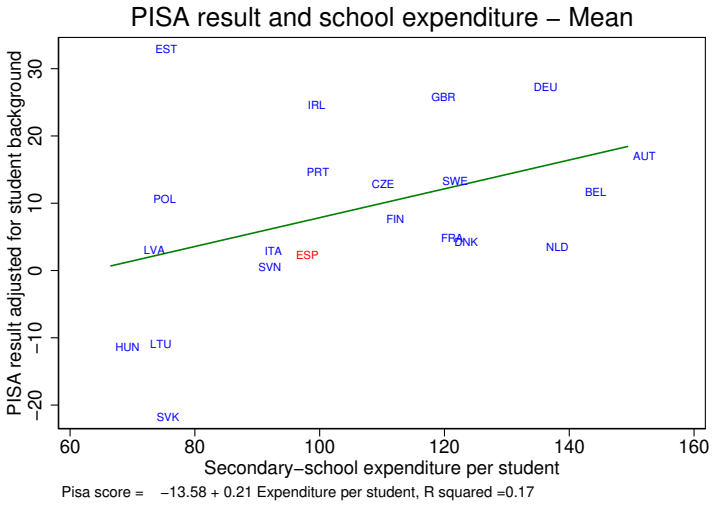
Figure 17: 2022 PISA average result in EU and UK, association with secondary-school expenditure



Notes: Total secondary-school expenditure per student in equivalent USD converted using PPPs for GDP, direct expenditure within educational institutions, EU-25 average = 100 (OECD, 2023). Bulgaria, Romania, and Greece not shown for readability.

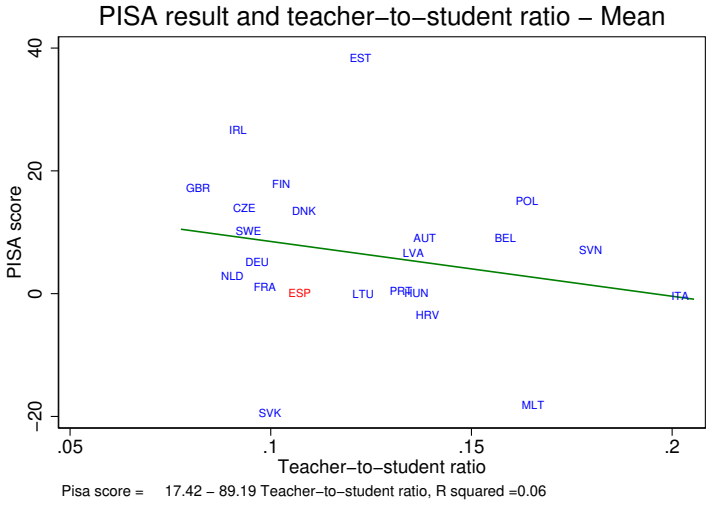
to-student ratio and decreasing class size to improve the value added of its education system. On the other hand, the academic literature documents institutional and organizational arrangements associated with better school performance Hanushek (1997); **?**); Chetty et al. (2014a,b); Hanushek (2020). First, school autonomy combined with external accountability, for example in the form of outside testing, of both schools and teachers. Second, the selection of teaching staff based on their classroom skills and teacher incentives based on classroom teaching. Third, the flexibility of schools to respond to strengths or deficits of their student populations, both in terms of their teaching methods and the selection of teaching staff.

Figure 18: 2022 PISA average result in EU and UK adjusted for parental education and migration history, association with secondary-school expenditure



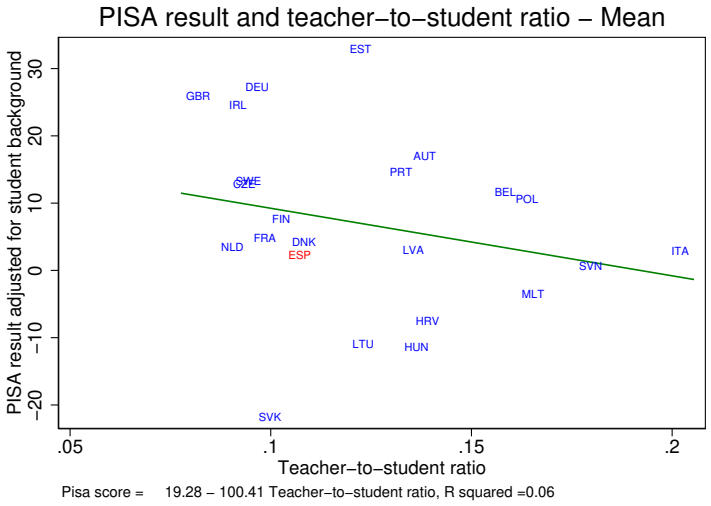
Notes: Total secondary-school expenditure per student in equivalent USD converted using PPPs for GDP, direct expenditure within educational institutions, EU-25 average = 100 (OECD, 2023). Bulgaria, Romania, and Greece not shown for readability.

Figure 19: 2022 PISA average result in EU and UK, association with teacher-to-student ratio



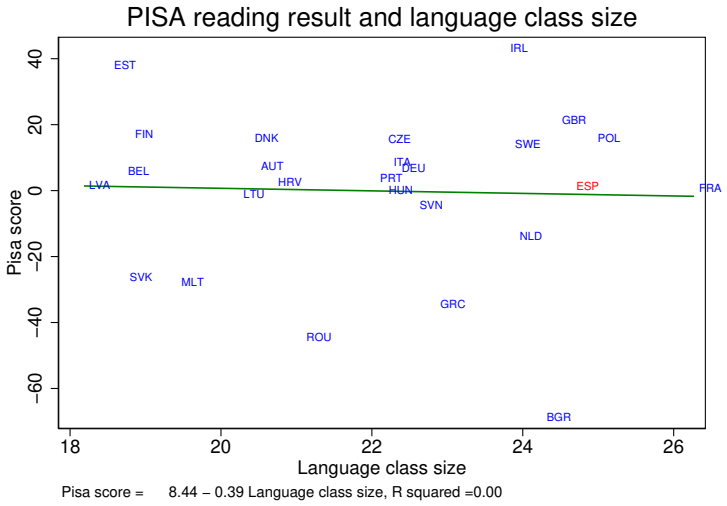
Notes: Bulgaria, Romania, and Greece not shown for readability.

Figure 20: 2022 PISA average result in EU and UK adjusted for parental education and migration history, association with teacher-to-student ratio



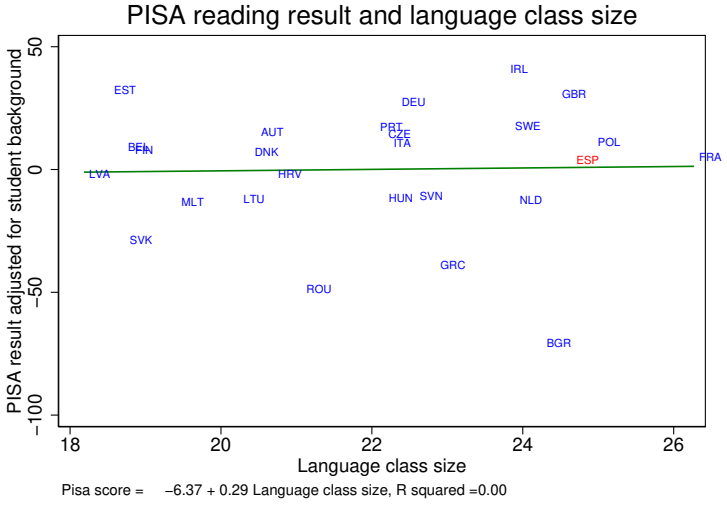
Notes: Bulgaria, Romania, and Greece not shown for readability.

Figure 21: 2022 PISA reading result in EU and UK, association with class size



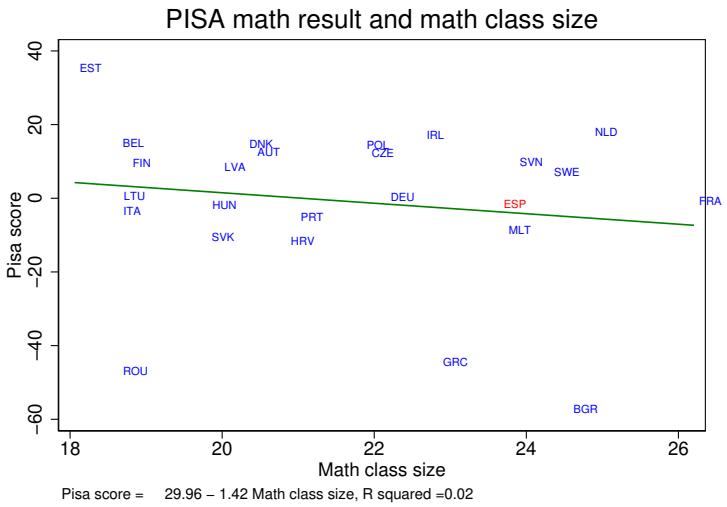
Notes: Bulgaria, Romania, and Greece not shown for readability.

Figure 22: 2022 PISA reading result in EU and UK adjusted for parental education and migration history, association with class size



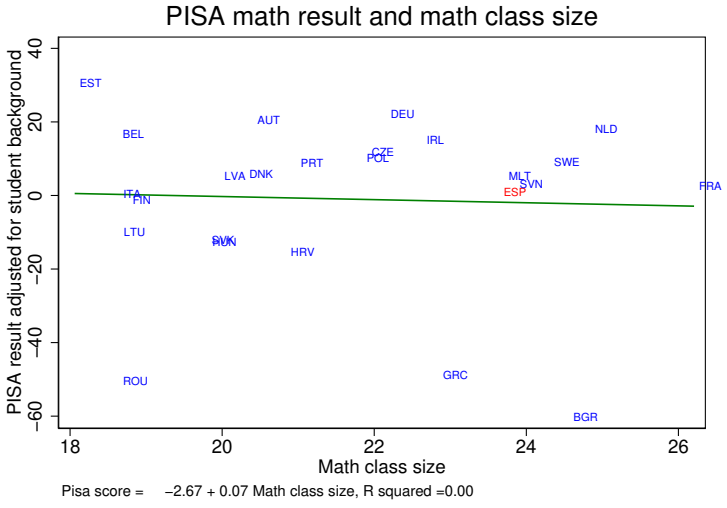
Notes: Bulgaria, Romania, and Greece not shown for readability.

Figure 23: 2022 PISA math result in EU and UK, association with class size



Notes: Bulgaria, Romania, and Greece not shown for readability.

Figure 24: 2022 PISA math result in EU and UK adjusted for parental education and migration history against in EU and UK, association with class size



Notes: Bulgaria, Romania, and Greece not shown for readability.

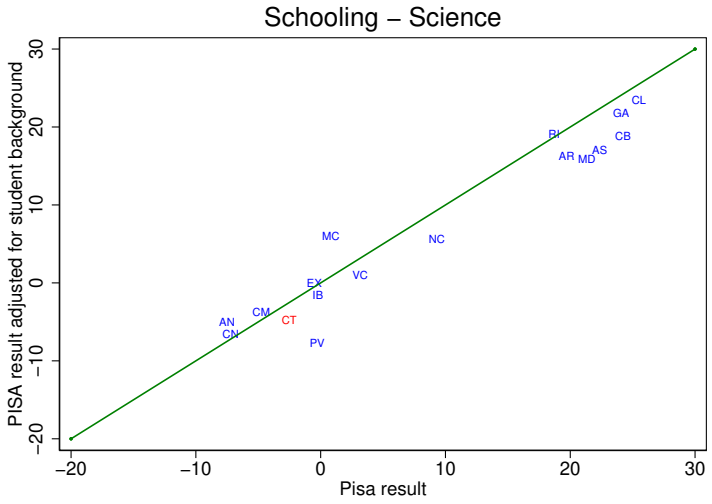
4 Catalonia in PISA 2022

4.1 Adjustments for student background

In Figures 25-36, we examine PISA across Spanish Autonomous Communities (CCAAs) without and with adjustments for student background.[1] The names of the CCAAs are abbreviated, see Appendix Table A.2 for an explanation. Our focus now is on the PISA performance of Catalonia when compared to other CCAA. All figures follow the approach we used for countries of the European Union. We show PISA results on the horizontal axis and adjusted PISA results on the vertical axis. Ceuta and Melilla are not shown for readability. The empirical method is the same as we have used for countries. In Figures 25, 26, and 27, we adjust for parental education of students. In Figures 28, 29, and 30, we also control for the individual immigration history of students using two indicator variables, one capturing whether at least one parent was born outside Spain but the student was born in the country and another whether both the student and at least one parent were born outside Spain. The main finding in these figures is that the PISA result of Catalonia, which is below average overall and in two of the three subjects tested, does not change adjusting for individual student background. Put differently, when compared to the Spanish average, student background does not account for the Catalan PISA result. In Figure 31, 32, and 33, we also take into account whether the student is in a school where strictly more than 10% of students in the tested cohort are first-generation immigrants (were born outside of Spain). This part of our empirical analysis is more challenging as it does not shed light on the sources of any correlation between the share of first-generation immigrant students in a school-cohort and PISA results. It should therefore be interpreted as a first attempt to have a quantitative idea of whether the concentration of first-generation immigrants in some schools might account for a substantial part of the PISA result in Catalonia when compared to other CCAAs. In line with our previous analysis, the counterfactual PISA result for each CCAA in Figures 31, 32, and 33 now also assumes that the share of schools with more than 10% first-generation immigrants is the same in each CCAA and equal to the average in Spain. It can be seen that with this adjustment, the PISA result of Catalonia improves somewhat relative to the Spanish average. The reason is straightforward. Students in schools with more than 10% first-generation immigrants have lower PISA results than with less than 10% first-generation immigrants, see the results in Appendix Tables A.9-A.11, and in Catalonia there are more such schools than in the

[1] We also include the two Autonomous Cities Ceuta and Melilla but do not display them in the figures for readability.

Figure 25: 2022 PISA science result across Spanish CCAAs adjusted for parental education

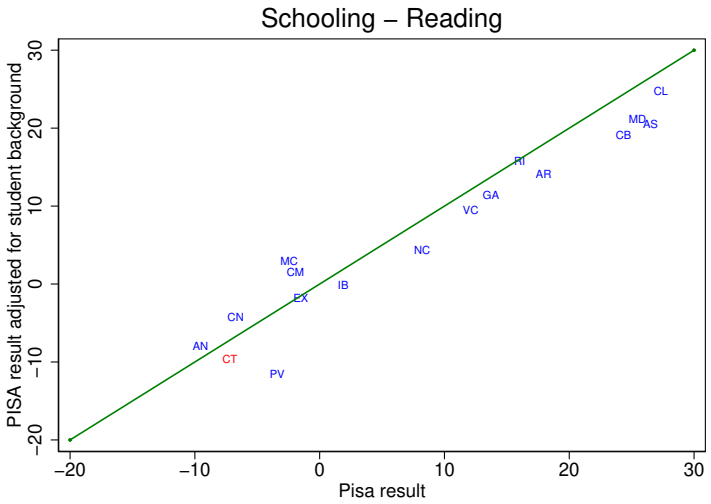


Notes: PISA results adjusted assuming homogeneous effects of student background variables. Ceuta and Melilla not shown for readability.

rest of Spain. Again, as already mentioned, the causes of this correlation are not clarified by our analysis and, as a result, the correlation could reflect omitted, third factors. A key finding in the figures is that quantitatively, the change in the PISA result of Catalonia is limited: around 5 PISA points. Hence, the potential for improving the Catalan PISA results by undoing some of the concentration of first-generation immigrants in some schools is limited. Moreover, as the PISA data does not allow us to identify the underlying causes of the lower PISA performance of schools with a concentration of students born abroad, it is unclear whether these schools would improve if the share of students born abroad were to decrease.

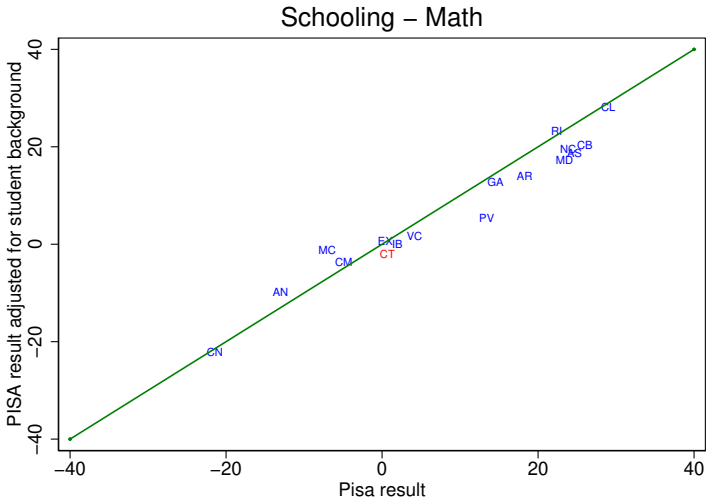
Figures 34, 35, and 36, repeat the analysis of Figures 31, 32, and 33 but allowing for CCAA-specific effects of student background variables on their PISA scores. It can be seen that the changes are minimal, which indicates that the main findings are robust with respect to the method used to account for student background (see Appendix Figure A.2 for a direct comparison of the results with the two different methods).

Figure 26: 2022 PISA reading result across Spanish CCAAs adjusted for parental education



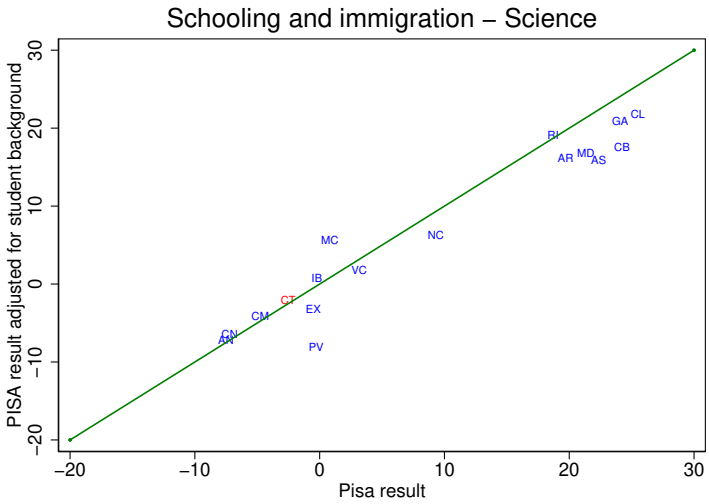
Notes: PISA results adjusted assuming homogeneous effects of student background variables. Ceuta and Melilla not shown for readability.

Figure 27: 2022 PISA mathematics result across Spanish CCAAs adjusted for parental education



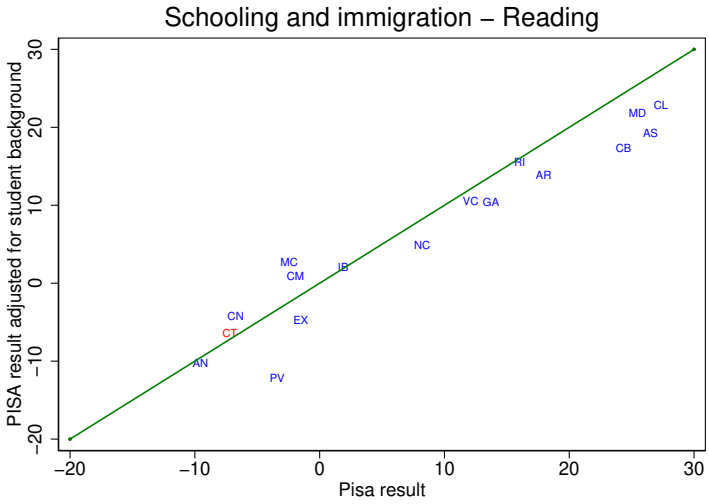
Notes: PISA results adjusted assuming homogeneous effects of student background variables. Ceuta and Melilla not shown for readability.

Figure 28: 2022 PISA science result across Spanish CCAAs adjusted for parental education and migration history



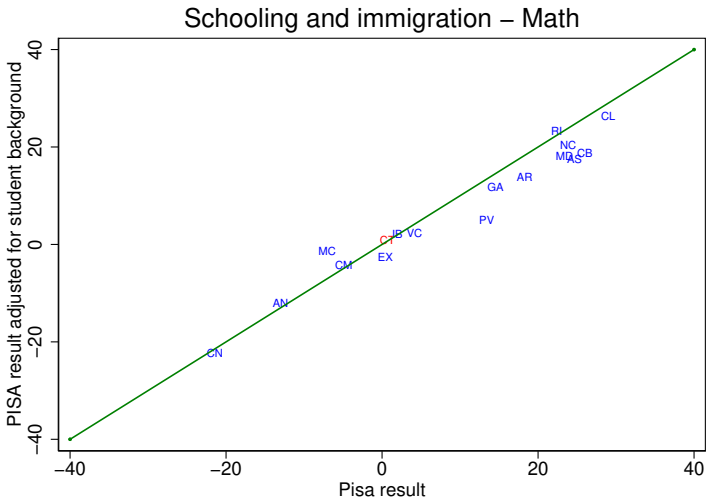
Notes: PISA results adjusted assuming homogeneous effects of student background variables. Ceuta and Melilla not shown for readability.

Figure 29: 2022 PISA reading result across Spanish CCAAs adjusted for parental education and migration history



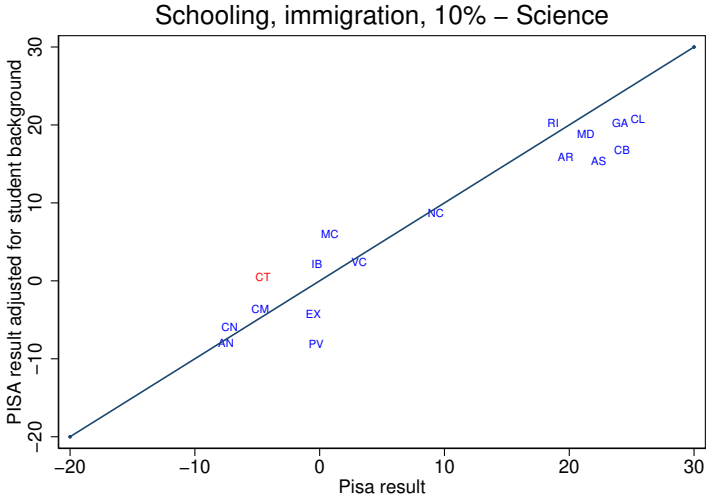
Notes: PISA results adjusted assuming homogeneous effects of student background variables. Ceuta and Melilla not shown for readability.

Figure 30: 2022 PISA mathematics result across Spanish CCAAs adjusted for parental education and migration history



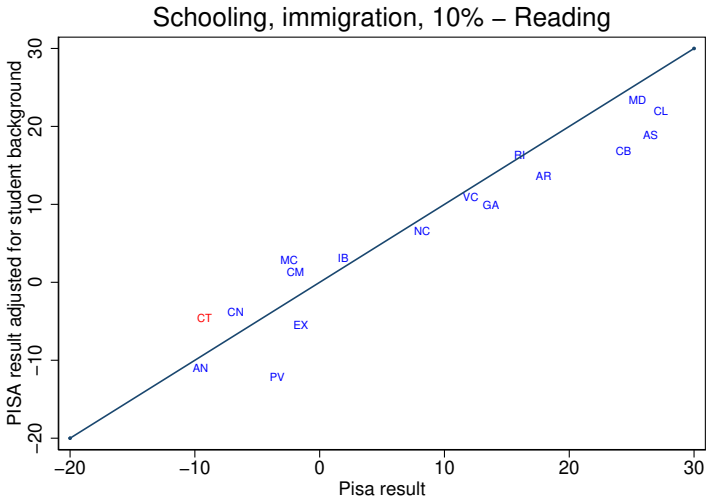
Notes: PISA results adjusted assuming homogeneous effects of student background variables. Ceuta and Melilla not shown for readability.

Figure 31: 2022 PISA science result across Spanish CCAAs adjusted for parental education, migration history and share of first-generation immigrants in the school



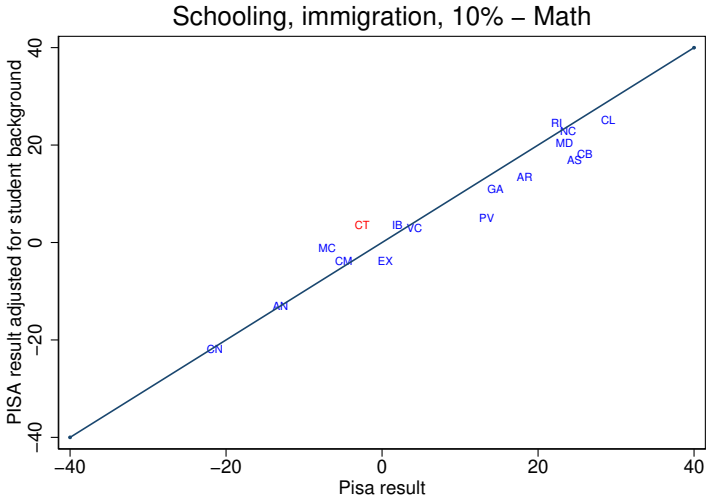
Notes: PISA results adjusted assuming homogeneous effects of student background variables. Ceuta and Melilla not shown for readability.

Figure 32: 2022 PISA reading result across Spanish CCAAs adjusted for parental education, migration history and share of first-generation immigrants in the school



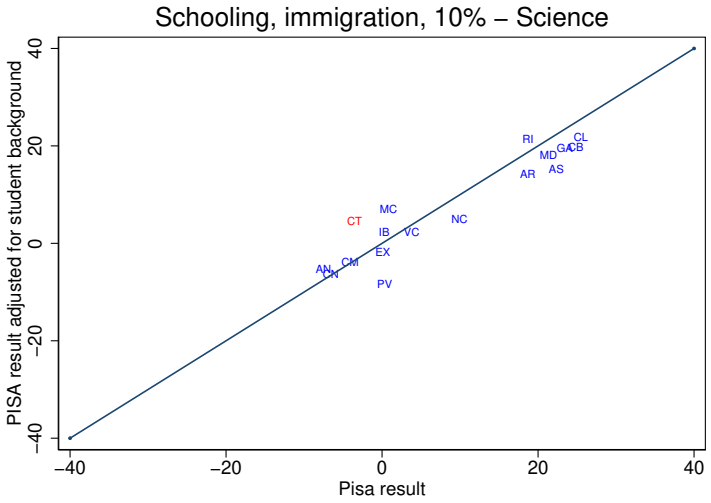
Notes: PISA results adjusted assuming homogeneous effects of student background variables. Ceuta and Melilla not shown for readability.

Figure 33: 2022 PISA reading result across Spanish CCAAs adjusted for parental education, migration history and share of first-generation immigrants in the school



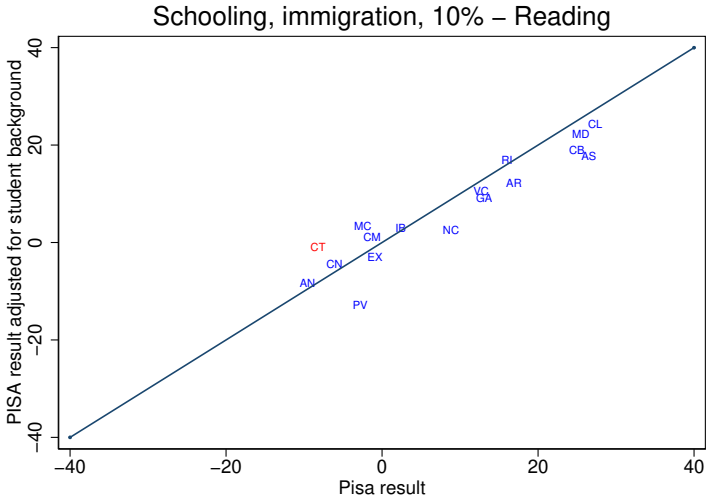
Notes: PISA results adjusted assuming homogeneous effects of student background variables. Ceuta and Melilla not shown for readability.

Figure 34: 2022 PISA science result across Spanish CCAAs adjusted for parental education, migration history and share of first-generation immigrants in the school



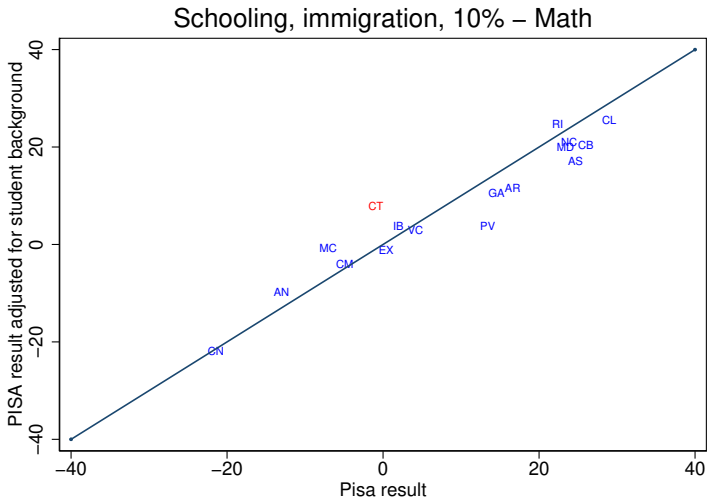
Notes: PISA results adjusted assuming CCAA-specific effects of student background variables. Ceuta and Melilla not shown for readability.

Figure 35: 2022 PISA reading result across Spanish CCAAs adjusted for parental education, migration history and share of first-generation immigrants in the school



Notes: PISA results adjusted assuming CCAA-specific effects of student background variables. Ceuta and Melilla not shown for readability.

Figure 36: 2022 PISA mathematics result across Spanish CCAAs adjusted for parental education, migration history and share of first-generation immigrants in the school

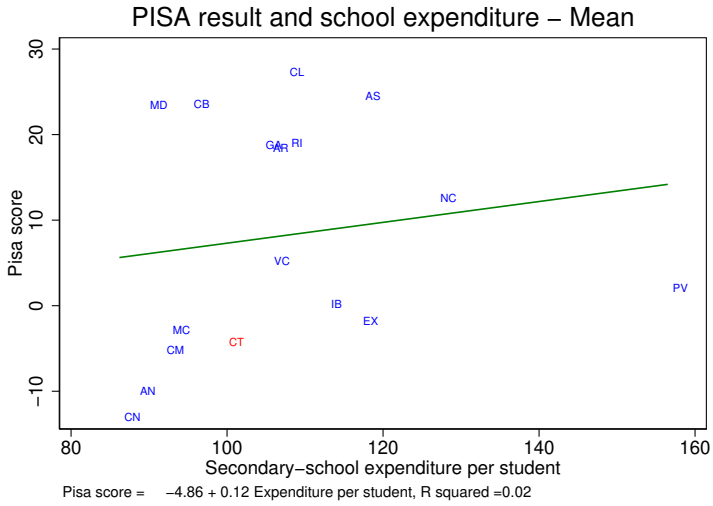


Notes: PISA results adjusted assuming CCAA-specific effects of student background variables. Ceuta and Melilla not shown for readability.

4.2 Secondary-school expenditure, teacher-to-student ratio, and class size

Figures 37-44 look at the role of expenditures per student across CCAAs and also the teacher-to-student ratio and class size, following the approach and definitions we used for European countries above. Catalonia is around the Spanish average in spending per student but has an above average teacher-to-student ratio and below average class size. The simple bivariate scatter plots show that spending more per student is associated with slightly better PISA result across CCAAs, but the positive correlation is statistically insignificant. Interestingly, the positive association vanishes altogether when we consider the PISA result adjusted for parental education and migration history. Hence, there is no evidence for a positive association between expenditures per student and the value added of the education system across Spanish CCAAs. However, note that this finding is not directly comparable to what we obtained for countries of the European Union as the expenditure data for CCAAs is not available in real (PPP-adjusted) terms. The figures for teacher-to-student ratios and the size of classes are especially interesting, as much of the debate in the media focuses on these two school resources. The figures show that higher teacher-to-student ratios and smaller class sizes are *not* associated with better PISA results across CCAAs. These figures are based on PISA

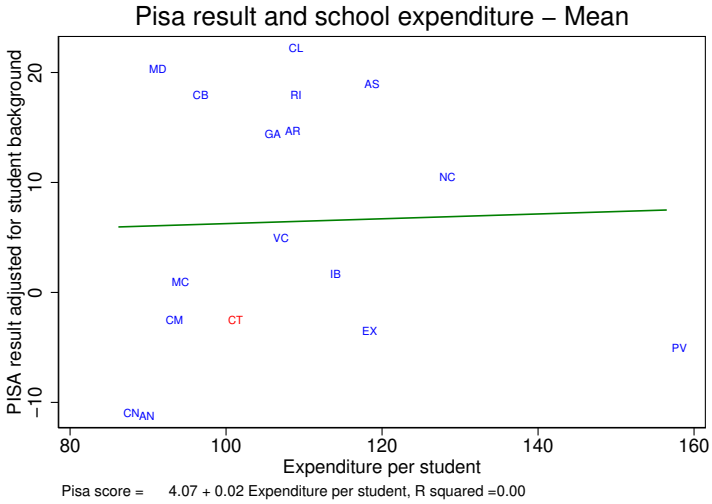
Figure 37: 2022 PISA average result across Spanish CCAA, association with secondary-school expenditure



Notes: Total secondary-school expenditure per student, Spanish average= 100 (de la Fuente, 2018, Table 4). Ceuta and Melilla not shown for readability.

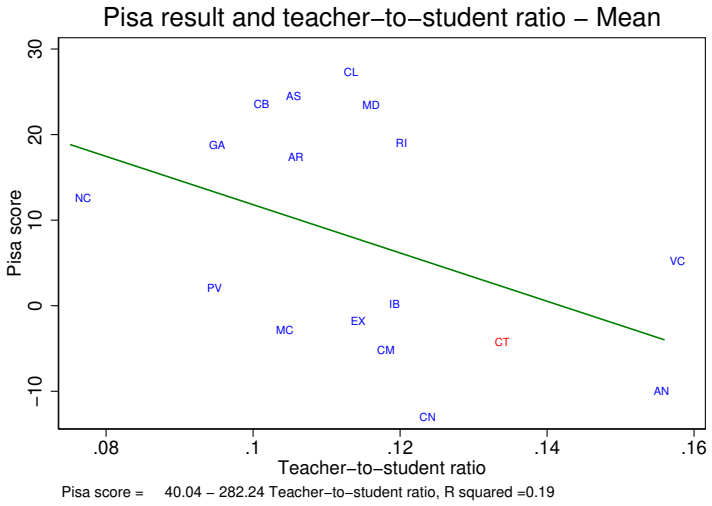
data and are therefore comparable to what we obtained for countries of the European Union.

Figure 38: 2022 PISA average result across Spanish CCAAs adjusted for parental education and migration history, association with secondary-school expenditure



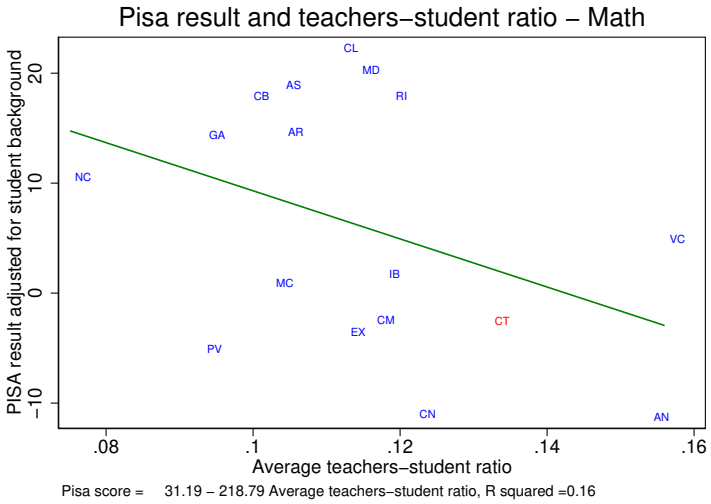
Notes: Total secondary-school expenditure per student, Spanish average= 100 (de la Fuente, 2018, Table 4). Ceuta and Melilla not shown for readability.

Figure 39: 2022 PISA average result across Spanish CCAA, association with teacher-to-student ratio



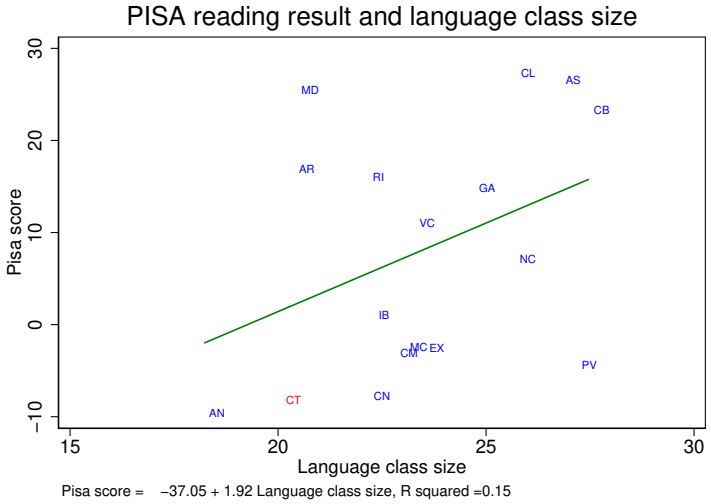
Notes: Ceuta and Melilla not shown for readability.

Figure 40: 2022 PISA average result across Spanish CCAAs adjusted for parental education and migration history, association with teacher-to-student ratio



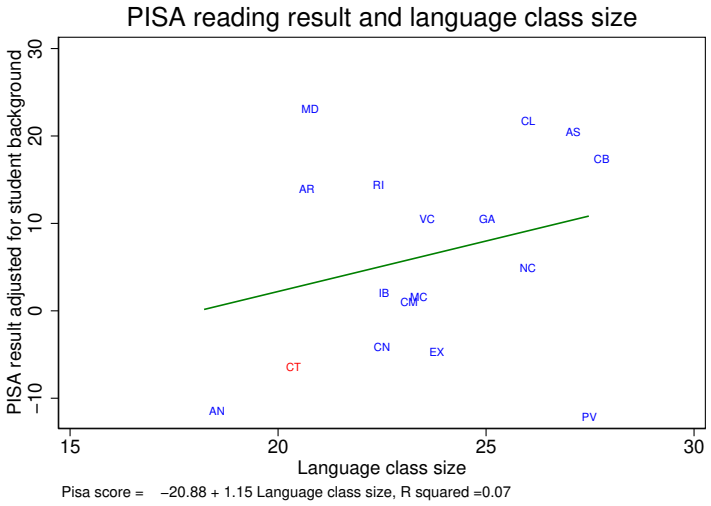
Notes: Ceuta and Melilla not shown for readability.

Figure 41: 2022 PISA reading result across Spanish CCAA, association with class size



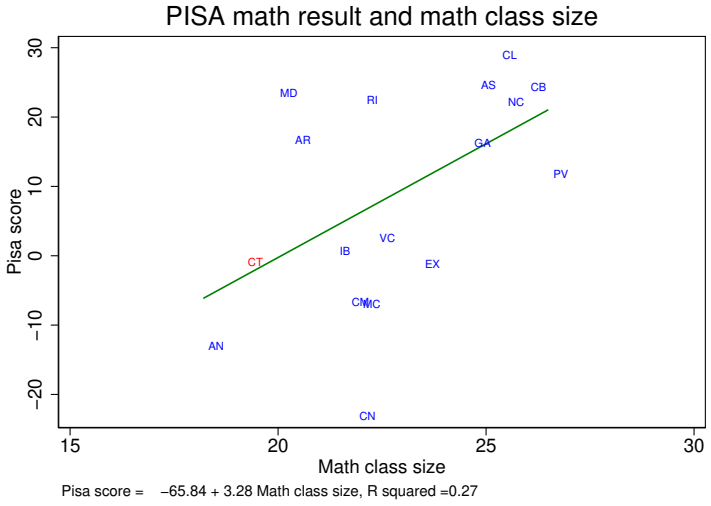
Notes: Ceuta and Melilla not shown for readability.

Figure 42: 2022 PISA reading result across Spanish CCAAs adjusted for parental education and migration history, association with class size



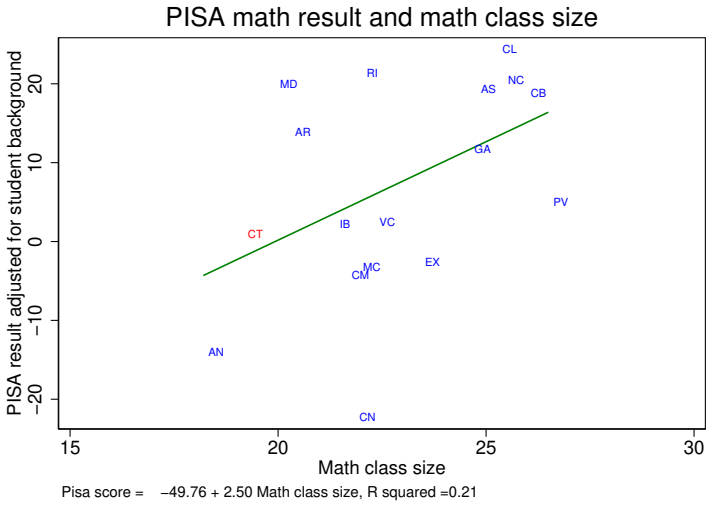
Notes: Ceuta and Melilla not shown for readability.

Figure 43: 2022 PISA mathematics result across Spanish CCAA, association with class size



Notes: Ceuta and Melilla not shown for readability.

Figure 44: 2022 PISA mathematics result across Spanish CCAAs adjusted for parental education and migration history, association with class size

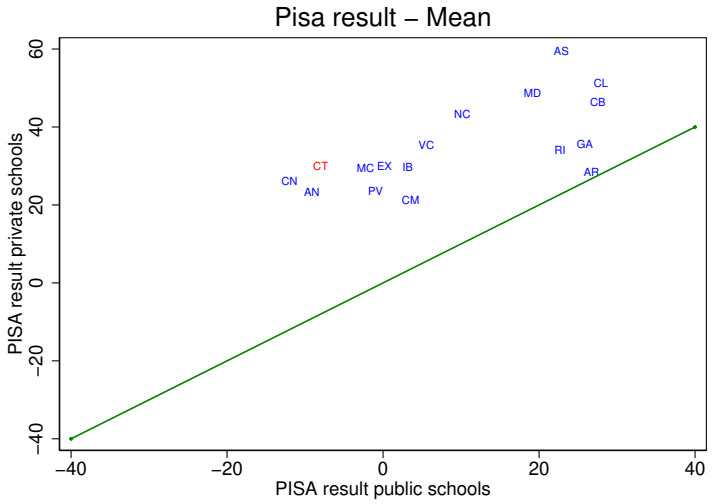


Notes: Ceuta and Melilla not shown for readability.

4.3 Public schools, private schools, and schools managed by religious institutions

Figures 45-49 examine the PISA results of public versus private schools, as defined by PISA. PISA results are relative to the Spanish PISA result (which is for all types of schools). The PISA results shown are averages across all three subjects tested. On the horizontal axis of Figure 45 it can be seen that Catalan public schools are performing below the public schools in most other CCAAs. On the vertical axis, it can be seen that Catalan private schools do relatively better when compared to private schools in other CCAAs. The results of Catalan private schools are around the median of private schools in other CCAAs. The figure can also be used to compare private with public schools in the same CCAA. It can be seen that Catalan private schools outperform Catalan public schools by around 40 PISA points, a very substantial gap. If Spain/Catalonia did 40 points better in 2022, it would have been among the best-performing education systems in our analysis. Of course, the gap between private and public schools may be largely driven by the background of their students. Figures 46 and 47 control for parental education and individual migration history. This reduces the gap between private and public schools in Catalonia to around 30 PISA points. Figure 48 brings in additional information on the socio-economic background of students, the number of books that students have in their homes.

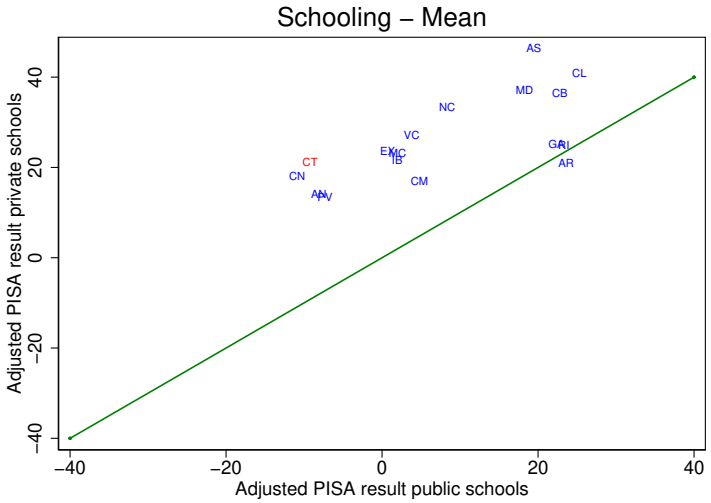
Figure 45: 2022 PISA average result across Spanish CCAAs in public and private schools



Notes: Ceuta and Melilla not shown for readability.

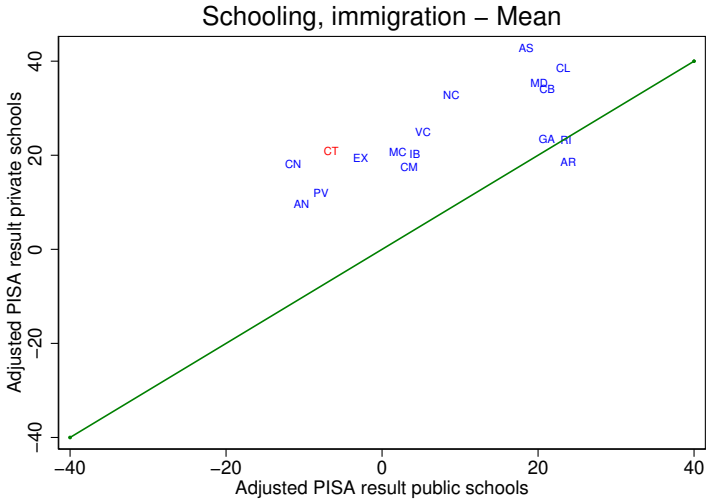
Now the gap shrinks to around 20 PISA points. Figure 49 additionally controls for the concentration of first-generation immigrants, as already explained above. This changes the conclusion by very little. Figures 50 to 54 compare public schools with schools managed by religious or church organizations, again as identified by PISA 2022. These schools outperform public schools by 25-30 points without any adjustments. When student background is accounted for, the gap shrinks to around 10 PISA points.

Figure 46: 2022 PISA average result across Spanish CCAAs adjusted for parental education in public and private schools



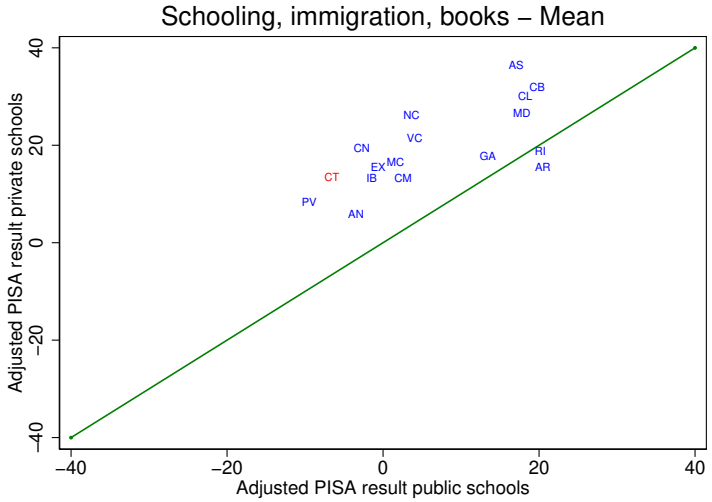
Notes: Ceuta and Melilla not shown for readability.

Figure 47: 2022 PISA average result across Spanish CCAAs adjusted for parental education and migration history in public and private schools



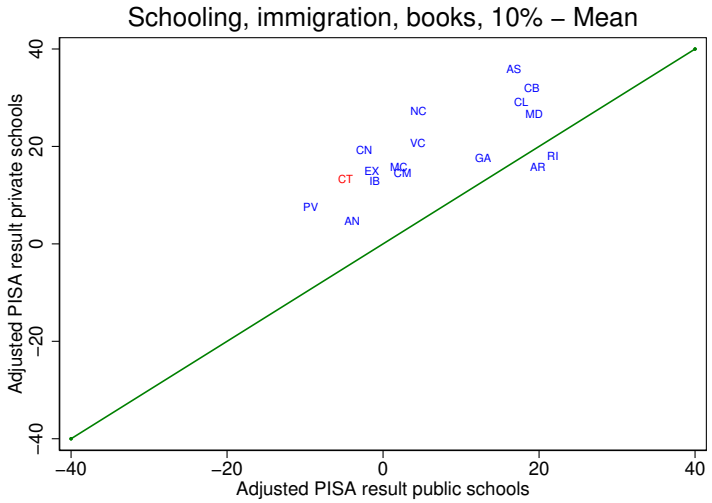
Notes: Ceuta and Melilla not shown for readability.

Figure 48: 2022 PISA average result across Spanish CCAAs adjusted for parental education, migration history and boks in public and private schools



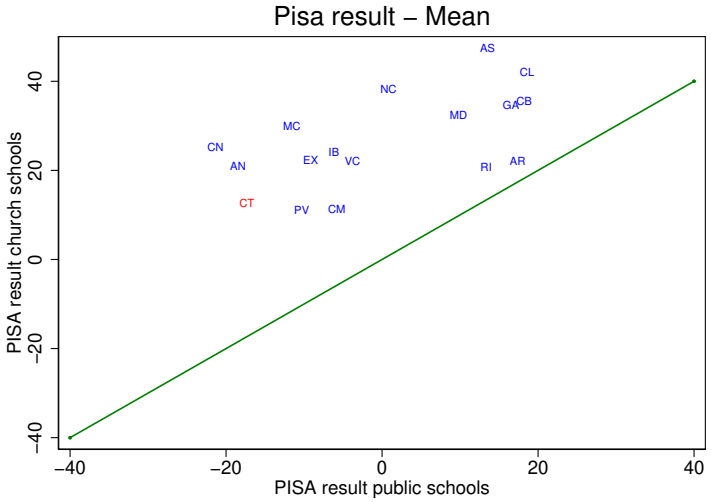
Notes: Ceuta and Melilla not shown for readability.

Figure 49: 2022 PISA average result across Spanish CCAAs adjusted for parental education, migration history, books, and share of first-generation immigrants in the school in public and private schools



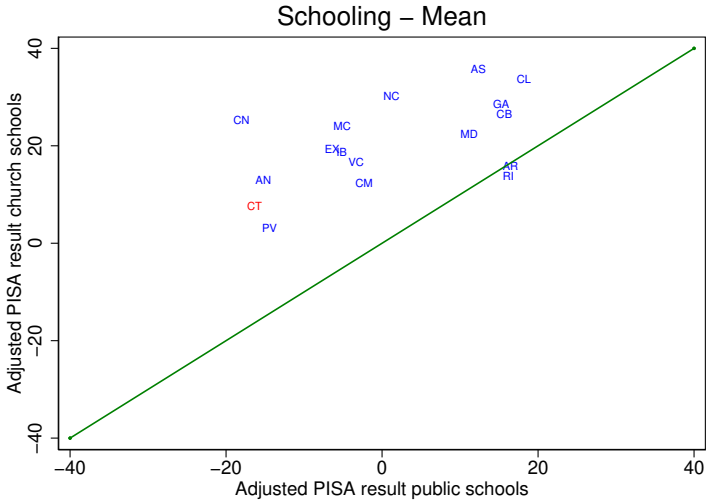
Notes: Ceuta and Melilla not shown for readability.

Figure 50: 2022 PISA average result across Spanish CCAAs in public schools and schools managed by church or religious institutions



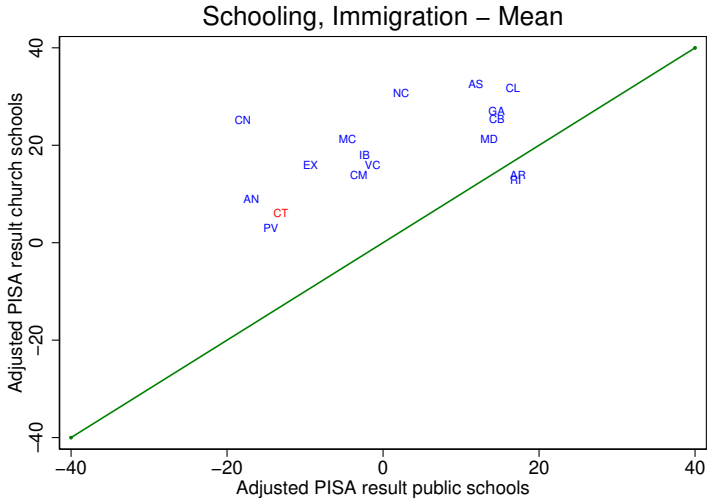
Notes: Ceuta and Melilla not shown for readability.

Figure 51: 2022 PISA average result across Spanish CCAAs adjusted for parental education in public schools and schools managed by church or religious institutions



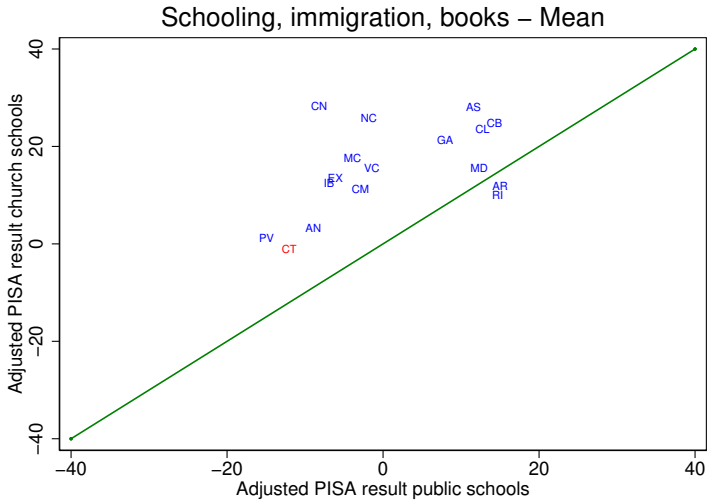
Notes: Ceuta and Melilla not shown for readability.

Figure 52: 2022 PISA average result across Spanish CCAAs adjusted for parental education and migration history in public schools and schools managed by church or religious institutions



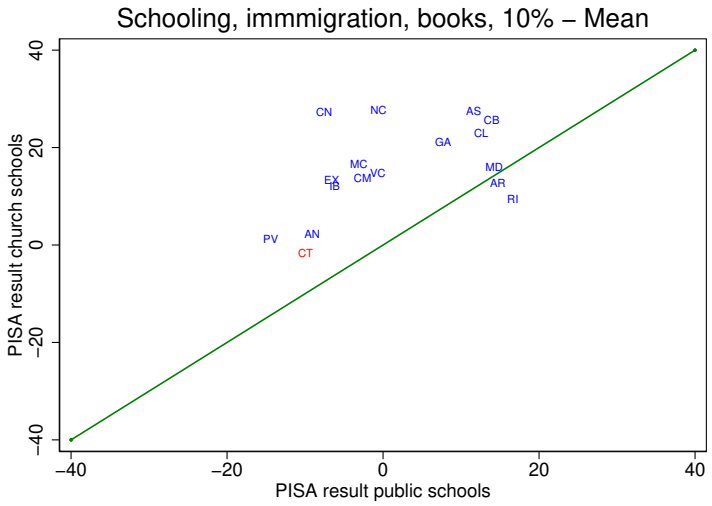
Notes: Ceuta and Melilla not shown for readability.

Figure 53: 2022 PISA average result across Spanish CCAAs adjusted for parental education, migration history and books in public schools and schools managed by church or religious institutions



Notes: Ceuta and Melilla not shown for readability.

Figure 54: 2022 PISA average result across Spanish CCAAs adjusted for parental education, migration history, books and share of first-generation immigrants in the school in public schools and schools managed by church or religious institutions



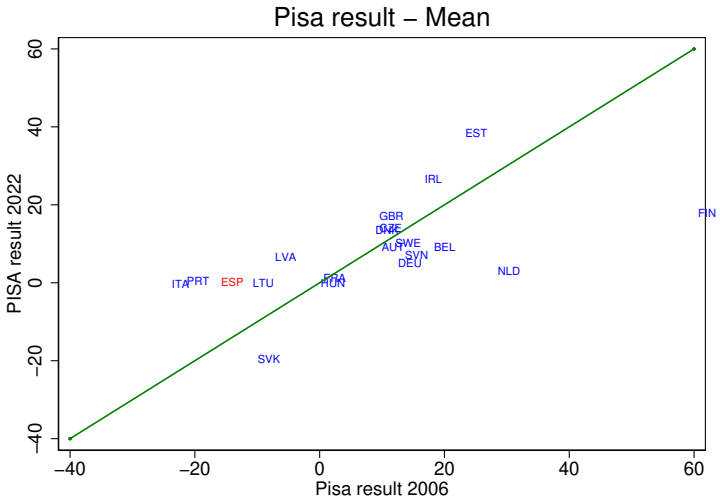
Notes: Ceuta and Melilla not shown for readability.

5 Spain in PISA 2006, 2018, and 2022

5.1 2006 and 2022

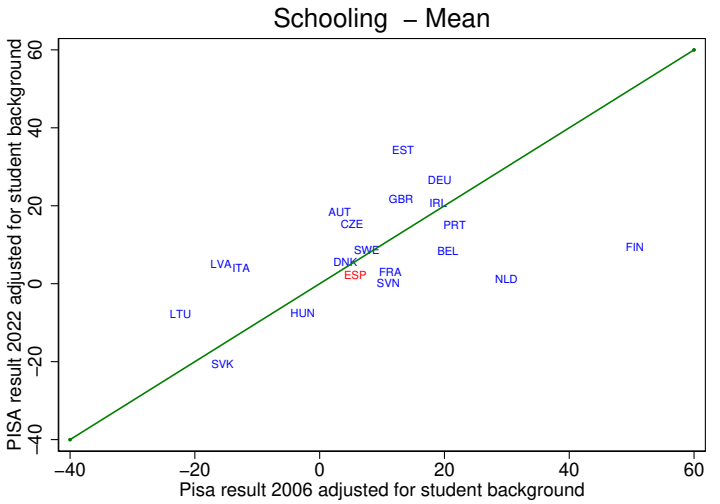
Figure 55 and 60 compare the results of Spain in PISA 2006 and 2022. PISA results are measured relative to the average across all countries in the same year. It can be seen that Spain has improved in PISA 2022 relative to PISA 2006 (Figure 55) but also that this improvement is entirely accounted for by parents' education levels converging to the European average (Figure 56).

Figure 55: 2006 and 2022 PISA average result in EU and UK compared



Notes: Bulgaria, Romania, and Greece not shown for readability.

Figure 56: 2006 and 2022 PISA average result in EU and UK compared adjusted for parental education

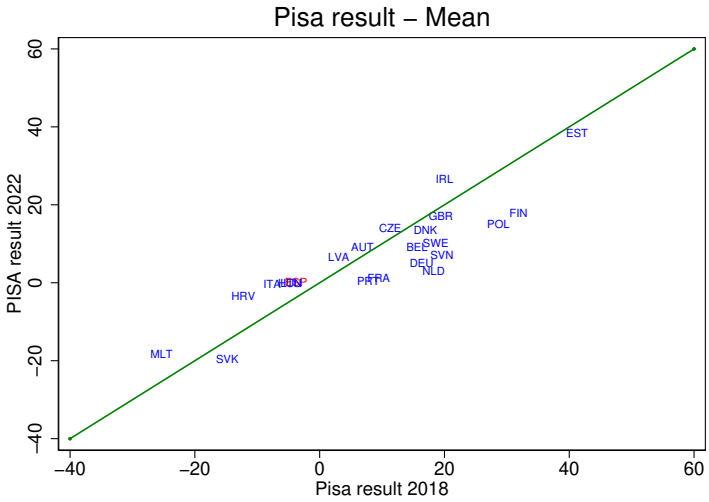


Notes: PISA results adjusted assuming homogeneous effects of student background variables. Bulgaria, Romania, and Greece not shown for readability.

5.2 2018 and 2022

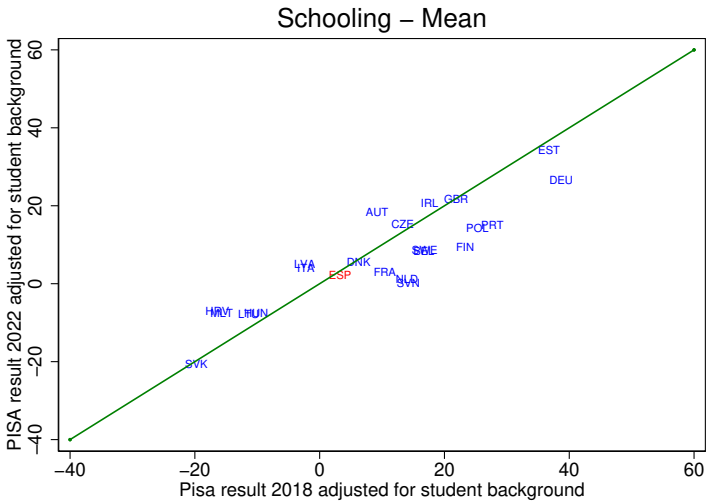
Figure 57 and 58 compare Spain in PISA 2022 to Spain in PISA 2018, the year before the outbreak of COVID-19. Again, PISA results are measured relative to the average across all countries in the same year. It can be seen that without or with adjustment for parental education, the Spanish PISA performance relative to other countries in Europe is nearly unchanged.

Figure 57: 2018 and 2022 PISA average result in EU and UK compared



Notes: Bulgaria, Romania, and Greece not shown for readability.

Figure 58: 2018 and 2022 PISA average result in EU and UK compared adjusted for parental education

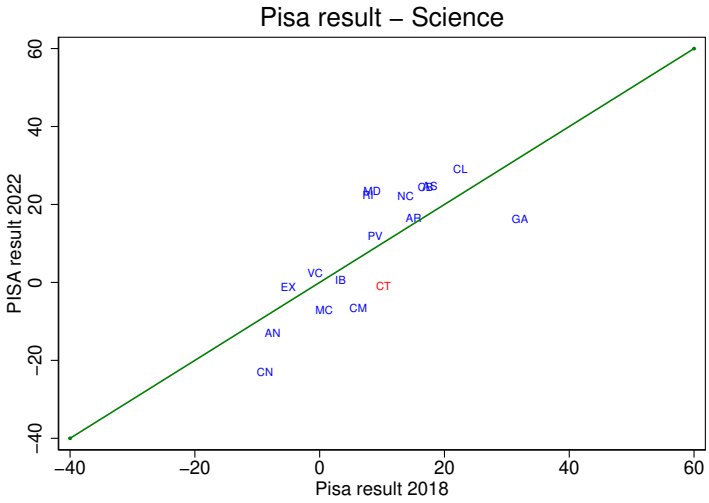


Notes: PISA results adjusted assuming homogeneous effects of student background variables. Bulgaria, Romania, and Greece not shown for readability.

6 Catalonia in PISA 2018 and 2022

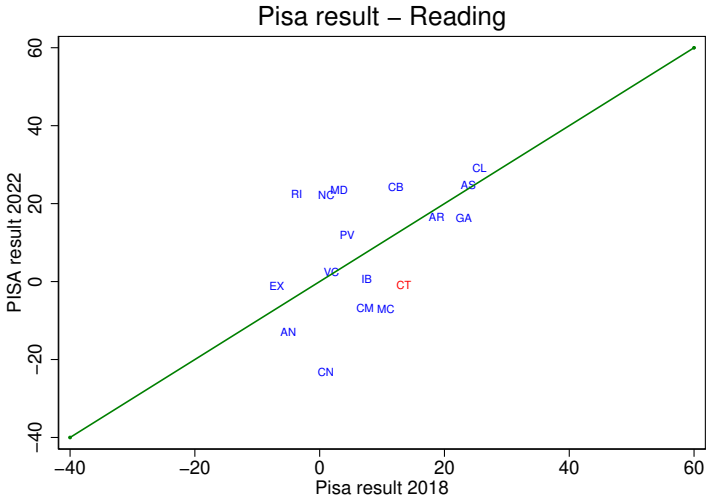
Figures 59 and 60 compare Spanish CCAAs in PISA 2022 and PISA 2018, the year before COVID-19. PISA results are measured relative to the average across all CCAAs in the same year. It can be seen that Catalonia has dropped in PISA 2022 relative to PISA 2018. In math, the drop is the largest across CCAA. In reading and science, the drop is among the largest. As a result of this drop, Catalonia went from above average in 2018 to clearly below average in 2022.

Figure 59: 2018 and 2022 PISA science result across Spanish CCAAs compared



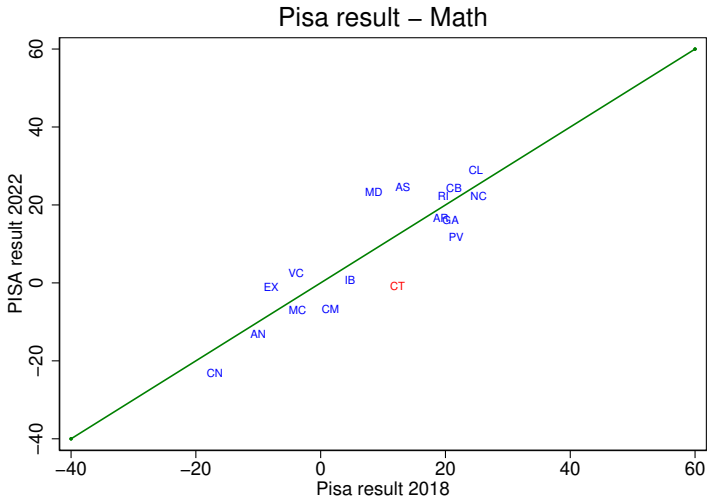
Notes: Bulgaria, Romania, and Greece not shown for readability.

Figure 60: 2018 and 2022 PISA reading result across Spanish CCAAs compared



Notes: Bulgaria, Romania, and Greece not shown for readability.

Figure 61: 2018 and 2022 PISA mathematics result across Spanish CCAAs compared



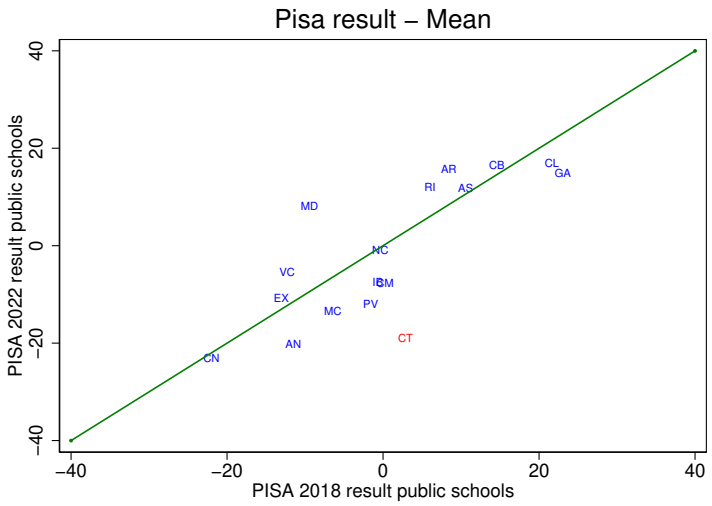
Notes: Bulgaria, Romania, and Greece not shown for readability.

6.1 Public and private schools in PISA 2018 and 2022

Figures 62-66 compare public schools across Spanish CCAAs in PISA 2022 and in PISA 2018, the year before COVID-19. PISA results are measured relative to the average in public schools across all CCAAs in the same year. The drop in the PISA result in Catalan public schools is striking and substantial. It amounts to the largest drop in the PISA result of public schools in all the CCAAs shown in the figures. The drop continues to emerge clearly even after all the adjustments we have been making for student background and the concentration of first-generation immigrants in schools.

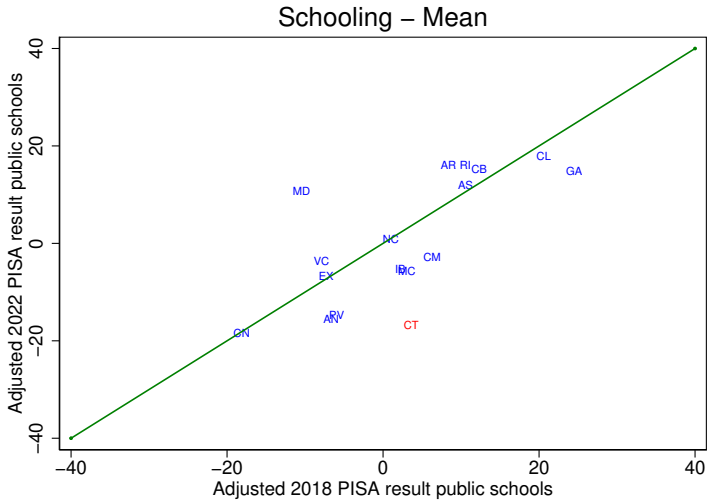
Figures 67-71 implement the same analysis for private schools. There appears to be no change in Catalonia from 2018 to 2022 relative to the average across all CCAA. That is, in contrast to Catalan public schools, the PISA result of Catalan private schools was stable in 2022 relative to 2018 when compared to other CCAAs.

Figure 62: PISA 2018 and 2022 average result across Spanish CCAAs in public schools



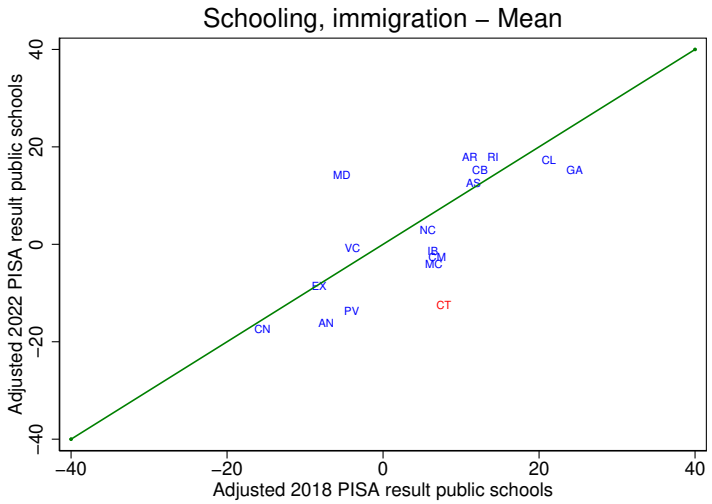
Notes: Bulgaria, Romania, and Greece not shown for readability.

Figure 63: PISA 2018 and 2022 average result across Spanish CCAAs adjusted for parental education in public schools



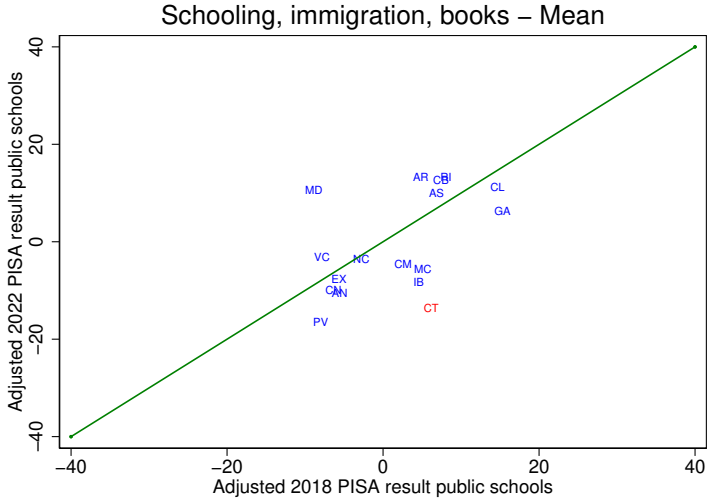
Notes: PISA results adjusted assuming homogeneous effects of student background variables. Bulgaria, Romania, and Greece not shown for readability.

Figure 64: PISA 2018 and 2022 average result across Spanish CCAAs adjusted for parental education and migration history in public schools



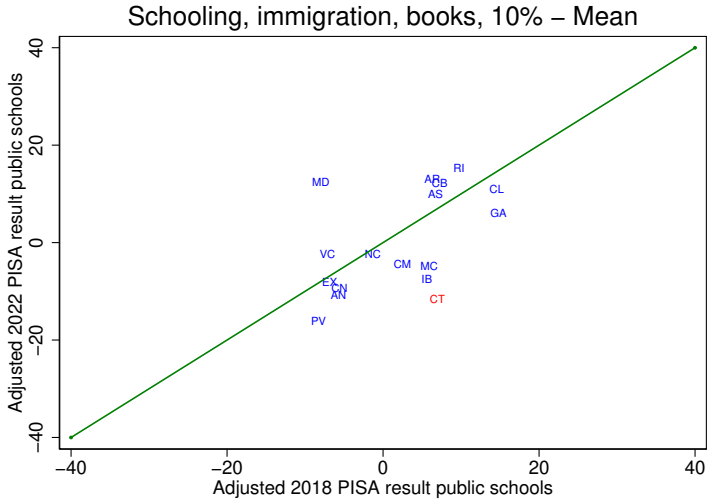
Notes: PISA results adjusted assuming homogeneous effects of student background variables. Bulgaria, Romania, and Greece not shown for readability.

Figure 65: PISA 2018 and 2022 average result across Spanish CCAAs adjusted for parental education, migration history and books in public schools



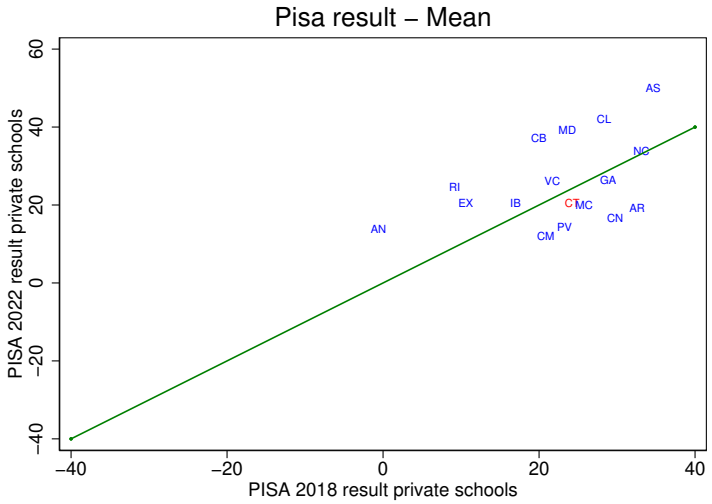
Notes: PISA results adjusted assuming homogeneous effects of student background variables. Bulgaria, Romania, and Greece not shown for readability.

Figure 66: PISA 2018 and 2022 average result across Spanish CCAAs adjusted for parental education, migration history, books and share of first-generation immigrants in the school in public schools



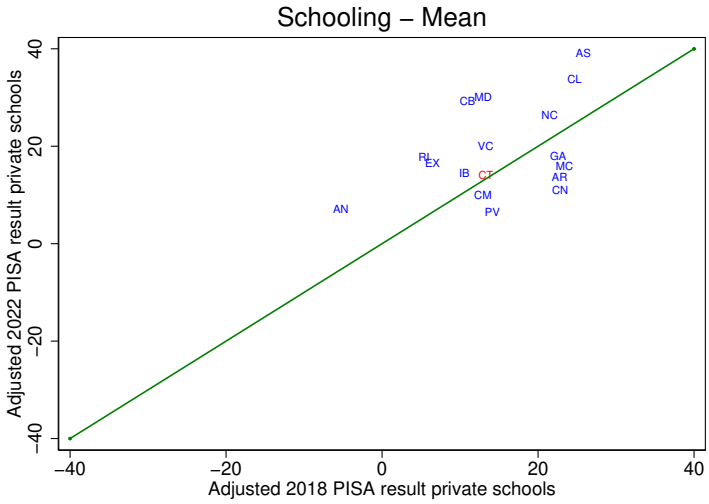
Notes: PISA results adjusted assuming homogeneous effects of student background variables. Bulgaria, Romania, and Greece not shown for readability.

Figure 67: PISA 2018 and 2022 average result across Spanish CCAAs in private schools



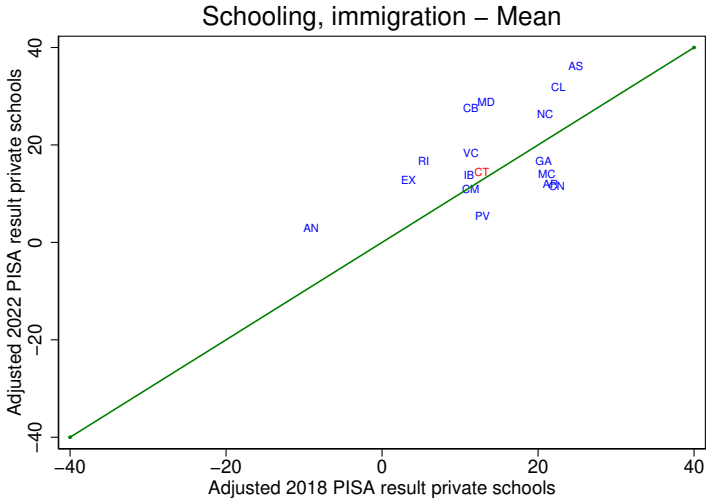
Notes: Bulgaria, Romania, and Greece not shown for readability.

Figure 68: PISA 2018 and 2022 average result across Spanish CCAAs adjusted for parental education in private schools



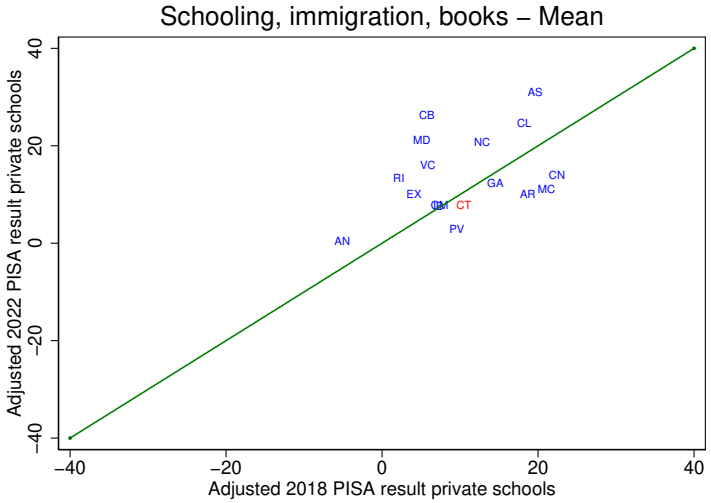
Notes: PISA results adjusted assuming homogeneous effects of student background variables. Bulgaria, Romania, and Greece not shown for readability.

Figure 69: PISA 2018 and 2022 average result across Spanish CCAAs adjusted for parental education and migration history adjusted for parental education, migration history and share of first-generation immigrants in the school in private schools



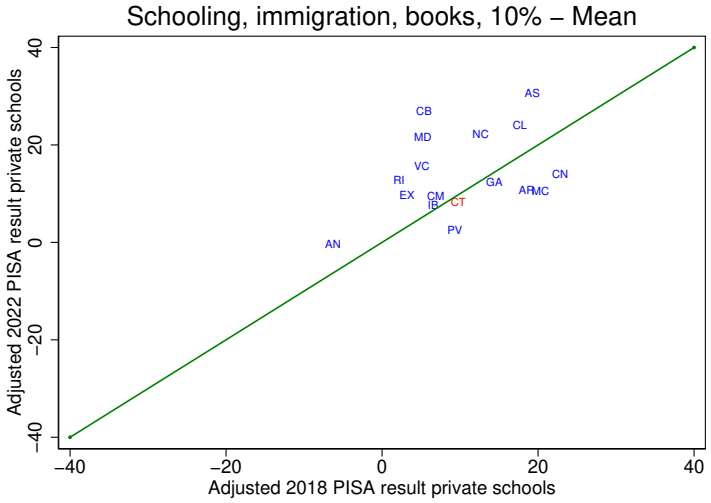
Notes: PISA results adjusted assuming homogeneous effects of student background variables. Bulgaria, Romania, and Greece not shown for readability.

Figure 70: PISA 2018 and 2022 average result across Spanish CCAAs adjusted for parental education, migration history and books in private schools



Notes: PISA results adjusted assuming homogeneous effects of student background variables. Bulgaria, Romania, and Greece not shown for readability.

Figure 71: PISA 2018 and 2022 average result across Spanish CCAAs adjusted for parental education, migration history, books and share of first-generation immigrants in the school in private schools



Notes: PISA results adjusted assuming homogeneous effects of student background variables. Bulgaria, Romania, and Greece not shown for readability.

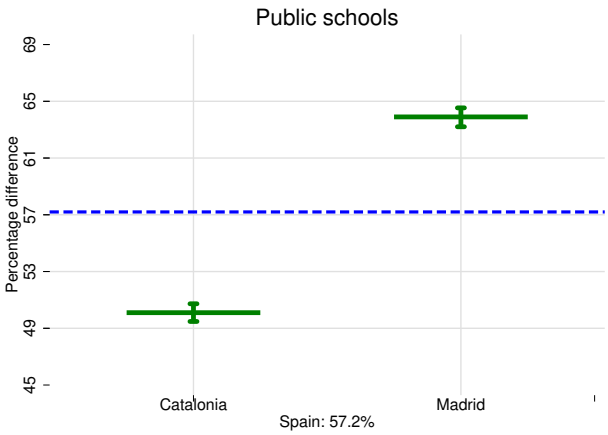
6.2 Student COVID survey public and private schools

Figures 72-74 and 75-77 examine the response of students to questions in the PISA student questionnaire that relate to school assignments during the period when their schools were closed because of COVID-19. Students were asked: (i) how often per week they were sent assignments; (ii) how often per week their schools checked with them to ensure that assignments were completed; and (iii) how often per week their schools asked them to submit completed school assignments. In Figures 72-77, we summarize the share of students who answer "almost every day of the week" in Catalonia and the Community of Madrid as compared to the Spanish average. In Figures 72-74, it can be seen that the Catalan public schools appear to have been less proactive than public schools in Spain and public schools in the Community of Madrid during the period of COVID-19 school closures. For example, in Figure 75, it can be seen that 57% of public school students in Spain answered that their school sent them an assignment almost every day of the week. In the Community of Madrid—which did not see a drop in PISA results in 2022 compared to 2018—the share is substantially above the Spanish average at 64%. In contrast, in Catalonia, the share is only 50%. Moreover, in Figure 77, we find that 46% of public school students in Spain answered that their school asked them to submit a completed assignment almost every day of the week. In the Community of Madrid, the share is substantially above the Spanish average at 53%. In Catalonia, the share is only 38%.

In Figures 75-77, it can be seen that private schools have apparently been more proactive than public schools during the period of COVID-19 school closures. Moreover, Catalan private schools compared to private schools in other CCAAs have been more proactive than Catalan public schools compared to public schools in other CCAAs. For example, as we have seen above, in the Community of Madrid, the share of students who answer that their school asked them to submit a completed assignment almost every day of the week is 53%, while it is only 38% in Catalonia. For private school students, the share in the Community of Madrid is 59% and the share in Catalonia is 52%. That is, the gap between private schools in the two CCAAs is about half the gap between public schools.

In Tables 1-3, we show the results for public and private schools in all Spanish CCAAs in three different specifications: (i) without any student background controls; (ii) accounting for parental education levels and the family's international migration history; (iii) accounting for parental education levels, the family's international migration history, and books at home. It can be seen that there are substantial differences across CCAAs whether or not we control for student background. Hence, differences across different CCAAs in the assessment of students of the COVID-19

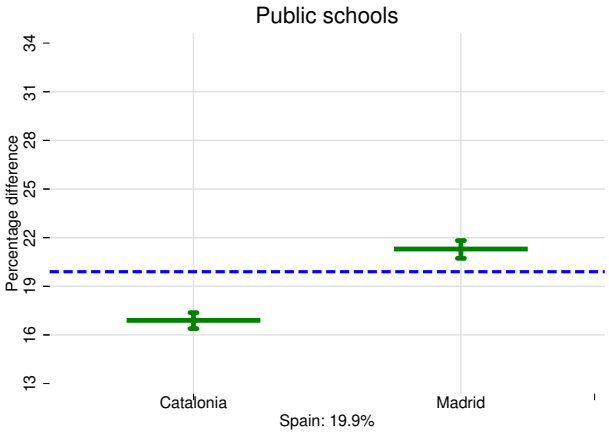
Figure 72: During COVID-19 school building closures, how often per week did somebody from your school send you an assignment? Share of students answering almost every day of the week.



Notes: Vertical bars denote 95% confidence intervals.

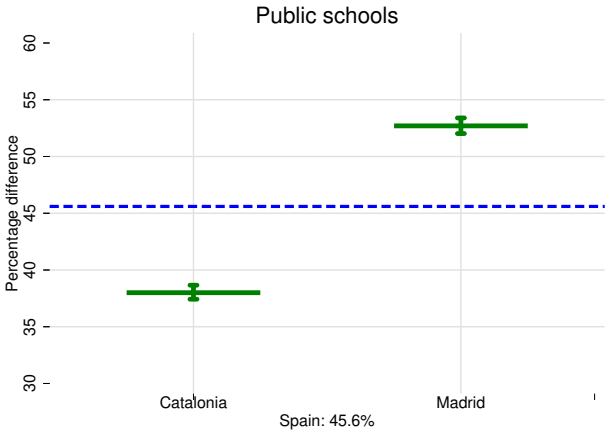
response cannot be accounted for by difference in student background.

Figure 73: During COVID-19 school building closures, how often per week did somebody from your school check to ensure you were completing your assignment? Share of students answering almost every day of the week.



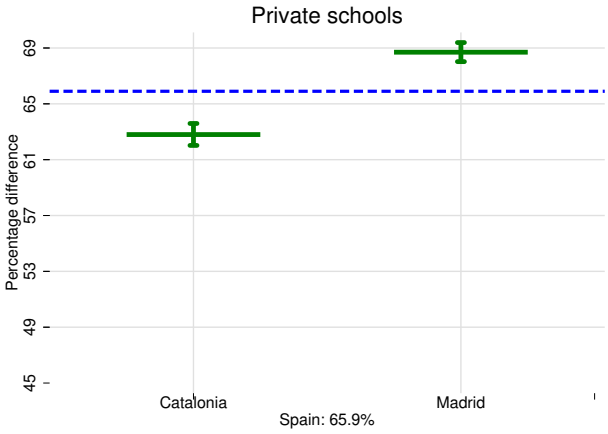
Notes: Vertical bars denote 95% confidence intervals.

Figure 74: During COVID-19 school building closures, how often per week did somebody from your school ask you to submit completed school assignments? Share of students answering almost every day of the week.



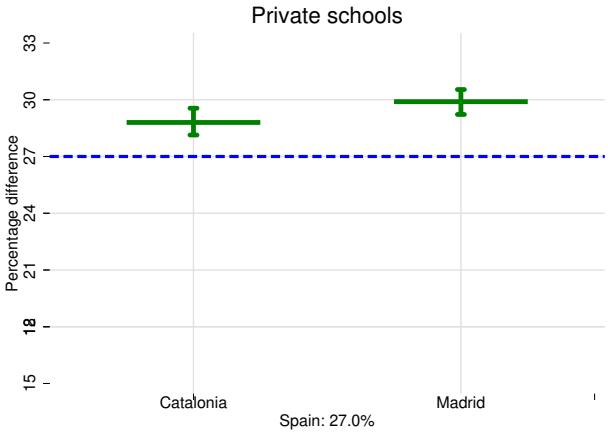
Notes: Vertical bars denote 95% confidence intervals.

Figure 75: During COVID-19 school building closures, how often per week did somebody from your school send you an assignment? Share of students answering almost every day of the week.



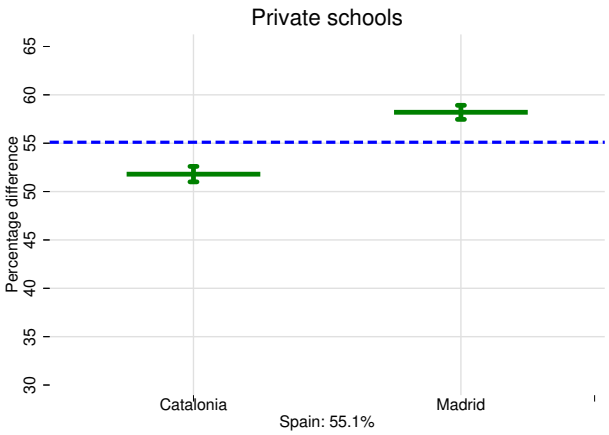
Notes: Vertical bars denote 95% confidence intervals.

Figure 76: During COVID-19 school building closures, how often per week did somebody from your school check to ensure you were completing your assignment? Share of students answering almost every day of the week.



Notes: Vertical bars denote 95% confidence intervals.

Figure 77: During COVID-19 school building closures, how often per week did somebody from your school ask you to submit completed school assignments? Share of students answering almost every day of the week.



Notes: Vertical bars denote 95% confidence intervals.

Table 1: During COVID-19 school building closures, how often did somebody from your school send you an assignment? Share of students answering almost every day of the week.

	(1)		(2)		(3)	
	Private schools	Public schools	Private schools	Public schools	Private schools	Public schools
Andalusia	0.659	0.591	0.650	0.576	0.645	0.581
	(0.00564)	(0.00302)	(0.00632)	(0.00411)	(0.00653)	(0.00445)
Aragon	0.650	0.627	0.647	0.622	0.643	0.619
	(0.0121)	(0.00826)	(0.0126)	(0.00893)	(0.0127)	(0.00904)
Asturias	0.779	0.552	0.760	0.539	0.755	0.535
	(0.0142)	(0.0107)	(0.0145)	(0.0112)	(0.0146)	(0.0113)
Balearic Islands	0.718	0.577	0.712	0.566	0.707	0.561
	(0.0132)	(0.00963)	(0.0136)	(0.0103)	(0.0137)	(0.0104)
Canary Islands	0.663	0.560	0.656	0.556	0.656	0.563
	(0.0122)	(0.00668)	(0.0131)	(0.00747)	(0.0132)	(0.00766)
Cantabria	0.693	0.634	0.689	0.631	0.686	0.626
	(0.0208)	(0.0127)	(0.0215)	(0.0134)	(0.0215)	(0.0135)
Castile and Leon	0.720	0.548	0.708	0.535	0.702	0.530
	(0.00923)	(0.00699)	(0.00975)	(0.00761)	(0.00985)	(0.00775)
Castile-La Mancha	0.611	0.615	0.623	0.598	0.618	0.598
	(0.0131)	(0.00633)	(0.0140)	(0.00710)	(0.0140)	(0.00725)
Catalonia	0.628	0.501	0.610	0.500	0.602	0.498
	(0.00491)	(0.00374)	(0.00576)	(0.00475)	(0.00597)	(0.00499)
Extremadura	0.680	0.622	0.668	0.613	0.662	0.612
	(0.0158)	(0.00894)	(0.0161)	(0.00957)	(0.0161)	(0.00968)
Galicia	0.566	0.534	0.570	0.525	0.563	0.519
	(0.0101)	(0.00599)	(0.0106)	(0.00663)	(0.0107)	(0.00683)
La Rioja	0.596	0.590	0.592	0.585	0.585	0.580
	(0.0215)	(0.0182)	(0.0217)	(0.0186)	(0.0218)	(0.0186)
Madrid	0.687	0.639	0.685	0.644	0.678	0.643
	(0.00427)	(0.00399)	(0.00519)	(0.00493)	(0.00546)	(0.00519)
Murcia	0.670	0.583	0.653	0.576	0.648	0.575
	(0.0105)	(0.00733)	(0.0110)	(0.00792)	(0.0111)	(0.00806)
Navarre	0.624	0.604	0.610	0.592	0.604	0.589
	(0.0154)	(0.0122)	(0.0160)	(0.0128)	(0.0161)	(0.0129)
Basque Country	0.634	0.511	0.621	0.502	0.619	0.501
	(0.00831)	(0.00852)	(0.00891)	(0.00917)	(0.00902)	(0.00927)
C. Valenciana	0.651	0.542	0.641	0.536	0.637	0.537
	(0.00591)	(0.00437)	(0.00650)	(0.00531)	(0.00666)	(0.00550)
Ceuta	0.612	0.567	0.626	0.544	0.636	0.555
	(0.0645)	(0.0265)	(0.0655)	(0.0279)	(0.0654)	(0.0279)
Melilla	0.451	0.585	0.412	0.584	0.407	0.594
	(0.0769)	(0.0235)	(0.0809)	(0.0249)	(0.0808)	(0.0250)

Notes: Standard errors in brackets. (1) No controls, (2) Parental education controls, (3) Parental education and migration history controls.

Table 2: During COVID-19 school building closures, how often per week did somebody from your school check to ensure you were completing your assignment? Share of students answering almost every day of the week.

	(1)		(2)		(3)	
	Private schools	Public schools	Private schools	Public schools	Private schools	Public schools
Andalusia	0.238	0.203	0.234	0.201	0.223	0.193
	(0.00485)	(0.00266)	(0.00544)	(0.00366)	(0.00561)	(0.00394)
Aragon	0.336	0.202	0.332	0.202	0.321	0.192
	(0.0102)	(0.00720)	(0.0107)	(0.00781)	(0.0108)	(0.00792)
Asturias	0.379	0.215	0.373	0.212	0.363	0.200
	(0.0123)	(0.00920)	(0.0126)	(0.00967)	(0.0127)	(0.00978)
Balearic Islands	0.299	0.226	0.301	0.222	0.288	0.211
	(0.0113)	(0.00825)	(0.0118)	(0.00885)	(0.0119)	(0.00895)
Canary Islands	0.253	0.197	0.238	0.191	0.231	0.184
	(0.0101)	(0.00579)	(0.0106)	(0.00650)	(0.0107)	(0.00667)
Cantabria	0.272	0.271	0.277	0.267	0.267	0.254
	(0.0172)	(0.0111)	(0.0176)	(0.0117)	(0.0177)	(0.0118)
Castile and Leon	0.228	0.230	0.215	0.230	0.204	0.216
	(0.00802)	(0.00572)	(0.00851)	(0.00630)	(0.00862)	(0.00644)
Castile-La Manch	0.379	0.239	0.364	0.235	0.352	0.225
	(0.0117)	(0.00518)	(0.0122)	(0.00593)	(0.0123)	(0.00608)
Catalonia	0.290	0.169	0.299	0.167	0.288	0.159
	(0.00401)	(0.00311)	(0.00484)	(0.00399)	(0.00501)	(0.00420)
Extremadura	0.337	0.263	0.339	0.263	0.329	0.254
	(0.0136)	(0.00778)	(0.0140)	(0.00840)	(0.0140)	(0.00850)
Galicia	0.282	0.208	0.278	0.216	0.267	0.204
	(0.00833)	(0.00496)	(0.00881)	(0.00557)	(0.00891)	(0.00575)
La Rioja	0.312	0.252	0.300	0.255	0.290	0.245
	(0.0187)	(0.0157)	(0.0193)	(0.0161)	(0.0193)	(0.0161)
Madrid	0.301	0.213	0.296	0.213	0.284	0.203
	(0.00373)	(0.00347)	(0.00458)	(0.00434)	(0.00482)	(0.00456)
Murcia	0.236	0.231	0.237	0.229	0.225	0.219
	(0.00894)	(0.00610)	(0.00946)	(0.00667)	(0.00956)	(0.00679)
Navarre	0.222	0.257	0.212	0.258	0.202	0.249
	(0.0129)	(0.0105)	(0.0135)	(0.0111)	(0.0135)	(0.0111)
Basque Country	0.271	0.241	0.265	0.232	0.255	0.224
	(0.00704)	(0.00707)	(0.00762)	(0.00764)	(0.00773)	(0.00774)
C. Valenciana	0.191	0.117	0.188	0.113	0.178	0.105
	(0.00527)	(0.00360)	(0.00581)	(0.00448)	(0.00595)	(0.00466)
Ceuta	0.254	0.195	0.238	0.215	0.232	0.210
	(0.0588)	(0.0231)	(0.0597)	(0.0247)	(0.0596)	(0.0247)
Melilla	0.267	0.236	0.265	0.253	0.252	0.247
	(0.0694)	(0.0205)	(0.0696)	(0.0214)	(0.0695)	(0.0216)

Notes: Standard errors in brackets. (1) No controls, (2) Parental education controls, (3) Parental education and migration history controls.

Table 3: During COVID-19 school building closures, how often per week did somebody from your school ask you to submit completed school assignments? Share of students answering almost every day of the week.

	(1)		(2)		(3)	
	Private schools	Public schools	Private schools	Public schools	Private schools	Public schools
Andalusia	0.551	0.495	0.578	0.527	0.566	0.521
	(0.00580)	(0.00311)	(0.00650)	(0.00430)	(0.00667)	(0.00461)
Aragon	0.614	0.463	0.640	0.487	0.626	0.476
	(0.0118)	(0.00839)	(0.0123)	(0.00914)	(0.0124)	(0.00926)
Asturias	0.597	0.434	0.617	0.455	0.603	0.445
	(0.0146)	(0.0107)	(0.0150)	(0.0113)	(0.0151)	(0.0114)
Balearic Islands	0.585	0.378	0.614	0.413	0.595	0.400
	(0.0138)	(0.00984)	(0.0143)	(0.0105)	(0.0144)	(0.0106)
Canary Islands	0.499	0.445	0.503	0.469	0.492	0.463
	(0.0132)	(0.00689)	(0.0139)	(0.00769)	(0.0139)	(0.00787)
Cantabria	0.615	0.520	0.646	0.555	0.636	0.544
	(0.0197)	(0.0133)	(0.0203)	(0.0139)	(0.0203)	(0.0140)
Castile and Leon	0.584	0.445	0.609	0.478	0.589	0.462
	(0.00976)	(0.00703)	(0.0103)	(0.00768)	(0.0104)	(0.00783)
Castile-La Manch	0.604	0.493	0.631	0.526	0.618	0.516
	(0.0138)	(0.00638)	(0.0146)	(0.00722)	(0.0147)	(0.00738)
Catalonia	0.522	0.380	0.546	0.403	0.532	0.391
	(0.00485)	(0.00375)	(0.00577)	(0.00481)	(0.00597)	(0.00507)
Extremadura	0.626	0.507	0.659	0.539	0.648	0.529
	(0.0176)	(0.00890)	(0.0180)	(0.00955)	(0.0180)	(0.00967)
Galicia	0.517	0.390	0.539	0.421	0.523	0.406
	(0.00977)	(0.00585)	(0.0104)	(0.00655)	(0.0105)	(0.00675)
La Rioja	0.553	0.524	0.575	0.556	0.560	0.543
	(0.0215)	(0.0186)	(0.0221)	(0.0191)	(0.0221)	(0.0191)
Madrid	0.586	0.527	0.618	0.557	0.602	0.544
	(0.00441)	(0.00419)	(0.00545)	(0.00521)	(0.00570)	(0.00546)
Murcia	0.550	0.504	0.572	0.539	0.561	0.529
	(0.0102)	(0.00737)	(0.0107)	(0.00801)	(0.0108)	(0.00815)
Navarre	0.581	0.559	0.597	0.584	0.587	0.578
	(0.0152)	(0.0129)	(0.0158)	(0.0136)	(0.0158)	(0.0137)
Basque Country	0.541	0.398	0.565	0.427	0.553	0.417
	(0.00856)	(0.00885)	(0.00920)	(0.00954)	(0.00931)	(0.00964)
C. Valenciana	0.523	0.413	0.557	0.448	0.544	0.434
	(0.00597)	(0.00431)	(0.00664)	(0.00533)	(0.00682)	(0.00552)
Ceuta	0.439	0.516	0.476	0.568	0.479	0.571
	(0.0771)	(0.0280)	(0.0801)	(0.0301)	(0.0800)	(0.0301)
Melilla	0.482	0.498	0.489	0.553	0.473	0.545
	(0.0787)	(0.0254)	(0.0801)	(0.0259)	(0.0800)	(0.0259)

Notes: Standard errors in brackets. (1) No controls, (2) Parental education controls, (3) Parental education and migration history controls.

6.3 Language spoken at home

Tables 4 and 5 examine the PISA results in 2022 and 2018 of students in the three CCAAs where Catalan or Valencian is an official language—the Balearic Islands, Catalonia, and the Community of Valencia. The analysis is limited to students whose parents are born in Spain and who speak either Spanish, Catalan, or Valencian at home. According to PISA, in Catalonia, the main language spoken at home of 50% of these students is Spanish and 9% of the students speaking mainly Spanish at home take the PISA test in Spanish. On the other hand, the average for the Balearic Islands and Community of Valencia is that 65% of students mainly speak Spanish at home and 45% of the students speaking mainly Spanish at home take the test in Spanish. As a result, the average student speaking Spanish at home is five times more likely to take the PISA test in Spanish in the Balearic Islands and Community of Valencia than in Catalonia. We relate the PISA results of students within their schools to parental education and books at home, plus whether they speak Spanish at home rather than Catalan or Valencian. The estimates shown in Tables 4 and 5 are for the indicator variable *Spanish spoken at home*. It can be seen that Spanish spoken at home is a statistically insignificant determinant of PISA results in Catalonia both in 2022 and 2018. Moreover, results are similar when we compare Catalonia on the one hand with the Balearic Islands and the Community of Valencia on the other hand. Hence, there is no evidence that students speaking Spanish at home achieve better PISA results in the Balearic Islands or the Community of Valencia than in Catalonia.

Table 4: Official language spoken at home and PISA 2022 results

	Catalonia	Balearic Islands and Valencian Community
Science	-4.079	-9.695
	(7.243)	(6.337)
Reading	-3.238	-12.05*
	(8.306)	(5.894)
Math	-4.607	-13.50*
	(5.565)	(6.102)

Notes: The estimates shown are for the indicator variable *Spanish spoken at home*. The analysis is limited to Catalonia on the one hand and the Balearic Islands and Community of Valencia on the other. We only consider students with parents born in Spain and where the language spoken at home is Spanish, Catalan, or Valencian. We control for parental education, books at home, and the school attended.

Table 5: Official language spoken at home and PISA 2018 results

	Catalonia	Balearic Islands and Valencian Community
Science	2.421	-8.589
	(6.560)	(5.624)
Reading	-5.859	-1.849
	(6.306)	(6.166)
Math	0.188	-5.278
	(6.512)	(4.767)

Notes: The estimates shown are for the indicator variable *Spanish spoken at home*. The analysis is limited to Catalonia on the one hand and the Balearic Islands and Community of Valencia on the other. We only consider students with parents born in Spain and where the language spoken at home is Spanish, Catalan, or Valencian. We control for parental education, books at home, and the school attended.

6.4 Concentration of first-generation immigrants

Figures 78-80 contain a more detailed analysis of the relationship between the PISA results of schools and the share of first-generation immigrants in the school.[2] The method used allows for non-linearities in the relationship in order to identify potential sharper drops in PISA results as the share of first-generation immigrants in the school rises. Results are relative to the average of the Autonomous Community (CCAA). In Figure 78, it seems that the PISA results of students in a school start dropping more steeply when the first-generation immigration share is around 20 percentage points above the average of the CCAA—which corresponds to a first-generation immigration share around 30 percentage points in Catalonia. Also, schools with a first-generation immigration share 20 percentage points above the average do some 30-40 PISA points worse on average than schools with no first-generation immigrants. Confidence bands are quite wide however, which indicates that the PISA results of schools with a high share of first-generation immigrants vary substantially around the average. In Figure 79, we control for the individual migration history of students, which ends up adjusting the PISA performance of schools by the PISA gap between immigrant and native students conditional on their school. Now schools with a first-generation immigration share 20 percentage points above the average do some 15 PISA points worse than schools with no first-generation immigrants. Figure 80 also takes into account parental education and books at home. Schools with a first-generation immigration share 20 percentage points above the average continue to do some 15 PISA points worse than schools with no first-generation immigrants. Also, there seems to be no strong evidence of a sharp drop in PISA results as the share of first-generation immigrants in the school rises. However, confidence intervals are large.

7 Conclusions

The Catalan PISA 2022 results have been disappointing. This much everybody in Catalonia seems to agree on, whether it is the Catalan government, political parties, unions, or the media. The results indicate that Catalonia needs to make determined policy changes to achieve the high-quality education system part of its planned transition to a knowledge society (Government of Catalonia, 2021). Especially worrisome are the extremely poor results of students in Catalan public schools, which saw a sharp decline in PISA 2022 compared to PISA 2018. It appears that the

[2] The method is Kernel-weighted local polynomial smoothing. We implement this method using STATA with default parameters.

Figure 78: Effects of the share of immigrants in school (no controls)

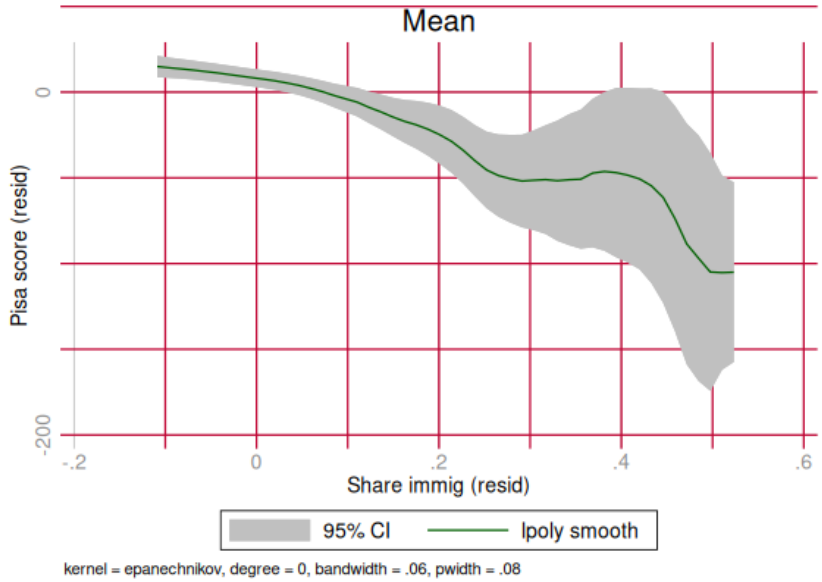


Figure 79: Effects of the share of immigrants in school (controls for individual migration history)

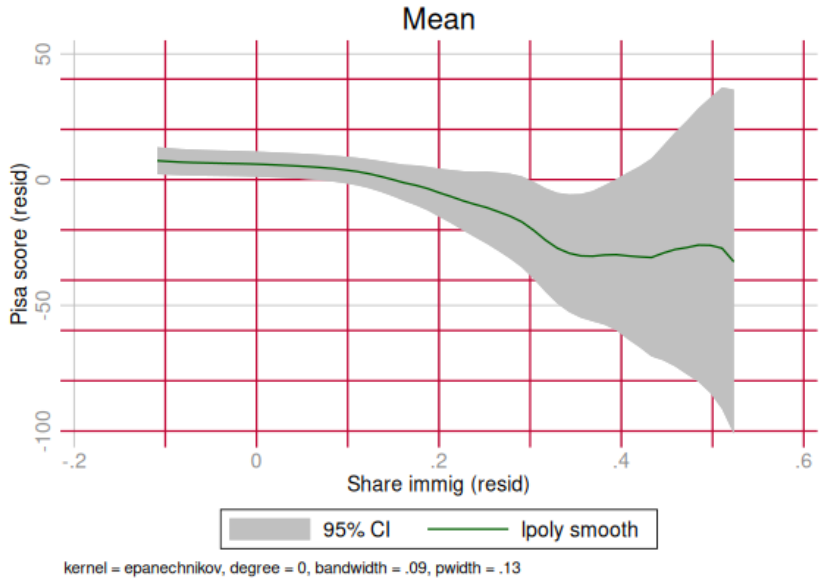
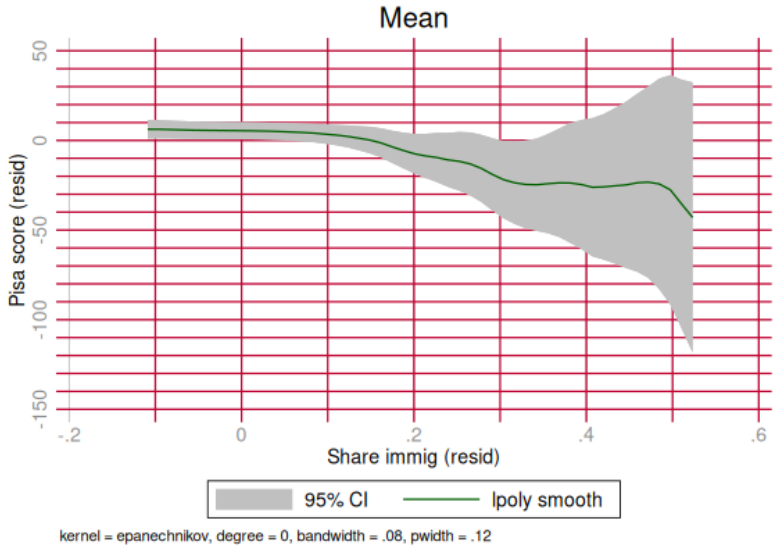


Figure 80: Effects of the share of immigrants in school (controlling for individual migration history, parental education, and number of books at home)



Catalan education system is failing especially those families who have their children attend public schools.

The disagreements start when it comes to the reasons for the poor performance of Catalonia and to what should be done about it. One part of the debate is focused on the need for additional resources. However, the teacher-to-student ratio in Catalonia is higher than in most other Autonomous Communities and the size of classes is smaller. The only Autonomous Community with a higher teacher-to-student ratio and smaller class size is Andalusia, which does worse in PISA 2022 than Catalonia even when differences in student background are accounted for. This is consistent with the empirical evidence that teacher-to-student ratios and class size are not key drivers of school performance. A second part of the debate focuses on the poor PISA 2022 results of public schools in Catalonia compared to private schools. Some see the reasons for this performance gap in the selection of students with greater family resources into private schools. However, a substantial performance gap remains even after controlling for a range of individual student background variables. A third part of the debate focuses on institutional and organizational factors rather than school resources or individual student background variables. The academic literature has found that school performance is generally better where school autonomy is combined with external accountability; where the selection of teaching staff is based on their classroom skills and teacher incentives are based on classroom

teaching; and where schools have the flexibility to respond to strengths or deficits of their student populations. There seems room for the Catalan education system to improve along these dimensions.

In contrast to the Catalan PISA 2022 results, the Spanish results have been stable around the average of the European Union. This has been true since PISA 2006 when the education of Spanish parents is taken into account. This suggests that the measures taken since 2006 to improve the Spanish education system compared to other countries in the European Union did not yield the desired result. That the Spanish education system need not remain stuck where it is, can be seen from Portugal's results in PISA. The Portuguese 2022 PISA results are some 15 points higher than those of Spain—this corresponds to more than one third of the difference between the countries in the top and bottom group of the European Union—when the education of parents is accounted for. This has been the case since PISA 2006. At the same time, the two countries are very similar in terms of real secondary-school expenditures per student and spending on education as a share of GDP (OECD, 2023).

References

Card, D. and Krueger, A. (1996). School resources and student outcomes: An overview of the literature and new evidece from north and south carolina. *Journal of Economic Perspectives*, American Economic Association, 10(4):31–50.

Chetty, R., Friedman, J., and Rockoff, J. (2014a). Measuring the impacts of teachers I: Evaluating bias in teacher value-added estimates. *American Economic Review*, 104(9):2593–2632.

Chetty, R., Friedman, J., and Rockoff, J. (2014b). Measuring the impacts of teachers II: Teacher value-added and student outcomes in adulthood. *American Economic Review*, 104(9):2633–79.

Ciccone, A. and Garcia-Fontes, W. (2008). The quality of the Catalan and Spanish education systems: A perspective from PISA. Unpublished manuscript.

de la Fuente, A. (2018). Gasto educativo por regiones y niveles en 2015 y su evolución desde 2000. Studies on the Spanish Economy e2018-16, FEDEA.

Fuchs, T. and Woessman, L. (2007). What accounts for international differences in student performance? a re-examination using PISA data. *Empirical Economics*, 32:433–464.

Government of Catalonia (2021). Catalan agreement on the knowledge society. Link: https://recercaiuniversitats.gencat.cat/web/.content/23_PNSC/pacte-nacional-societat-coneixement/documents/document_final_multiidioma/catalan_agreement_on_the_knowledge_society_accessible.pdf. Accessed on March 11, 2024.

Hanushek, E. A. (1996). Measuring investment in education. *Journal of Economic Perspectives*, American Economic Association, 10(4):9–30.

Hanushek, E. A. (1997). Assessing the effects of school resources on student performance: An update. *Educational Evaluation and Policy Analysis*, 19(2):141–164.

Hanushek, E. A. (2020). Chapter 13 - education production functions. In Bradley, S. and Green, C., editors, *The Economics of Education (Second Edition)*, pages 161–170. Academic Press, second edition edition.

Holzberger, D., Reinhold, S., Lüdtke, O., and Seidel, T. (2020). A meta-analysis on the relationship between school characteristics and student outcomes in science and maths – evidence from large-scale studies. *Studies in Science Education*, 56(1):1–34.

OECD (2005a). *PISA 2003 Data Analysis Manual*. OECD, Paris.

OECD (2005b). *PISA 2003 Technical Report*. OECD, Paris.

OECD (2023). *Education at a Glance 2023*. OECD, Paris.

Rivkin, S., Hanushek, E., and Kain, J. (2005). Teachers, schools and academic achievement. *Econometrica*, 73(2):417–458.

Appendix

Table A.1: ISO 3166-1 A-3 Country Codes

AUT:	Austria
BEL:	Belgium
BGR:	Bulgaria
HRV:	Croatia
CZE:	Czechia
DNK:	Denmark
EST:	Estonia
FIN:	Finland
FRA:	France
DEU:	Germany
GRC:	Greece
HUN:	Hungary
IRL:	Ireland
ITA:	Italy
LVA:	Latvia
LTU:	Lithuania
MLT:	Malta
NLD:	Netherlands
POL:	Poland
PRT:	Portugal
ROU:	Romania
SVK:	Slovakia
SVN:	Slovenia
ESP:	Spain
GBR:	United Kingdom

Table A.2: ISO 3166-2:ES Autonomous communities and cities codes

AN:	Andalucía
AR:	Aragón
AS:	Asturias
CN:	Canarias
CB:	Cantabria
CM:	Castilla-La Mancha
CL:	Castilla y León
CT:	Cataluña
EX:	Extremadura
GA:	Galicia
IB:	Islas Baleares
RI:	La Rioja
MD:	Madrid
MC:	Murcia
NC:	Navarra
PV:	País Vasco
VC:	Comunidad Valenciana
CE:	Ceuta
ML:	Melilla

Table A.3: Immigration descriptive statistics in the European Union

	Group 1	Group 2	% of students attending schools with more than 10% group 1	% of schools with more than 10% of group 1
Austria	0.053	0.129	0.163	0.182
Belgium	0.104	0.260	0.384	0.401
Bulgaria	0.020	0.045	0.038	0.045
Croatia	0.020	0.240	0.011	0.011
Czech Republic	0.030	0.102	0.078	0.088
Denmark	0.053	0.177	0.165	0.246
Estonia	0.024	0.203	0.070	0.071
Finland	0.051	0.104	0.144	0.249
France	0.065	0.264	0.218	0.316
Germany	0.103	0.292	0.381	0.399
Greece	0.033	0.219	0.072	0.096
Hungary	0.014	0.066	0.014	0.034
Ireland	0.104	0.251	0.410	0.412
Italy	0.037	0.161	0.077	0.169
Latvia	0.020	0.181	0.033	0.040
Lithuania	0.021	0.105	0.040	0.058
Malta	0.112	0.173	0.388	0.378
Netherlands	0.067	0.205	0.239	0.253
Poland	0.019	0.025	0.032	0.042
Portugal	0.078	0.203	0.260	0.268
Romania	0.010	0.028	0.002	0.015
Slovak Republic	0.030	0.061	0.075	0.087
Slovenia	0.070	0.134	0.196	0.278
Spain	0.075	0.175	0.266	0.244
Sweden	0.125	0.224	0.473	0.464
United Kingdom	0.102	0.241	0.387	0.293

Group 1: Students born abroad with at least one parent born abroad.
Group 2: Students born in the country with at least one parent born abroad.

Table A.4: Immigration descriptive statistics in Spain

	Group 1	Group 2	% of students attending schools with more than 10% of group 1	% of schools with more than 10% of group 1
Andalusia	0.044	0.132	0.132	0.132
Aragon	0.068	0.180	0.186	0.222
Asturias	0.054	0.112	0.157	0.151
Balearic Islands	0.094	0.248	0.351	0.358
Canary Islands	0.071	0.198	0.260	0.259
Cantabria	0.061	0.123	0.148	0.154
Castile and Leon	0.042	0.131	0.107	0.109
Castile-La Mancha	0.066	0.165	0.267	0.226
Catalonia	0.109	0.243	0.455	0.451
Extremadura	0.026	0.068	0.097	0.093
Galicia	0.060	0.142	0.146	0.172
La Rioja	0.080	0.206	0.324	0.319
Madrid	0.101	0.196	0.400	0.403
Murcia	0.064	0.213	0.255	0.288
Navarre	0.097	0.193	0.423	0.415
Basque Country	0.076	0.111	0.197	0.200
Comunidad Valenciana	0.092	0.180	0.275	0.283
Ceuta	0.025	0.396	0.023	0.083
Melilla	0.033	0.476	0.003	0.100

Group 1: Students born abroad with at least one parent born abroad.
Group 2: Students born in Spain with at least one parent born abroad.

Table A.5: Percentage of first generation immigrants in school

	Catalonia		Spain	
	Percentage of schools	Percentage of students in schools	Percentage of schools	Percentage of students in schools
More than 50%	2.0%	2.1%	0.8%	0.9%
More than 40%	2.0%	2.1%	1.3%	1.1%
More than 30%	5.9%	5.5%	3.3%	3.4%
More than 20%	19.6%	19.4%	7.6%	8.7%
More than 10%	45.1%	45.5%	24.4%	28.0%

Table A.6: Parental education and migration history effects in the European Union - Science PISA results

	(1)	(2)	(3)
Father no degree	-59.68***	-51.63***	-49.99***
	(3.809)	(3.763)	(3.771)
Father primary school	-27.77***	-25.53***	-25.04***
	(2.856)	(2.910)	(2.896)
Father basic secondary	-14.89***	-13.96***	-13.28***
	(1.648)	(1.609)	(1.575)
Father college	15.20***	17.02***	16.99***
	(1.253)	(1.248)	(1.269)
Mother no degree	-45.78***	-30.88***	-28.67***
	(3.981)	(3.867)	(3.792)
Mother primary school	-30.89***	-25.61***	-24.59***
	(3.932)	(3.960)	(3.955)
Mother basic secondary	-18.48***	-16.44***	-16.13***
	(1.541)	(1.575)	(1.564)
Mother college	18.74***	19.17***	18.79***
	(1.118)	(1.124)	(1.134)
Group 1		-54.84***	-43.87***
		(2.649)	(2.454)
Group 2		-17.16***	-13.93***
		(1.775)	(1.718)
School has more than 10% immigration			-25.20***
			(2.866)
Observations	185954	182754	182754

Notes: *, **, *** significant at the 10 percent, 5 percent, and 1 percent significance level respectively. Standard errors in brackets. Country fixed effects. Reference group is students born in the country with parents born in the country with advanced secondary education. Estimations methods can be found in OECD (2005a,b).
Group 1: Students born abroad with at least one parent born abroad.
Group 2: Students born in the country with at least one parent born abroad.

Table A.7: Parental education and migration history effects in the European Union - Reading PISA results

	(1)	(2)	(3)
Father no degree	-53.67***	-45.72***	-44.10***
	(4.642)	(4.662)	(4.703)
Father primary school	-30.71***	-28.40***	-27.92***
	(2.935)	(2.927)	(2.906)
Father basic secondary	-12.66***	-11.92***	-11.24***
	(1.600)	(1.574)	(1.542)
Father college	14.45***	16.38***	16.35***
	(1.240)	(1.219)	(1.243)
Mother no degree	-45.43***	-30.42***	-28.24***
	(4.113)	(3.888)	(3.888)
Mother primary school	-27.78***	-22.67***	-21.67***
	(3.616)	(3.607)	(3.625)
Mother basic secondary	-14.36***	-12.21***	-11.91***
	(1.973)	(1.942)	(1.922)
Mother college	17.35***	17.84***	17.46***
	(1.121)	(1.099)	(1.112)
Group 1		-56.65***	-45.85***
		(2.723)	(2.421)
Group 2		-13.52***	-10.34***
		(1.727)	(1.629)
School has more than 10% immigration			-24.82***
			(2.943)
Observations	185954	182754	182754

Notes: *, **, *** significant at the 10 percent, 5 percent, and 1 percent significance level respectively. Standard errors in brackets. Country fixed effects. Reference group is students born in the country with parents born in the country with advanced secondary education. Estimations methods can be found in OECD (2005a,b).
Group 1: Students born abroad with at least one parent born abroad.
Group 2: Students born in the country with at least one parent born abroad.

Table A.8: Parental education and migration history effects in the European Union - Mathematics PISA results

	(1)	(2)	(3)
Father no degree	-52.36***	-44.84***	-43.33***
	(3.640)	(3.653)	(3.657)
Father primary school	-27.89***	-25.79***	-25.34***
	(2.334)	(2.324)	(2.274)
Father basic secondary	-14.73***	-14.06***	-13.43***
	(1.487)	(1.441)	(1.402)
Father college	16.76***	18.43***	18.39***
	(1.184)	(1.169)	(1.188)
Mother no degree	-39.86***	-27.33***	-25.28***
	(3.441)	(3.165)	(3.116)
Mother primary school	-28.44***	-24.14***	-23.20***
	(3.119)	(3.249)	(3.229)
Mother basic secondary	-15.43***	-13.72***	-13.44***
	(1.588)	(1.575)	(1.575)
Mother college	17.85***	18.12***	17.77***
	(1.064)	(1.049)	(1.053)
Group 1		-45.61***	-35.47***
		(2.221)	(2.061)
Group 2		-14.69***	-11.71***
		(1.521)	(1.490)
School has more than 10% immigration			-23.31***
			(2.838)
Observations	185954	182754	182754

Notes: *, **, *** significant at the 10 percent, 5 percent, and 1 percent significance level respectively. Standard errors in brackets. Country fixed effects. Reference group is students born in the country with parents born in the country with advanced secondary education. Estimations methods can be found in OECD (2005a,b).
Group 1: Students born abroad with at least one parent born abroad.
Group 2: Students born in the country with at least one parent born abroad.

Table A.9: Parental education and migration history effects in Spain - Science PISA results

	(1)	(2)	(3)	(4)	(5)
Father no degree	-53.66***	-52.63***	-52.00***	-38.64***	-38.25***
	(6.200)	(6.344)	(6.401)	(5.947)	(5.984)
Father primary school	-17.34***	-17.28***	-17.09***	-10.87*	-10.78*
	(4.647)	(4.621)	(4.611)	(4.508)	(4.506)
Father basic secondary	-9.126**	-9.712***	-9.356***	-5.175	-4.927
	(2.819)	(2.845)	(2.826)	(2.723)	(2.713)
Father college	6.157*	6.644*	6.413*	3.367	3.202
	(2.734)	(2.728)	(2.734)	(2.688)	(2.688)
Mother no degree	-47.54***	-40.05***	-39.54***	-21.16**	-20.88**
	(6.969)	(7.252)	(7.213)	(7.036)	(7.002)
Mother primary school	-10.10	-8.088	-7.371	0.407	0.881
	(5.867)	(5.642)	(5.629)	(5.103)	(5.100)
Mother basic secondary	-15.42***	-15.12***	-14.92***	-8.244*	-8.134*
	(3.368)	(3.427)	(3.414)	(3.339)	(3.327)
Mother college	10.57***	9.543***	9.339***	3.453	3.333
	(2.534)	(2.507)	(2.507)	(2.528)	(2.529)
Group 1		-41.55***	-36.59***	-20.20***	-16.55***
		(4.451)	(4.379)	(4.266)	(4.246)
Group 2		-9.730***	-7.939**	-2.016	-0.697
		(2.787)	(2.796)	(2.626)	(2.641)
No books				-80.53***	-80.11***
				(6.053)	(6.093)
1-10 books				-51.19***	-50.68***
				(4.239)	(4.202)
11-25 books				-27.46***	-27.23***
				(3.451)	(3.430)
101-200 books				19.10***	18.92***
				(2.830)	(2.842)
201-500 books				31.76***	31.79***
				(3.679)	(3.685)
More than 500 books				21.65***	21.74***
				(5.018)	(5.026)
School has more than 10% immigration			-12.07***		-9.253***
			(2.923)		(2.647)
Observations	28569	28069	28069	28030	28030

Notes: *, **, *** significant at the 10 percent, 5 percent, and 1 percent significance level respectively. Standard errors in brackets. Country fixed effects. Reference group is students born in Spain with parents born in Spain with advanced secondary education and 24-100 books at home. Estimations methods can be found in OECD (2005a,b).
Group 1: Students born abroad with at least one parent born abroad.
Group 2: Students born in the country with at least one parent born abroad.

Table A.10: Parental education and migration history effects in Spain - Reading PISA results

	(1)	(2)	(3)	(4)	(5)
Father no degree	-45.61***	-44.68***	-44.20***	-30.47***	-30.21***
	(7.346)	(7.421)	(7.489)	(7.399)	(7.438)
Father primary school	-17.87***	-17.98***	-17.83***	-11.61*	-11.54*
	(4.822)	(4.908)	(4.906)	(4.645)	(4.648)
Father basic secondary	-3.742	-4.395	-4.125	0.0355	0.203
	(3.852)	(3.891)	(3.880)	(3.761)	(3.755)
Father college	6.492**	7.075**	6.900**	3.684	3.573
	(2.454)	(2.492)	(2.503)	(2.420)	(2.425)
Mother no degree	-56.30***	-49.41***	-49.02***	-30.15***	-29.96***
	(6.881)	(7.189)	(7.220)	(7.063)	(7.070)
Mother primary school	-6.099	-4.619	-4.077	4.302	4.622
	(6.309)	(6.201)	(6.143)	(5.843)	(5.798)
Mother basic secondary	-16.09***	-15.53***	-15.37***	-8.551*	-8.476*
	(3.954)	(3.864)	(3.856)	(3.733)	(3.727)
Mother college	15.15***	14.12***	13.96***	7.935***	7.854***
	(2.292)	(2.252)	(2.245)	(2.145)	(2.139)
Group 1		-40.72***	-36.97***	-19.33***	-16.86***
		(4.034)	(4.009)	(4.134)	(4.193)
Group 2		-7.607**	-6.252*	0.0176	0.909
		(2.737)	(2.801)	(2.562)	(2.642)
No books				-86.84***	-86.55***
				(6.094)	(6.100)
1-10 books				-47.59***	-47.25***
				(4.649)	(4.626)
11-25 books				-23.07***	-22.92***
				(3.403)	(3.384)
101-200 books				23.48***	23.36***
				(3.516)	(3.522)
201-500 books				33.55***	33.57***
				(4.106)	(4.113)
More than 500 books				24.48***	24.54***
				(5.145)	(5.152)
School has more than 10% immigration			-9.125*		-6.252
			(3.633)		(3.360)
Observations	28569	28069	28069	28030	28030

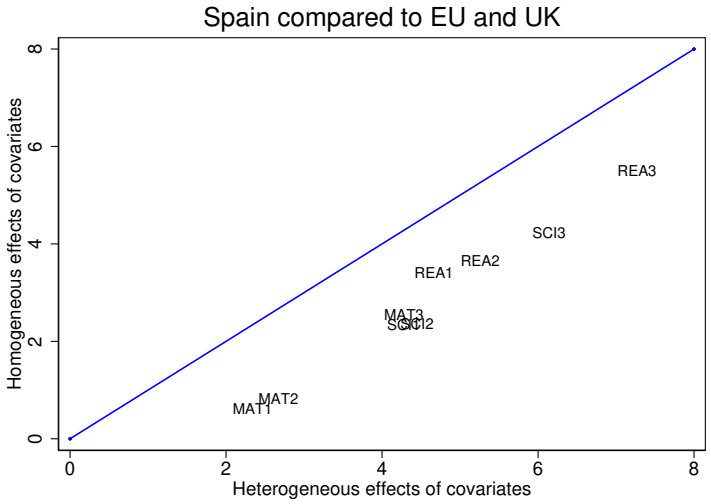
Notes: *, **, *** significant at the 10 percent, 5 percent, and 1 percent significance level respectively. Standard errors in brackets. Country fixed effects. Reference group is students born in Spain with parents born in Spain with advanced secondary education and 24-100 books at home. Estimations methods can be found in OECD (2005a,b).
Group 1: Students born abroad with at least one parent born abroad.
Group 2: Students born in the country with at least one parent born abroad.

Table A.11: Parental education and migration history effects in Spain - Mathematics PISA results

	(1)	(2)	(3)	(4)	(5)
Father no degree	-48.03***	-45.89***	-45.23***	-32.76***	-32.35***
	(5.200)	(5.393)	(5.464)	(4.991)	(5.048)
Father primary school	-18.16***	-17.82***	-17.63***	-11.54**	-11.45**
	(3.948)	(3.997)	(3.974)	(3.720)	(3.712)
Father basic secondary	-11.14***	-11.73***	-11.36***	-7.419**	-7.157**
	(2.490)	(2.528)	(2.496)	(2.379)	(2.360)
Father college	7.256**	7.879***	7.638***	4.688*	4.514*
	(2.248)	(2.213)	(2.225)	(2.168)	(2.173)
Mother no degree	-45.28***	-38.20***	-37.66***	-20.78***	-20.48***
	(5.786)	(5.881)	(5.872)	(5.756)	(5.751)
Mother primary school	-10.29*	-8.874*	-8.129	-0.616	-0.115
	(4.508)	(4.407)	(4.337)	(3.965)	(3.910)
Mother basic secondary	-14.94***	-14.43***	-14.22***	-7.824***	-7.708***
	(2.427)	(2.372)	(2.359)	(2.326)	(2.313)
Mother college	12.68***	11.56***	11.35***	5.747**	5.620**
	(2.062)	(2.004)	(2.000)	(1.953)	(1.953)
Group 1		-43.05***	-37.88***	-22.69***	-18.83***
		(3.465)	(3.489)	(3.431)	(3.529)
Group 2		-9.612***	-7.750***	-2.130	-0.737
		(2.084)	(2.130)	(1.979)	(2.031)
No books				-74.55***	-74.10***
				(4.492)	(4.525)
1-10 books				-48.21***	-47.68***
				(3.265)	(3.207)
11-25 books				-26.76***	-26.52***
				(2.698)	(2.667)
101-200 books				19.10***	18.91***
				(2.263)	(2.265)
201-500 books				28.91***	28.95***
				(2.440)	(2.438)
More than 500 books				25.53***	25.63***
				(4.262)	(4.267)
School has more than 10% immigration			-12.55***		-9.774***
			(2.909)		(2.559)
Observations	28569	28069	28069	28030	28030

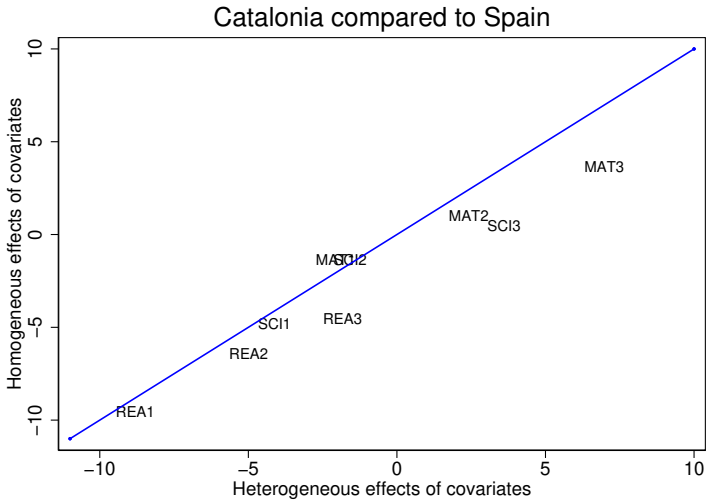
Notes: *, **, *** significant at the 10 percent, 5 percent, and 1 percent significance level respectively. Standard errors in brackets. Country fixed effects. Reference group is students born in Spain with parents born in Spain with advanced secondary education and 24-100 books at home. Estimations methods can be found in OECD (2005a,b).
Group 1: Students born abroad with at least one parent born abroad.
Group 2: Students born in the country with at least one parent born abroad.

Figure A.1: Comparison of the estimations with homogeneous and country-specific effects of student background variables - European sample



Notes: SCI: Science, MAT: Mathematics, REA: Reading. 1: Parental education controls, 2: Parental education and migration history controls, 3: Parental education, migration history and share of first-generation immigrants in the school controls.

Figure A.2: Comparison of the estimations with homogeneous and CCAA-specific effects of student background variables - Spanish sample



Notes: SCI: Science, MAT: Mathematics, REA: Reading. 1: Parental education controls, 2: Parental education and migration history controls, 3: Parental education, migration history and share of first-generation immigrants in the school controls.

Table A.12: 2018 and 2022 PISA average result across Spanish CCAAs compared

	(1)		(2)		(3)		(4)	
	2018	2022	2018	2022	2018	2022	2018	2022
Andalusia	-9.6	-10.0	-6.9	-9.0	-9.4	-11.2	-10.1	-12.1
Aragon	15.6	17.4	11.7	14.8	12.1	14.7	13.6	14.3
Asturias	16.2	24.5	13.2	20.1	12.6	18.9	12.2	18.5
Balearic Islands	3.5	0.2	3.4	-0.5	5.7	1.7	6.6	3.0
Canary Islands	-10.4	-13.1	-9.0	-11.0	-8.2	-11.0	-7.2	-10.5
Cantabria	14.8	23.6	9.9	19.4	8.9	17.9	8.4	17.2
Castile and Leon	22.4	27.3	20.2	24.0	18.9	22.2	18.4	21.2
Castile-La Mancha	2.8	-5.2	6.0	-2.0	4.9	-2.5	4.5	-2.0
Catalonia	10.0	-4.2	5.8	-5.5	7.4	-2.5	7.9	-0.1
Extremadura	-8.6	-1.7	-5.2	-0.4	-8.0	-3.5	-10.0	-4.5
Galicia	23.2	18.7	21.9	15.3	20.4	14.4	19.7	13.7
La Rioja	6.2	19.0	6.8	18.0	8.0	17.9	9.7	19.0
Madrid	4.5	23.4	-1.6	19.5	0.6	20.3	1.5	22.3
Murcia	0.3	-2.9	7.0	1.2	7.8	0.9	8.5	1.2
Navarre	11.3	12.5	7.2	9.8	9.1	10.5	10.5	12.7
Basque Country	9.7	2.0	1.9	-4.6	1.6	-5.0	1.3	-5.1
Comunidad Valenciana	-3.0	5.2	-2.8	4.0	-1.6	4.9	-1.3	5.4
Ceuta	-67.4	-70.8	-61.1	-64.1	-62.5	-62.7	-64.1	-65.2
Melilla	-41.6	-66.1	-28.3	-49.2	-28.5	-46.0	-30.0	-48.9

Deviations from the Spanish average. (1): Unadjusted mean PISA result, (2) Parental education controls, (3) Parental education and migration history controls, (4) Parental education, migration history and share of first-generation immigrants in the school controls.

Table A.13: 2022 PISA average result across Spanish CCAAs in public and private schools

	(1)		(2)		(3)		(4)	
	Private	Public	Private	Public	Private	Public	Private	Public
Andalusia	23.2	-10.8	9.6	-12.0	5.9	-5.1	4.7	-5.6
Aragon	28.5	25.1	18.5	22.2	15.6	18.8	15.8	18.2
Asturias	59.4	21.2	42.9	16.9	36.4	15.5	35.9	15.1
Balearic Islands	29.7	1.8	20.3	2.9	13.2	-2.8	12.8	-2.4
Canary Islands	26.1	-13.7	18.1	-13.1	19.5	-4.4	19.2	-4.1
Cantabria	46.5	25.9	34.1	19.5	31.9	18.1	32.0	17.4
Castile and Leon	51.4	26.4	38.5	21.6	30.1	16.7	29.2	16.1
Castile-La Mancha	21.3	1.8	17.5	1.7	13.2	0.8	14.6	0.7
Catalonia	29.9	-9.6	21.0	-8.1	13.4	-8.2	13.4	-6.4
Extremadura	29.9	-1.4	19.3	-4.3	15.5	-2.2	14.9	-3.1
Galicia	35.6	24.2	23.3	19.4	17.9	11.7	17.6	11.2
La Rioja	34.0	21.3	23.3	22.2	18.8	18.8	18.0	20.4
Madrid	48.7	17.4	35.3	18.4	26.7	16.0	26.7	17.6
Murcia	29.4	-4.0	20.7	0.2	16.6	-0.2	15.7	0.2
Navarre	43.2	8.5	32.9	7.2	26.2	2.0	27.3	2.9
Basque Country	23.7	-2.6	12.0	-9.4	8.3	-11.1	7.7	-10.9
C. Valenciana	35.5	3.9	24.9	3.6	21.6	2.4	20.7	2.8
Ceuta	-50.0	-74.3	-52.0	-66.1	-34.5	-49.9	-34.9	-51.5
Melilla	-12.5	-61.0	-21.5	-42.8	-27.6	-37.0	-28.9	-38.7

Deviations from the Spanish average. (1): Unadjusted mean PISA result, (2) Parental education and migration history controls, (3) Parental education, migration history and number of books at home controls, (4) Parental education, migration history, number of books at home and share of first-generation immigrants in the school controls.

Table A.14: 2022 PISA average result across Spanish CCAAs adjusted for parental education in public schools and schools managed by church or religious institutions

	(1)		(2)		(3)		(4)	
	Church	Public	Church	Public	Church	Public	Church	Public
Andalusia	21.4	-19.6	9.5	-18.0	3.8	-10.1	2.8	-10.3
Aragon	22.5	16.3	14.4	16.2	12.4	13.9	13.2	13.5
Asturias	48.0	12.4	33.0	10.8	28.5	10.5	28.0	10.5
Balearic Islands	24.7	-7.0	18.4	-3.2	13.0	-7.7	12.5	-7.1
Canary Islands	25.8	-22.5	25.7	-19.2	28.8	-9.4	27.7	-8.8
Cantabria	36.1	17.1	25.8	13.4	25.3	13.2	26.1	12.7
Castile and Leon	42.6	17.6	32.1	15.6	24.1	11.7	23.4	11.5
Castile-La Mancha	11.9	-7.0	14.5	-4.4	11.8	-4.1	14.1	-3.9
Catalonia	13.1	-18.4	6.7	-14.2	-0.6	-13.1	-1.2	-11.1
Extremadura	22.8	-10.2	16.4	-10.4	14.1	-7.2	13.8	-7.7
Galicia	35.2	15.4	27.6	13.4	21.7	6.8	21.6	6.5
La Rioja	21.4	12.5	13.4	16.1	10.5	13.9	9.9	15.7
Madrid	32.9	8.6	21.8	12.3	16.2	11.1	16.5	12.9
Murcia	30.5	-12.8	21.8	-5.8	18.2	-5.1	17.1	-4.4
Navarre	38.7	-0.3	31.2	1.1	26.3	-3.0	28.1	-1.8
Basque Country	11.5	-11.4	3.6	-15.5	1.8	-16.0	1.6	-15.6
C. Valenciana	22.6	-4.9	16.4	-2.5	16.0	-2.6	15.2	-1.9
Ceuta	-1.2	-83.1	-15.5	-72.2	-7.4	-54.8	-8.5	-56.2
Melilla	-20.0	-69.8	-25.8	-48.9	-30.9	-41.9	-32.0	-43.4

Deviations from the Spanish average. (1): Unadjusted mean PISA result, (2) Parental education and migration history controls, (3) Parental education, migration history and number of books at home controls, (4) Parental education, migration history, number of books at home and share of first-generation immigrants in the school controls.

Table A.15: PISA 2018 and 2022 average result across Spanish CCAAs in public schools

	(1)		(2)		(3)		(4)	
	2022	2018	2022	2018	2022	2018	2022	2018
Andalusia	-19.6	-13.2	-16.2	-8.9	-10.1	-7.2	-10.3	-7.4
Aragon	16.3	6.8	17.9	9.5	13.9	3.2	13.5	4.7
Asturias	12.4	9.0	12.6	10.0	10.5	5.3	10.5	5.1
Balearic Islands	-7.0	-2.0	-1.4	5.1	-7.7	3.2	-7.1	4.3
Canary Islands	-22.5	-23.7	-17.4	-17.2	-9.4	-8.1	-8.8	-7.3
Cantabria	17.1	12.9	15.2	10.8	13.2	5.8	12.7	5.6
Castile and Leon	17.6	20.1	17.4	19.7	11.7	13.1	11.5	13.0
Castile-La Mancha	-7.0	-1.5	-2.6	5.2	-4.1	0.8	-3.9	0.7
Catalonia	-18.4	1.3	-12.4	6.2	-13.1	4.6	-11.1	5.4
Extremadura	-10.2	-14.7	-8.6	-9.8	-7.2	-7.3	-7.7	-8.5
Galicia	15.4	21.4	15.2	22.9	6.8	13.6	6.5	13.1
La Rioja	12.5	4.7	17.9	12.7	13.9	6.7	15.7	8.4
Madrid	8.6	-11.2	14.1	-7.1	11.1	-10.6	12.9	-9.8
Murcia	-12.8	-8.2	-4.0	4.8	-5.1	3.3	-4.4	4.2
Navarre	-0.3	-2.0	2.9	4.1	-3.0	-4.5	-1.8	-3.0
Basque Country	-11.4	-3.2	-13.7	-5.6	-16.0	-9.6	-15.6	-9.9
C. Valenciana	-4.9	-13.9	-0.7	-5.6	-2.6	-9.5	-1.9	-8.8
Ceuta	-83.1	-74.5	-70.4	-69.5	-54.8	-57.9	-56.2	-58.3
Melilla	-69.8	-48.2	-47.1	-30.6	-41.9	-23.6	-43.4	-24.4

Deviations from the Spanish average. (1): Unadjusted mean PISA result, (2) Parental education and migration history controls, (3) Parental education, migration history and number of books at home controls, (4) Parental education, migration history, number of books at home and share of first-generation immigrants in the school controls.

Table A.16: PISA 2018 and 2022 average result across Spanish CCAAs in private schools

	(1)		(2)		(3)		(4)	
	2022	2018	2022	2018	2022	2018	2022	2018
Andalusia	14.4	-2.2	3.5	-10.7	1.0	-6.7	0.1	-7.9
Aragon	19.7	30.9	12.4	19.9	10.6	17.0	11.2	16.9
Asturias	50.6	33.0	36.8	23.2	31.5	18.0	31.2	17.7
Balearic Islands	20.9	15.6	14.2	9.8	8.2	5.9	8.2	5.2
Canary Islands	17.3	28.1	12.0	20.7	14.6	20.7	14.6	21.1
Cantabria	37.6	18.3	28.0	9.7	26.9	4.1	27.3	3.7
Castile and Leon	42.6	26.8	32.5	21.0	25.1	16.7	24.5	16.1
Castile-La Mancha	12.5	19.1	11.4	9.6	8.3	5.6	9.9	5.1
Catalonia	21.1	22.6	14.9	11.2	8.4	8.9	8.7	8.2
Extremadura	21.1	9.0	13.3	1.8	10.6	2.5	10.2	1.6
Galicia	26.8	27.2	17.3	19.0	12.9	12.8	12.9	12.7
La Rioja	25.2	7.8	17.3	4.0	13.9	0.8	13.3	0.8
Madrid	39.9	21.9	29.3	11.6	21.7	3.3	22.0	3.4
Murcia	20.6	24.0	14.6	19.4	11.6	19.3	11.1	18.5
Navarre	34.4	31.4	26.8	19.2	21.3	11.2	22.6	11.0
Basque Country	14.8	21.7	6.0	11.3	3.4	8.0	3.0	7.7
C. Valenciana	26.6	20.1	18.9	9.8	16.6	4.2	16.1	3.4
Ceuta	-58.8	-23.9	-58.1	-31.1	-39.4	-24.2	-39.6	-25.5
Melilla	-21.3	13.3	-27.6	-4.1	-32.6	-7.0	-33.5	-8.1

Deviations from the Spanish average. (1): Unadjusted mean PISA result, (2) Parental education and migration history controls, (3) Parental education, migration history and number of books at home controls, (4) Parental education, migration history, number of books at home and share of first-generation immigrants in the school controls.