Social inequality, classroom inequality?

Latin American study of school segregation using PISA data.

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Motivation:
Segregation and Learning Outcomes - Language

Graph 1. Scatter plot: Gini index of each school and average Language score of each school, by management sector at age 15. Year 2022.

Source: Prepared by Observatorio Argentinos por la Educación based on OECD PISA tests.

The context:
Segregation and Learning Outcomes

- **POTENTIAL ENDOGENEITY!**
- **Diversity in Schools: Immigrants and the Educational Performance of U.S. Born Students (Figlio et. al 2021). →Quasi experimental approach (sibling comparison):** exposure to immigrant students positively impacts the academic performance of U.S.-born students, especially those from disadvantaged backgrounds, without negatively affecting affluent U.S.-born students.

Besides educational outcomes, why is segregation important?

Motivation and relevance

Theme: The use of PISA to inform specific policy reforms and changes

School segregation has become a critical issue in educational research, defined as the "concentration of students from certain socioeconomic levels in specific schools, areas, and sectors of the educational system" (Botinelli, 2017).

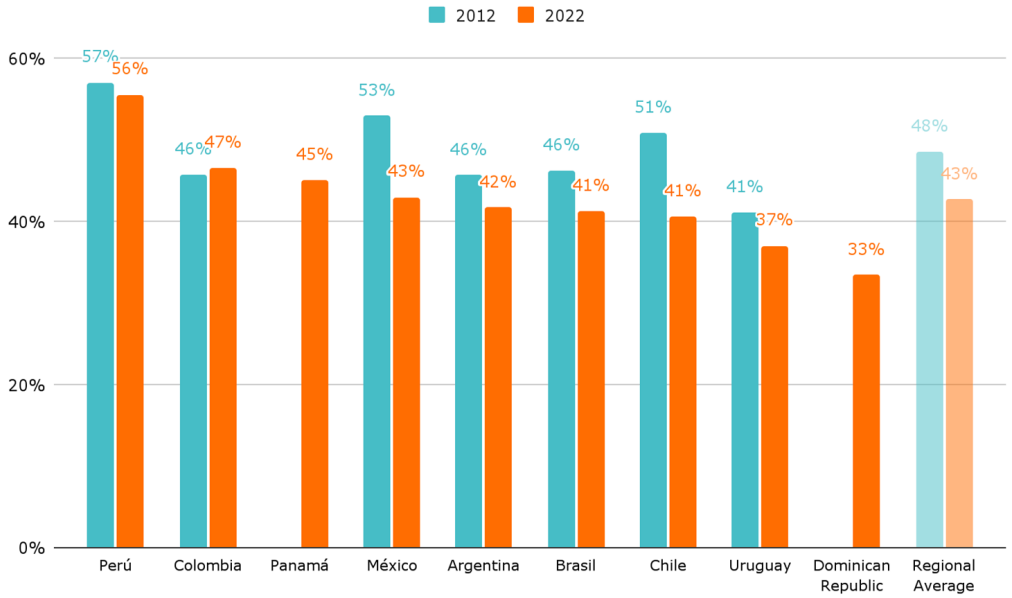
- Student distribution arises from differences in family income and social standing
- Leads to children from disadvantaged backgrounds being concentrated in schools of lower quality, **perpetuating inequality and limiting their life trajectories** (Krüger, 2019).
- Education systems are expected to promote meaningful learning and redistribute sociocultural capital to foster equality and social cohesion (Krüger, 2019).
- Schools have the potential to be spaces for interaction across socioeconomic strata, cultivating respect and equity. However, this potential is undermined when systems become segregated.

Methodology

- **We used PISA data for 2012 and 2022 in 12 Latin American Countries (Stata and R data processing).**
- **Dissimilarity Index** to measure segregation across schools.
- **Hutchens Index** for segregation decomposition between and within sectors.
- **Gini coefficient** to assess inequality within schools →compare it with average socioeconomic level of the school. More segregated schools have higher or lower SES?

Findings: The landscape of school segregation in Latin America. 2012 - 2022

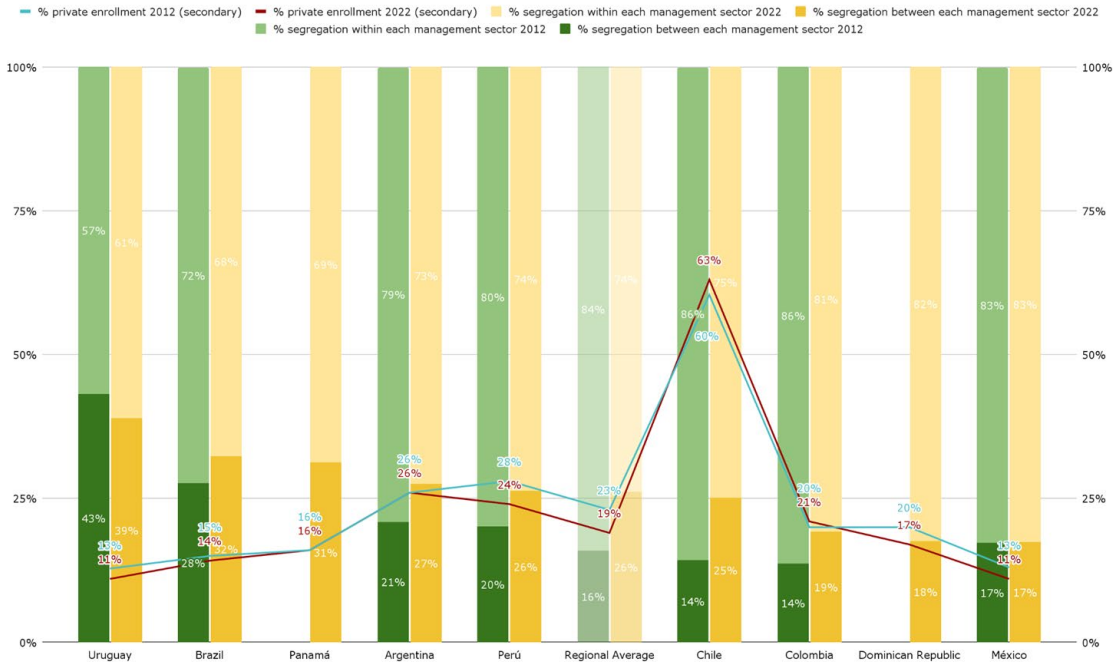
Graph 2. Dissimilarity Index at age 15 by country, LATAM years 2012, 2018 and 2022. In %.
Interpretation: interpreted as the proportion of students from the poorest quartile in each country that should be transferred to another school so that all schools have the same socioeconomic level. The higher the proportion, the greater the school segregation.



Source: Prepared by Observatorio Argentinos por la Educación based on OECD PISA tests.
Note: Panama and Dominican Republic did not participate in 2012.

Findings: How much of the segregation is explained by migration to the private sector? 2012 -2022

Graph 3. Decomposition of school segregation by socioeconomic level within and between the public and private sectors at age 15, year 2022. Square Root Index (H).



Source: Prepared by Observatorio Argentinos por la Educación based on OECD PISA tests.

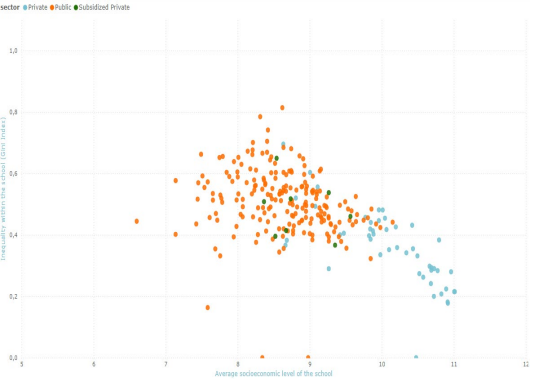
Is school segregation independent of socioeconomic status?
2022

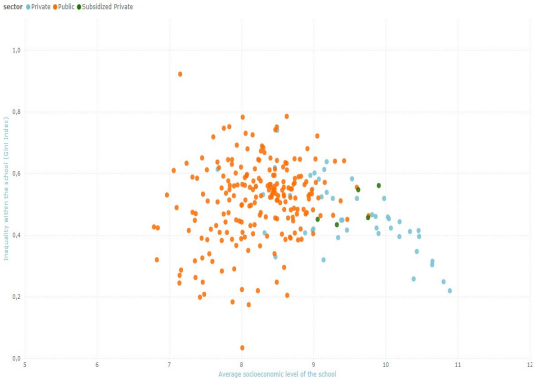
Graph 4. Scatter plot: Gini index of each school and average socioeconomic level of each school, by management sector at age 15. Year 2022. Each point is a school.
Interpretation: the higher the Gini index, the less segregated the schools are (they house students from different socioeconomic levels). The higher the average socioeconomic level of the school, the more affluent the schools.

Source: Prepared by Observatorio Argentinos por la Educación based on OECD PISA tests.

Argentina - Brasil - Chile (2022)

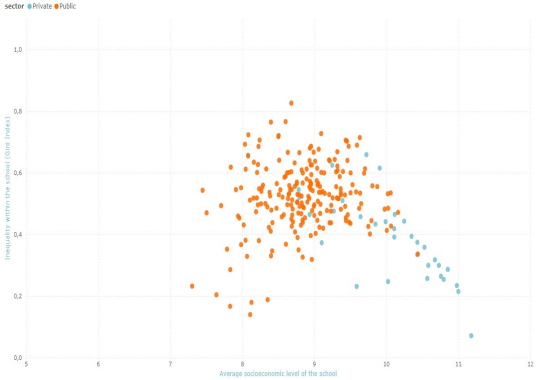
Colombia - El Salvador - Guatemala (2022)

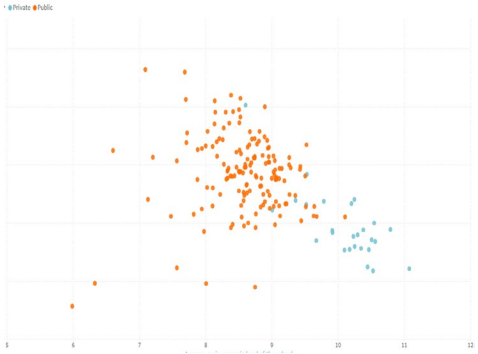


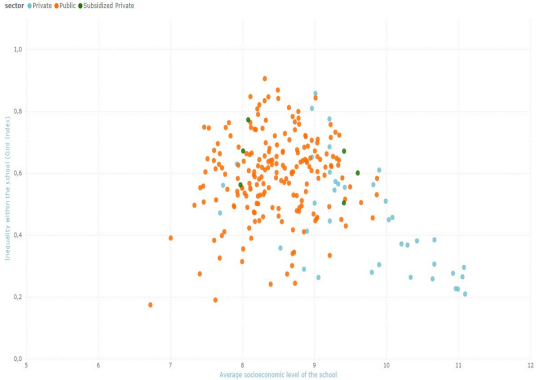


Source: Prepared by Observatorio Argentinos por la Educación based on OECD PISA tests.

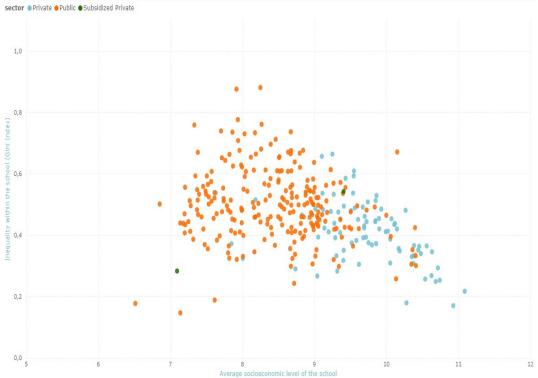
México - Panamá - Paraguay (2022)

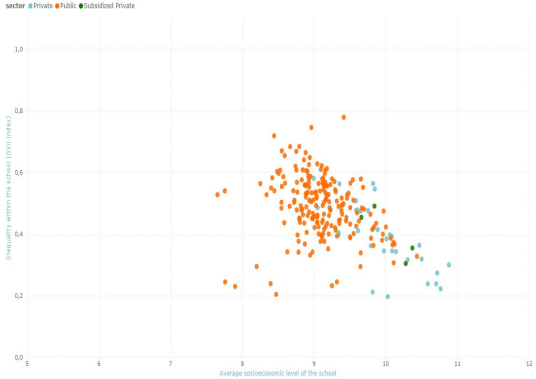






Perú - Dominican Republic - Uruguay (2022)





Source: Prepared by Observatorio Argentinos por la Educación based on OECD PISA tests.

Conclusions and Lessons

1. **Average and dispersion.** For a country, average performance should be important, but dispersion in scores is also important.
2. **Advantages of social interaction**. This can be achieved in schools with homogeneous or heterogeneous SES. The evidence shows that heterogeneous schools have these advantages (those of the papers).
3. **Potential policy trade-off.** Our paper shows that, at least in Latin America, there could be a policy trade off between high performance with schools with homogeneous SES and schools with heterogeneous SES.
    - Higher performance with homogeneous SES schools
    - Lower performance in schools with heterogeneous SES

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Thank you !

Hvala !

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Methodology

Dissimilarity Index

$$D = \frac{1}{2} \sum_{i=1}^{n} \left| \frac{X_i}{X} - \frac{Y_i}{Y} \right|$$

- X_i: Number of individuals from group X in subunit i.
- X: Total number of individuals from group X in the entire area.
- Y_i: Number of individuals from group Y in subunit i.
- Y: Total number of individuals from group Y in the entire area.
- n: Number of subunits (e.g., neighborhoods, schools).

- **Low Segregation (D<0.30)**: Indicates relatively even distribution.
- **Moderate Segregation (0.30≤D<0.60)**: Reflects some unevenness in group distribution.
- **High Segregation (D≥0.60)**: Suggests strong separation between groups, with significant isolation.

Interpretation:

- D ranges from 0 to 1.
- D=0: Perfectly even distribution across subunits.
- D=1: Complete segregation, where the groups do not coexist in any subunit.

In practical terms, D can be interpreted as the percentage of individuals from one group who would need to move to a different subunit to achieve an even distribution.

Methodology

Hutchens Index

The **Hutchens Index**, also known as the **Square Root Index**, measures segregation by focusing on the evenness of group distributions across subunits while giving more weight to differences in smaller proportions. It is particularly useful in settings where small groups are of interest.

$$H = 1 - \frac{\sum_{i=1}^{n} \min\left(\frac{X_i}{X}, \frac{Y_i}{Y}\right)}{1 - \min\left(\frac{X}{T}, \frac{Y}{T}\right)}$$

- Fundamental causes of segregation growth: the selective migration of the least deprived groups from public schools to private schools (Gasparini et al., 2011).
- How much of the segregation is explained by segregation within each management sector or between management sectors.

Methodology

Gini Index

$$G = 1 - \sum_{i=1}^{n} (X_i + X_{i-1})(Y_i - Y_{i-1})$$

The **Gini Index**, a measure of inequality, is commonly used to quantify income or wealth disparity. It ranges from **0 (perfect equality) to 1 (perfect inequality)**.

*The absolute Gini Index is used so that it is invariant to the value of the socioeconomic level index. It consists of multiplying the Gini coefficient by the mean of the socioeconomic level. This is necessary since the socioeconomic level indicator of the Aprender tests integrates negative numbers through which the calculation of the Gini Index cannot be performed. A linear transformation is applied to this SES indicator so that it becomes positive and the Gini coefficient can be calculated. Different linear transformations were tested, and the absolute Gini coefficient remains Gini coefficient remains invariant to the sample.