The Role of Privatization of Basic Education on the Persistence of Educational Inequality in Colombia

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Contents

1 Introduction

During the second half of the 20th century, Colombia witnessed parallel growth in both public education access and private sector participation in basic education. By the end of the century, the combination of public policies and rising demand for private education had increased secondary school access from 6.2% in 1951 to 70.5% of the school-age population (Ramírez-Giraldo & Téllez-Corredor, 2006). As of 2015, the basic education system provided nearly full coverage for the Colombian youth, with 20% of students being served by the private sector (Ministerio de Educación Nacional de Colombia, 2023). Under the theoretical framework of Epple and Romano (1998), the demand for private institutions can only be sustained if the quality of private education is superior to that of public schools. This suggests that an increase in private education attendance is expected to improve overall educational quality. Nevertheless, the emergence of private institutions within Colombia's basic education system has not translated into improved academic achievement, as evidenced by the country's poor performance in PISA 2022 (OECD, 2023). The disconnect between access and quality highlights a pressing concern for Colombia: while privatization has increased educational access, its contribution to improving learning outcomes remains uncertain.

The gap between access and quality also raises broader questions about the developmental role of education in Colombia. A wide range of literature has covered the importance of accessible basic education for human development and economic prosperity. The international empirical evidence has frequently linked the expansion towards universal basic education with the reduction in the population's vulnerability to poverty, higher economic growth, and an increase in educational attainment (Petrakis & Stamatakis, 2002; Yang & Guo, 2020). However, the impact of increased schooling in developing countries has followed an alternative trajectory. The literature has raised concerns about the effectiveness of education due to structural issues such as inadequate resources, student-teacher ratios, and preexisting social disparities (Najafizade & Mennerick, 1988; Dréze & Sen, 1996). In Colombia, despite significant progress in accessibility to basic education, socioeconomic inequalities have shown little improvement over time (World Bank, 2023). This indicates that the current education system has been unable to deliver the expected development outcomes for the country.

In fact, Cárdenas, Fergusson and García (2021) argued that the Colombian education system reinforces

and reproduces social inequality. The authors describe the population as being segregated from the start of their basic education: high-income students attend high-quality private institutions, while lower-income students are limited to public schools or lower-quality private education. The latter is particularly relevant given other findings suggesting that variance in students' educational achievement in Colombia is largely explained by their institution (Duarte, Bos, & Moreno, 2012). Furthermore, this aligns with evidence indicating that basic education quality is highly heterogeneous across the country (Castro-Aristizábal et al., 2022; Rodríguez-Gómez et al., 2024). Nonetheless, the literature available addressing this issue is rather descriptive and non-causal.

According to Broer, Bai, and Fonseca (2019), the presence of heterogeneity in education systems is an important determinant on socioeconomic-based achievement gaps. Cross-national research on test scores shows that institutional heterogeneity disproportionately disadvantages students from lower socioeconomic backgrounds, who consistently underperform in comparison to more privileged students (Ornstein, 2010). Consistent with previous findings, significant performance gaps have been observed in Colombia, both across students' socioeconomic strata and between school sectors (Castro-Aristizábal et al., 2017). However, the extent to which the interaction of these factors amplifies disparities in learning outcomes remains insufficiently explored in Colombia.

This thesis aims to understand the role of privatization in shaping educational inequality in Colombia, with a primary focus on disparities in academic achievement among basic education graduates. Specifically, it investigates: *What is the differential effect of private basic education on learning outcomes across income groups in Colombia?* To answer this, I employ a two-stage least squares (2SLS) fixed effects strategy, using the relative availability of private schools as an instrument for private school attendance. The main outcome of interest is student performance on the standardized achievement test Saber 11. The analysis is conducted through two complementary strategies: first, I estimated separate specifications by socioeconomic stratum to capture within-group effects; and second, I implemented an interaction model that estimates heterogeneous treatment effects across groups within a unified specification. This dual approach improves both interpretability and statistical precision. To further support the robustness of the effects, I evaluate the stratified models through additional controls and an alternative instrument. Overall, these results provide a

compelling view of how privatization can contribute to the persistence of educational inequality.

The paper is organized as follows. Section 2 reviews the relevant literature building a compelling framework for the area of research. Section 3 describes the data sources and presents the pertinent summary statistics. Section 4 outlines the empirical methodology. Section 5 presents the main results along with robustness checks for the empirical strategy. Section 6 discusses the policy implications of the results and outlines the study's limitations. Finally, Section 7 concludes with a summary of the main findings and their broader significance.

2 Literature Review

2.1 Privatization of Basic Education

The privatization of education has been historically supported under the free-market assumption that increasing school choice and competition would enhance educational quality (Friedman, 1955). Nevertheless, the more recent literature has shifted focus, highlighting the effects of privatization on socioeconomic inequality. In a comparative analysis between culturally similar countries, Adamson, Astrand, & Darling-Hammond (2016) demonstrated that countries with a stronger private education sector exhibit greater disparities in educational achievement. Similarly, Ammermueller (2013) identifies that countries with larger shares of private school enrollment tend to experience wider socioeconomic gaps in academic performance among students. Furthermore, research has found that higher levels of private education spending within a country are associated with greater wage inequality (Huber, Gunderson, & Stephens, 2019). Notably, Latin America exhibits one of the highest and most rapidly increasing levels of private sector participation in the provision of basic education (Moschetti, Verger, & Fontdevila, 2018). However, privatization trends have evolved differently across the region.

In the case of Colombia, García Villegas and Gómez-Estrada (2021) attribute the emergence of the private education sector to the political tensions throughout the 20th century. The authors argue that the ongoing confrontations between the Liberal and Conservative parties hindered the consolidation of a unified

national education program. As a result, the instability and disruptions of the public school system pushed the demand for basic education of upper classes towards private institutions (García Villegas and Gómez-Estrada, 2021), suggesting an initial concentration of private schools in urbanized municipalities where elites resided. Simultaneously, legislative reforms introduced requirements for local administrations to allocate a portion of their budgets to education. Nevertheless, historical data showed that spending was unevenly distributed across municipalities, leading to disparities in provision (Ramírez-Giraldo & Téllez-Corredor, 2006).

Following these earlier developments, the second half of the century, marked by demographic and economic growth, brought about a rapid expansion of Colombia's basic education system. Ramírez-Giraldo and Téllez-Corredor (2006) document that both public and private sectors grew proportionally during this period, resulting in a relatively stable distribution of students across the two sectors over time. However, this aggregate stability coexisted with significant regional disparities in educational access. Furthermore, private education in Colombia has progressively extended its reach beyond high-income populations. This shift has been driven by both the emergence of low-cost private institutions and incremental policies that outsourced public education costs to private providers, such as charter schools and voucher programs (AlWindi, 2015; Moschetti et. al, 2018; Verger, Fontdevila, & Zancajo, 2016).

2.2 School Choice and Institutional Segregation

As private basic education has become more available across different socioeconomic sectors in Colombia, understanding its impact on educational inequality first requires examining the main determinants of parental school choice. A broad range of literature has consistently established that household income strongly predicts private school enrollment (Hossain, Shohel, & Jahan, 2017; Merga & Sofamo, 2020). The relationship has been proven particularly significant in Latin American countries (Rutkowski, Rutkowski, & Plucker 2012), reflecting both an increasing preference for private education within wealthier families and the resulting educational stratification. Nonetheless, this preference pattern persists even among Colombia's lower-income populations, outcomes from a randomized voucher program demonstrate that reducing financial barriers

increased parental selection of private schools (Angrist et al., 2002).

International evidence also highlights parental education as a key factor in school choice. The literature indicates that in developing countries parents with higher educational attainment are more likely to choose private schools (Asadullah & Maliki, 2018; Siddiqui, 2017). Overall, this effect is partly driven by the positive correlation between parental education and household income, further confirming institutional segregation. However, findings suggest it is also influenced by more educated parents having a better understanding of the implications of school selection. This dynamic is further illustrated in Colombia, where Wasserman (2021) reports that the majority of public-school educators choose to enroll their own children in private institutions. Such behavior appears to align with the generalized perception that private schooling offers higher quality standards than public education in the country (Cárdenas et al., 2021).

Moreover, studies using standardized test score data from Colombia support this perception. Results indicate that private school students generally outperform their public school peers (Cárdenas et al., 2021; Duarte et al., 2012). This explains the widespread preference for private education among families with sufficient socioeconomic resources. Additionally, the literature has documented that in developing countries, low-income families may also opt for lower-cost private education when facilitated by geographic accessibility, voucher programs, dissatisfaction with public schooling, and quality perceptions (Alderman, Orazem, & Paterno, 2001; Tooley & Dixon, 2007). Nevertheless, global empirical evidence on low-fee private schools suggests that these institutions still exhibit poor educational quality, characterized by underqualified teachers and insufficient resources (Härmä, 2021).

2.3 Educational Achievement

While the expansion of privatization and the determinants of school choice have shaped access to basic education in Colombia, the resulting stratified system plausibly contributes to the reproduction of educational inequality. According to the literature, academic achievement in Colombia is closely linked to students' socioeconomic and geographic backgrounds (Duarte et al., 2012; Rodríguez-Gómez et al., 2024). Standardized test results consistently show significant gaps in academic performance between students from different

income strata, with evidence showing positive correlations between socioeconomic status and test scores in Language, Math, and Science as early as fifth grade (Duarte et al., 2012; García-González & Skrita, 2019). Cárdenas et al. (2021) attribute these disparities to unequal access to preschool education, variations in school quality, and parental school selection. Additionally, the literature identifies school quality gaps across municipalities, highlighting the concentration of quality education in specific regions (Castro-Aristizábal et al., 2022). As a result, educational outcomes in Colombia reflect not only individual effort or ability, but also the structural inequities within the education system.

2.3.1 Heterogeneity in Education Systems

Furthermore, the literature has found that achievement gaps among students are especially pronounced in systems characterized by high institutional heterogeneity. Overall, studies have identified substantial disparities in school quality across Colombia, reflected in differences in infrastructure, teacher qualifications, student-teacher ratio, and availability of learning resources (García et al., 2015; Rodríguez-Gómez et al., 2024). This is particularly concerning given that school choice in Colombia is largely determined by families' socioeconomic status. International evidence further suggests that the extent of educational achievement gaps linked to socioeconomic background is mediated by the degree of heterogeneity within education systems (Broer et al., 2019). Notably, findings exhibit that students from low socioeconomic backgrounds perform better in more homogeneous education systems, compared to those in systems with larger disparities (Ornstein, 2010).

In light of the institutional heterogeneity observed in Colombia's education system, Duarte et al. (2012) provide a valuable analysis of the relationship between socioeconomic status and academic performance, suggesting that achievement outcomes are largely determined by the institution attended. This study decomposes the variance in student performance into within-school and between-school components, highlighting that, while students from different socioeconomic backgrounds show similar test scores within the same school, significant disparities emerge across institutions. Similarly, national-level data show a strong positive association between academic achievement, socioeconomic status, and school tuition, reflecting the sorting of population groups into different types of institutions (Cárdenas et al., 2021). Together, these findings

suggest that school selection in Colombia contributes to the extent of income-based achievement gaps, with institutional segregation fostering educational inequality.

2.3.2 Public-Private Performance Gaps

International data on standardized assessments largely documents that, on average, private school students outperform their public school counterparts (Alt & Peter, 2002; Neuman, 2022). However, the empirical challenge for academic research lies in identifying whether this performance gap reflects differences attributable to the school sector or stems from selection bias. Private school students often differ from public school students across academically relevant characteristics, suggesting that observed achievement gaps may reflect pre-existing student background rather than school quality. If the latter holds, even well-controlled comparisons may overstate (or understate) the benefits of private schooling. Additionally, the wide variation in private school quality limits the reliability of broad generalizations. As a result, the literature emphasizes the need for robust strategies to estimate the impact of private schooling on student achievement.

In the Colombian context, Fergusson and Flórez (2021) report that private school students generally achieve higher test scores than their public school peers. Nevertheless, the observed test score gain decreases as private school fees decline, pointing to significant heterogeneity within the private sector. This analysis, however, relies on OLS estimates with individual-level controls and does not address potential endogeneity in school choice, limiting causal interpretation. Conversely, Angrist et al. (2002) offer a more rigorous approach to isolating the effect of private schooling by leveraging a randomized voucher lottery in Colombia. The findings demonstrate that voucher winners who attended private schools performed better on achievement tests. While results reveal causal evidence on educational performance, voucher programs primarily target low-income students and do not fully capture how privatization affects educational inequality across the broader socioeconomic distribution.

Private school vouchers have been widely used as a source of exogenous variation to evaluate the impact of private schooling on student achievement, with experimental studies showing mixed results across different contexts (Epple, Romano, and Urquiola, 2017). In Chile's highly privatized education system, Anand, Mizala,

and Repetto (2009) have identified performance gains for low-income students attending private voucher schools. Comparable positive results emerge from smaller-scale voucher strategies, including English language improvement in India (Dixon et al., 2019) and higher achievement among specific minority populations in the United States (Howell et. al, 2002). In contrast, other evidence documents null or negative outcomes. Particularly, Wolf et al. (2010) found no significant performance effects from Washington D.C.'s voucher program. While evidence on Louisiana identified a negative impact for students attending private voucher institutions (Abdulkadiroglu, Pathak, and Walters, 2018). These mixed findings suggest that the effectiveness of private education through voucher programs is highly context-dependent and not universally beneficial.

Furthermore, several cross-country studies have employed instrumental variable approaches to address school choice endogeneity. For instance, West and Woessmann (2010) and Heller-Sahlgren (2018) use historical Catholic population shares to instrument private education attendance. The empirical evidence supports a causal association between greater private school prevalence and higher student achievement, operating through two mechanisms:(1) direct benefits of private school attendance, and (2) competitive effects that improve public school performance. Nevertheless, contrary implications emerge from within-country analyses. Cohen-Zada (2009) found no significant achievement effects from private school shares across the United States, signaling the importance of context-specific causal evidence. Moreover, while this instrument has received support in the academic literature, its validity depends on historical religious variation, a factor that may be absent in predominantly Catholic countries like Colombia and could potentially compromise the instrument's identifying power.

Neal (1997) proposes an alternative approach to estimating the effects of Catholic schooling on educational achievement by using the geographic density of Catholic schools as an additional instrument alongside religion-related variables. However, this strategy relies on the assumption that a household's county of residence is exogenous to school selection decisions. Similarly, Figlio and Stone (2000) account for selection in school choice using a set of local geographic characteristics such as crime rates, student concentration in public schools, private and public school availability, minority population, and unionization status of the public sector. Their findings reveal a significant academic advantage for students attending non-religious private schools, in comparison to the observed null or negative effects associated with religious private schools.

Collectively, these studies illustrate the difficulty of addressing selection bias when evaluating the impact of private schooling.

3 Data and Descriptive Statistics

This research primarily utilizes a comprehensive database constructed from Colombia's Saber 11 standardized exam administered by the Colombian Institute for the Evaluation of Education (ICFES). The Saber 11 assesses learning outcomes by the end of basic education and is mandatory for graduation, though it also serves as an important criterion for higher education admissions. The database includes test scores, individual and household sociodemographic characteristics, school-level attributes, and municipality of residence for senior students between 2014 and 2022. To implement our empirical strategy, we combine this core data set with municipality-year panels from the Center for Studies on Economic Development (CEDE), the National Administrative Department of Statistics (DANE), and the CINEP / Peace Program Research Center which provide additional indicators on education, economic conditions, political conflict, and governance.

Table 1 presents summary statistics for the main variables used in the analysis. The dataset includes 3,235,077 observations at the individual level, corresponding to Saber 11 test-takers between 2014 and 2022. For interpretability, categorical variables, such as parental education and school sector, are represented as binary indicators. The average test score is 254.8 points, with 28% of students enrolled in private schools and the remainder in public education. Notably, the average stratum level is 2.02, indicating that students predominantly come from relatively low-socioeconomic backgrounds. Access to technological resources is limited, and parental educational attainment is low, with only 13% of mothers having completed higher education. At the municipality-year level, public school supply slightly exceeds private supply on average, but the private-to-public ratio shows substantial variation (SD = 6.78), reflecting geographic disparities in sector-based school availability. Furthermore, economic inequality is also pronounced, with the Unsatisfied Basic Needs Index ranging from 1.6% to 93.7% of the population across municipalities. These observations highlight the heterogeneity of students' educational contexts, offering a foundation for examining variation in academic performance by socioeconomic groups and school sector.

Table 1: Summary Statistics

	Mean	Std. Dev.	Min.	Max.	Obs.
Individual-Level Variables					
Student Characteristics					
Test score	254.84	49.43	0.00	495.00	3235077
Household Characteristics					
Stratum level	2.02	1.06	1.00	6.00	3235077
Mother Higher Education	0.13	0.34	0.00	1.00	3235077
Mother No Education	0.17	0.38	0.00	1.00	3235077
Mother Primary Education	0.28	0.45	0.00	1.00	3235077
Mother Secondary Education	0.31	0.46	0.00	1.00	3235077
Mother Technical Education	0.09	0.28	0.00	1.00	3235077
Father Higher Education	0.12	0.32	0.00	1.00	3235077
Father No Education	0.22	0.42	0.00	1.00	3235077
Father Primary Education	0.27	0.44	0.00	1.00	3235077
Father Secondary Education	0.27	0.44	0.00	1.00	3235077
Father Technical Education	0.06	0.24	0.00	1.00	3235077
Computer	0.60	0.49	0.00	1.00	3210867
Internet access	0.59	0.49	0.00	1.00	3228496
Household Population	4.53	1.69	1.00	12.00	3209126
Urban	0.86	0.35	0.00	1.00	3235077
School Characteristics					
Private Education	0.28	0.45	0.00	1.00	3235077
Bilingual	0.02	0.14	0.00	1.00	2786143
Municipality-Year-Level Variables					
Education Indicators					
Public School Supply	7.65	15.34	0.00	368.46	7245
Private School Supply	7.60	30.76	0.00	808.05	7245
Private_to_Public Ratio	2.03	6.78	0.00	30.00	7245
Student-to-Teacher Ratio	15.47	4.78	0.75	37.00	7238
School Attendance Rate	65.71	6.09	17.43	78.66	7240
Literary Rate	89.82	5.08	56.32	98.02	7240
% SGP Allocated to Education	0.11	0.16	0.00	0.77	7235
Economic Indicators					
Unsatified Basic Needs Index	21.77	16.88	1.59	93.65	7234
Income	85568.14	619659.85	0.00	19199023.40	7166
Political Indicators					
Historical Social Protest Movements	122.53	103.37	1.00	364.00	7245

Particularly, Figure 1 shows the distribution of Saber 11 test scores (0-500 scale) by socioeconomic stratum, as defined by the official household classification system developed by DANE. Aligned with the literature on educational achievement, the data reveal that as students' stratum level increases, test scores become increasingly concentrated at higher values. Overall, the figure highlights substantial differences in achievement level, with the peak density for the two highest strata exhibiting minimal overlap with the test results of the student population in the lower strata. This pattern suggests that students from higher

socioeconomic backgrounds systematically outperformed less advantaged students.

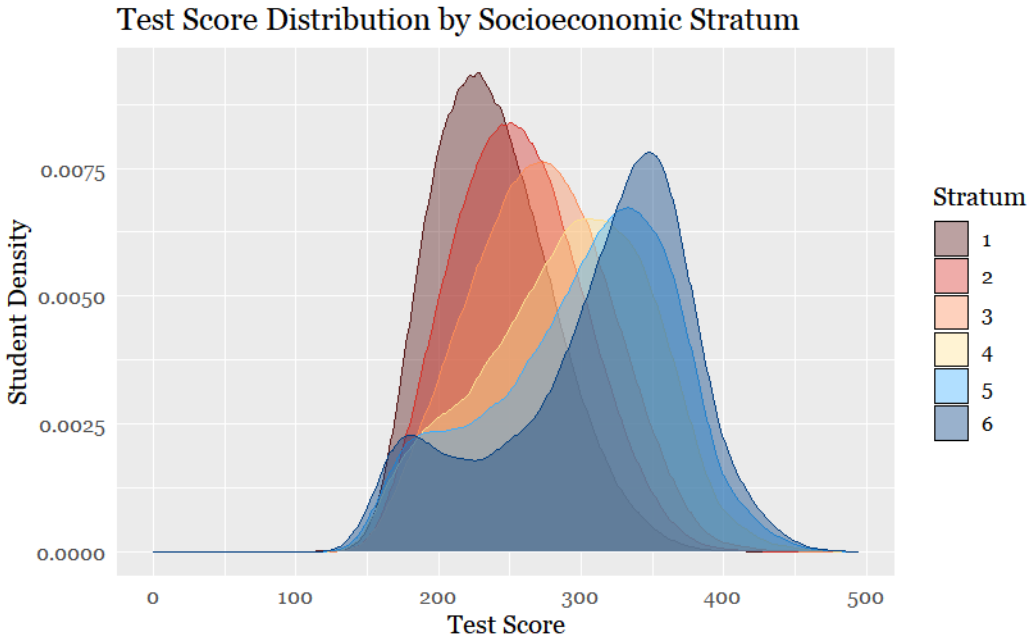

Figure 1: Distribution of test scores by socioeconomic stratum for graduating students in the Saber 11 examination (2014–2022). Source: ICFES.

Furthermore, Table 2 complements the distributional patterns of educational achievement by presenting a decomposition of the student population across socioeconomic strata and school sectors. The statistics evidence a pronounced stratification: students from lower strata are predominantly concentrated in public education, while higher strata largely favors private education. Nonetheless, public and private school students are present within each stratum, indicating that school choice is not exclusively determined by socioeconomic status. In terms of average test scores, private school students generally outperform their public counterpart. However, disaggregated results reveal that in Stratum 1, public school students slightly outperform those in private schools, whereas from Stratum 2 onward, private students score progressively higher. The widening gap suggests higher-stratum families leverage their economic capacity to access increasingly higher-quality private schools. These observations are consistent with previously discussed research on institutional segregation.

Table 2: Descriptive Statistics by Stratum and School Sector

	Number of Students		Percentage (%)		Mean Test Score	
School sector	Public	Private	Public	Private	Public	Private
Total	2,340,430	894,743	72.3	27.7	248	274
Stratum 1	1,069,225	141,238	88.3	11.7	238	234
Stratum 2	862,420	278,673	75.6	24.4	254	259
Stratum 3	346,516	280,323	55.3	44.7	261	282
Stratum 4	44,292	112,477	28.3	71.7	248	306
Stratum 5	11,663	50,119	18.9	81.1	226	318
Stratum 6	6,314	31,913	16.5	83.5	210	330

4 Methodology

Building on insights from the literature review on the privatization of basic education and data description, this section presents the empirical strategy used to estimate the effect of attending private basic education institutions on student achievement across socioeconomic groups in Colombia. The previous sections highlight the relevance of socioeconomic stratum as a determinant of both school choice and educational inequality, therefore the econometric approach accounts for these differential effects. Furthermore, estimating a causal relationship is challenging due to potential endogeneity in school choice even within the same socioeconomic group. The literature suggests that families who self-select into private education may systematically differ from those who choose public schools, such as in parental education, involvement, expectations, and other factors that can influence academic performance.

To address these concerns, the main empirical strategy relies on a three-part approach: (1) controlling for unobserved heterogeneity across municipalities and cohorts using fixed effects; (2) addressing endogeneity in school choice by using relative private school availability as an instrumental variable, leveraging exogenous variation across municipalities and cohort; and (3) estimating the model separately by socioeconomic stratum to test whether the effect of attending a private school varies across income groups, as suggested by the literature on educational segregation in Colombia. Across all eight models, the coefficients of interest capture the effect of private school attendance on achievement, enabling comparison of both overall and stratum-specific impacts.

The baseline specification estimates the association between private school attendance and student achievement using an ordinary least squares (OLS) regression with fixed effects. The model controls for observable individual and household characteristics, including parental education and computer access, as well as unobserved heterogeneity at the municipality and cohort levels. The inclusion of fixed effects is motivated by García et al. (2015), who show that local characteristics such as public education spending, student-teacher ratio, and the Unsatisfied Basic Needs index (UBN) are important determinants of students' educational vulnerability in Colombia. Figure 2 illustrates the variation in average test scores across municipalities and cohorts, revealing substantial geographic and temporal disparities in educational outcomes. These observations further justify the inclusion of fixed effects to mitigate the potential bias from unobserved factors at these levels.

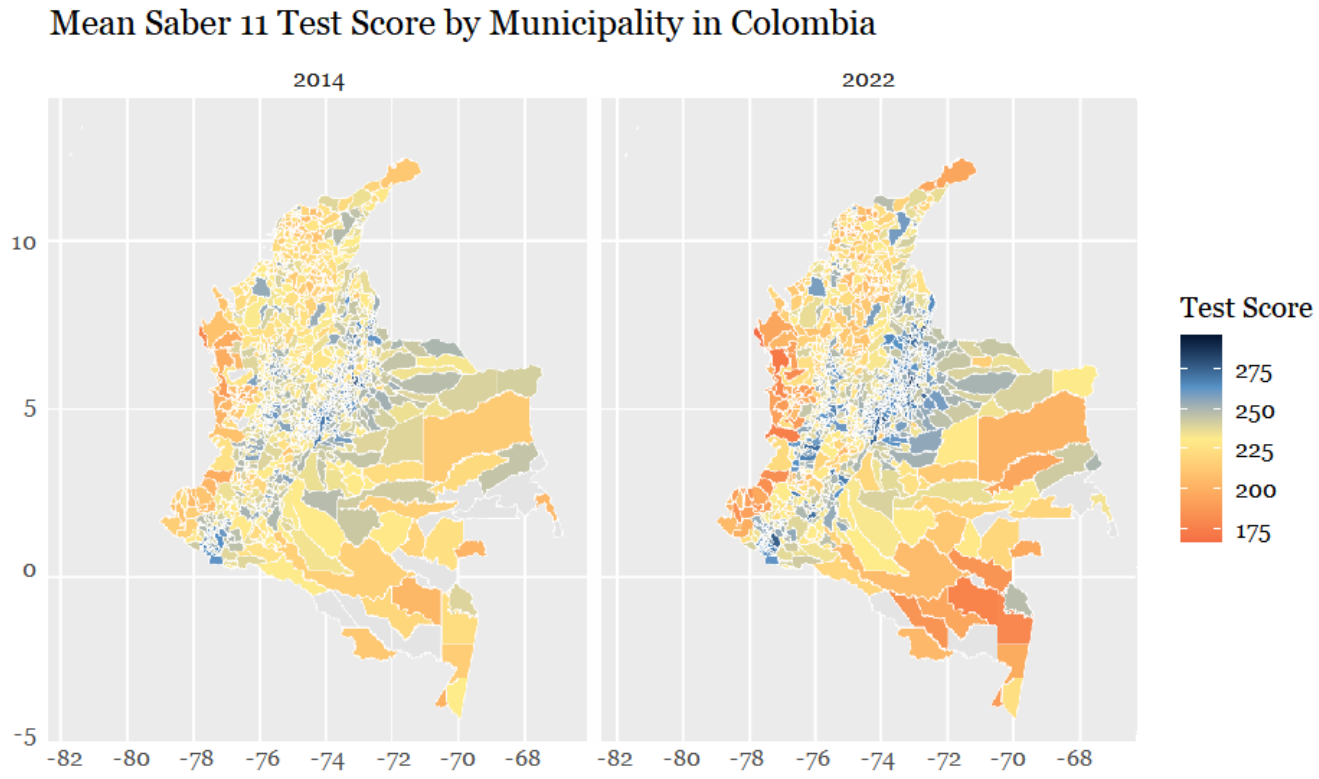

Figure 2: Distribution of Saber 11 test scores average by municipality for student cohorts 2014 and 2022). Source: ICFES.

Furthermore, standard errors are clustered at the school level to account for shared environmental factors

affecting students within schools. This accounts for potential correlation in student outcomes arising from shared exposure to institutional resources, teacher quality, and practices that may vary systematically across schools. Nevertheless, further endogeneity concerns remain unresolved at the baseline. The estimating model is specified as follows:

$$\text{Test Score}_{imc} = \alpha + \beta \cdot \text{Private}_{imc} + \gamma X_{imc} + \delta_m + \lambda_c + \varepsilon_{imc} \tag{1}$$

where TestScore_{imc} is the Saber 11 test score of student i in municipality m and cohort c. Private_{imc} is a binary indicator equal to 1 if the student attends a private school. X_{imc} is a vector of observed individual and household characteristics. δ_m and λ_c denote municipality and cohort fixed effects, respectively. Finally, ε_{imc} is the unobserved error term. The coefficient β is the parameter of interest and captures the estimated average difference in test scores between private and public school students. Nonetheless, non-random selection into the school sector does not allow for causal interpretation.

Recognizing the well-documented endogeneity of private school choice in educational achievement estimates, the empirical strategy proceeds with an instrumental variable approach that aligns with the available administrative data and the country's background. The choice of instrument is motivated by Figlio and Stone (2000), who exploit geographic variation in sector selection variables to address the endogeneity of private school attendance. While their framework includes a broader set of instruments, this empirical strategy focuses solely on sector-based school availability as an intended source of exogenous variation. Accordingly, this paper instruments private education selection with the ratio of private to public schools specific to each student's municipality and cohort.

To strengthen the interpretation of the instrument, the continuous ratio is transformed into a categorical variable capturing relative private school availability. The private-to-public schools ratio is categorized based on quintiles of its distribution, reflecting increasing levels of private sector presence. This transformation mitigates the influence of extreme outliers and aligns with the institutional interpretation of school access. Figure 3 shows the variation in relative private school availability across municipalities and cohorts, providing support for the relevance of the instrument.

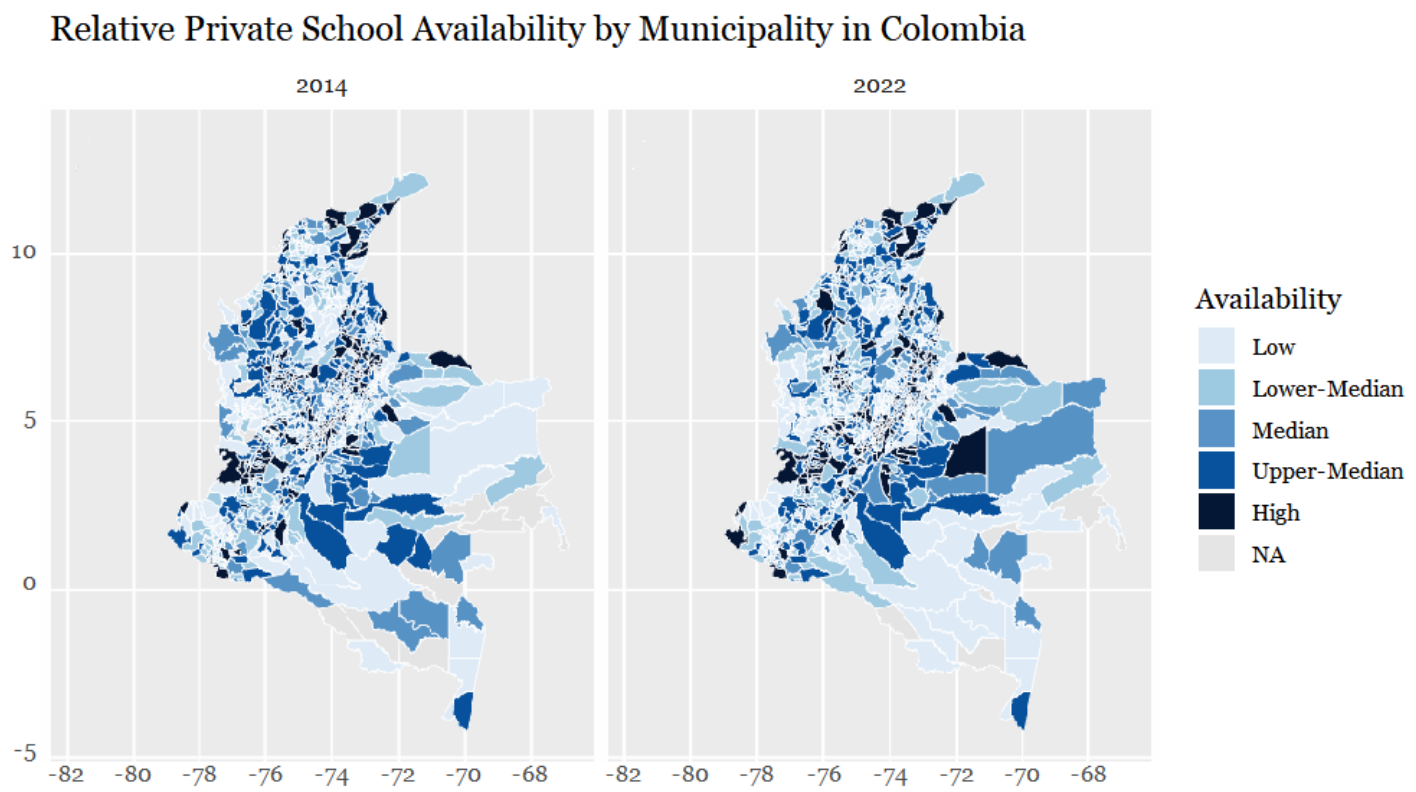

Figure 3: Distribution of Saber 11 test scores average by municipality for student cohorts 2014 and 2022). Source: ICFES.

The two-stage least squares (2SLS) model with fixed effects is estimated as follows.

The first stage regresses the likelihood of private attendance on the instrument:

$$\text{Private}_{imc} = \pi_0 + \pi_1 \cdot \text{PrivateAvailability}_{mc} + \pi_2 X_{imc} + \mu_m + \nu_c + u_{imc} \tag{2}$$

The second stage estimates test scores using predicted private school attendance:

$$\text{TestScore}_{imc} = \alpha + \beta \cdot \widehat{\text{Private}}_{imc} + \gamma X_{imc} + \delta_m + \lambda_c + \varepsilon_{imc} \tag{3}$$

Where β captures the Local Average Treatment Effect (LATE) of private schooling on test scores. Specifically, β represents the average causal effect of attending a private school for those students whose schooling

decisions are influenced by the instrument: namely, the relative private school availability in their municipality and cohort. The validity of the estimates and its interpretation is conditional on two criteria. First, the instrument must strongly predict private school attendance. This condition is assessed by examining the F-statistic for the first-stage specification, testing for the instrument's relevance. Second, the instrument must satisfy the exclusion restriction, implying that the private-to-public school ratio should affect test scores only through private school attendance, and not through alternative channels.

While the exclusion restriction cannot be directly tested, this paper argues that it is plausibly satisfied in the Colombian context. The private-to-public school ratio primarily captures the relative availability of private education within a municipality. As discussed in the literature review, the spatial distribution of schools has been largely shaped by historical political, institutional, and demographic factors, rather than by contemporary student achievement (García Villegas & Gómez-Estrada, 2021). This interpretation is reinforced by the persistence of student distribution across school sectors (Ramirez & Tellez, 2006), suggesting that historical patterns continue to be reflected in the current structure of the education system. Notably, the extension of private provision to low-income populations has been predominantly associated with exogenous policy initiatives (Angrist et al, 2002), further supporting the instrument's validity. Furthermore, by including fixed effects for both municipality and year, the analysis accounts for unobserved local characteristics and temporal shocks that could simultaneously affect school supply and student performance. Under this specification, the remaining variation in the instrument is assumed to influence test scores only through its effect on private school attendance. Nevertheless, some concern remains given international evidence of potential moderate competition effects arising from private school presence. Acknowledging this limitation, additional robustness checks are conducted to assess the sensitivity of the results.

To capture how the achievement effect of private school attendance varies by socioeconomic background, the 2SLS model with fixed effects, as specified in equations (2) and (3), is additionally estimated separately for each socioeconomic stratum. This stratified approach is motivated by extensive evidence of educational segregation in Colombia and is designed to address the key confounding influence of socioeconomic background (Duarte et al., 2012). These stratum-specific estimates complement the baseline OLS and 2SLS results and serve two main analytical purposes. First, they test the hypothesis of heterogeneous private

school quality across income groups: higher-stratum students benefit from good quality private institutions, while lower-stratum students attend public or lower quality private schools (Cárdenas et al., 2021). Second, the analysis examines whether the private-to-public school ratio, used as an instrument, functions consistently across strata, given the strong role of socioeconomic status in school choice (Rutkowski, Rutkowski, & Plucker 2012). Under the assumption that public school quality does not vary systematically across strata, significant differences in private school effects would provide evidence on segregation patterns and reflect how privatization contributes to educational inequality in Colombia.

To strengthen the empirical assessment of heterogeneous effects, the analysis is extended by estimating an interacted 2SLS model, presented in specifications (4) and (5). While stratified regressions estimate effects separately by socioeconomic group, they do not formally test whether differences between groups are statistically significant. The interaction model overcomes this by including all strata within a single framework, where the interaction term directly measures how the effect of private schooling on test scores changes with socioeconomic status. This unified specification improves comparability by estimating private school effects relative not only to public schools within each group but also across socioeconomic groups, enabling a clearer understanding of how the returns to private education vary along the socioeconomic spectrum. Additionally, the first stage includes an interaction between the instrument (relative private school availability) and stratum level, allowing the instrument to operate differently across strata. These specifications follow the same theoretical motivation as the stratified regressions, which are grounded in the literature on private education and educational segregation.

First Stage:

$$\begin{aligned}\text{Private}_{imc} = \alpha_0 + \alpha_1 \,\text{PrivateAvailability}_{mc} + \alpha_2 \,(\text{PrivateAvailability}_{mc} \times \text{Stratum\_level}_{imc}) \\ + \alpha_3 \,\text{Stratum\_level}_{imc} + \alpha_4 X_{imc} + \mu_m + \nu_c + u_{imc} \end{aligned} \tag{4}$$

Second Stage:

$$\text{Test\_score}_{imc} = \beta_0 + \beta_1 \widehat{\text{Private}}_{imc} + \beta_{2,s} \left(\widehat{\text{Private}}_{imc} \times \text{Stratum\_level}_{imc}\right) + \beta_3 \text{Stratum\_level}_{imc} + \gamma X_{imc} + \delta_m + \lambda_c + \epsilon_{imc} \quad (5)$$

The interaction model offers both methodological and interpretive advantages. First, by pooling all observations rather than estimating separate models by stratum, it increases statistical power and improves the precision of the estimates. This is particularly valuable for detecting effects among smaller socioeconomic groups. Second, it examines the robustness and consistency of plausible heterogeneous effects. In this specification, the baseline category is public school students in Stratum 1. The coefficient β_1 captures the estimated effect of private schooling in Stratum 1. The interaction terms, represented by the vector $\beta_{2,s}$, show how the effect of private schooling varies across socioeconomic strata relative to this baseline. A statistically significant $\beta_{2,s}$ indicates that the private school effect systematically changes with stratum level. Therefore, the LATE for each stratum s is thus given by the sum $\beta_1 + \beta_{2,s}$. Finally, the coefficient vector β_3 captures differences in test scores by stratum among public school students. Together, the stratified and interaction models serve complementary roles in assessing how private education shapes educational outcomes across socioeconomic groups in Colombia.

Furthermore, to assess the robustness of the findings, two additional strategies are implemented. First, I expand specifications (2) and (3) by including municipality-level controls for public education quality. Specifically, I incorporate measures such as municipal education funding and student-teacher ratios, which are standard proxies for schooling quality. These variables account for heterogeneity in public school resources and capture potential competitive effects that may confound estimates. For instance, if private education increases where public school quality is low, omitting these controls could overstate the benefits of private schooling. Conversely, if private competition improves public education, the bias could be negative. While fully understanding these mechanisms lies beyond the scope of this study, including public education quality controls helps reduce omitted variable bias and provides more reliable estimates of private education's effect on test scores.

The second strategy introduces an alternative instrumental variable based on the historical intensity of social protest movements at the departmental level[1]. The instrument is a binary measure (low vs. high) capturing the number of social movement protests recorded in each department between 1986 and 1990. Figure 4 displays the distribution of the historical intensity of social protest movements across departments in Colombia. Restricted to the departmental level by data availability, this measure nevertheless leverages variation in historical conflict patterns that plausibly influenced long-term trust in public institutions and, consequently, predict current private school attendance.

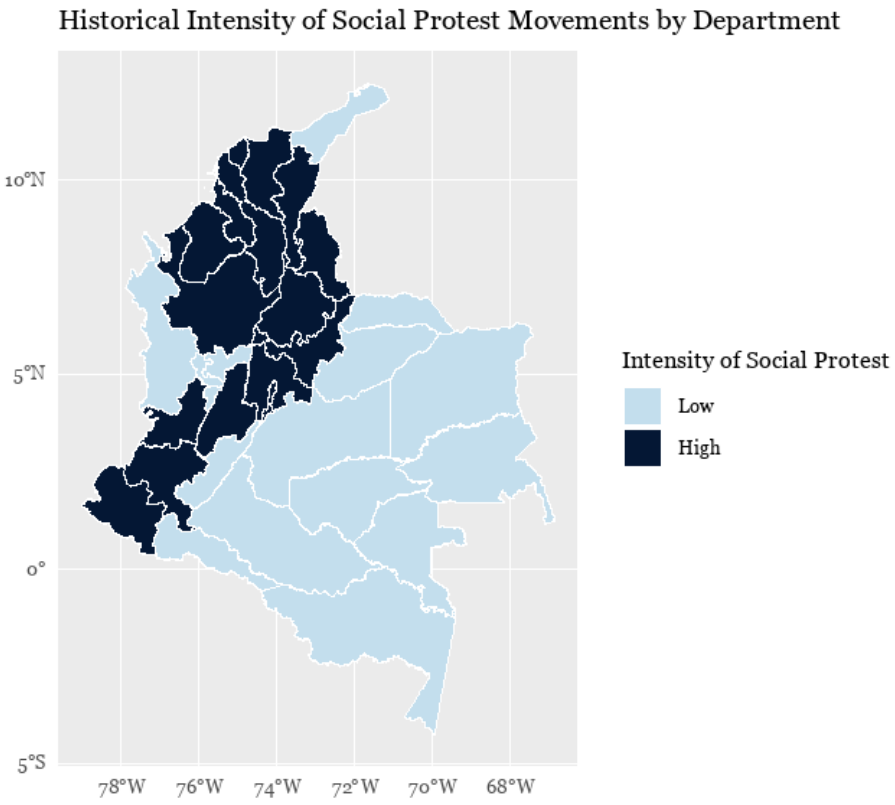

Figure 4: Distribution of the historical intensity of social protest movements recorded in each department between 1986 and 1990. Source: CINEP / Peace Program Research Center.

Similarly to the theoretical framework underlying the primary instrument (relative private school availability), this strategy builds on the historical trajectory of education in Colombia, where political conflict shaped the early development of private schooling and sector-based enrollment patterns have persisted over time (García Villegas & Gómez-Estrada, 2021; Ramírez & Téllez, 2006). Furthermore, the use of this instru-

[1]In Colombia, a *department* (*departamento*) is a top-level administrative division similar to a state or province. Each department contains multiple municipalities.

ment is also conceptually aligned with Figlio and Stone (2000), who include unionization variables within their set of instruments to capture school choice. Overall, although the department-level approach may yield different point estimates due to within-department variation, it provides a useful test of whether the observed socioeconomic patterns in private school effects persist across identification strategies. This supports the consistency and robustness of the main findings

5 Results

Table 3 presents the estimated effects of private education on standardized test scores, controlling for municipality and cohort fixed effects. Column (1) reports OLS estimates for the overall student population, indicating a slightly positive and statistically significant effect. However, when instrumenting private education with municipality-cohort relative private availability (Column 2), the estimate increases in magnitude but becomes insignificant. Nonetheless, the first-stage F-statistic is well above conventional thresholds, indicating that the instrument is strong and relevant for predicting private school attendance. The difference in significance between OLS and 2SLS estimates suggests potential bias from unobserved selection into private schools.

Columns (3) through (8) present 2SLS estimates disaggregated by socioeconomic stratum. The estimated effect of private schooling varies substantially across these groups. Column (3) shows that for students in Stratum 1, private school attendance is associated with a 7.7-point decline in test scores. For Stratum 2 (Column 4), the estimated impact of private school is small (0.69) and statistically insignificant. This suggests that for the lowest socioeconomic groups private schooling has either negative or null effects on educational achievement relative to public schooling.

In contrast, the estimated returns to private schooling rise markedly among students in higher socioeconomic strata. From Stratum 3 onward, effects become both larger and statistically significant. Columns (5) to (8) report that private education increases students' test scores by 12.43 points in Stratum 3, 44.41 points in Stratum 4, 38.08 in Stratum 5, and reaches 100.4 additional points in Stratum 6. The difference in estimated test score gains between Stratum 3 and Stratum 6 highlights a sharp socioeconomic gap in the

Table 3: Effect of Private Education on Test Scores

	OLS	2SLS					
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Independent variable								
Private_Education	1.995***	4.303	-7.673***	0.6903	12.43***	44.41***	38.08**	100.4***
	(0.7069)	(2.979)	(2.482)	(2.976)	(3.997)	(9.399)	(15.40)	(21.45)
Household controls								
MotherPrimaryEducation	5.032***	5.067***	4.979***	5.467***	7.820***	5.500***	1.797	6.136***
	(0.1028)	(0.1143)	(0.1104)	(0.1600)	(0.3402)	(0.7030)	(1.125)	(1.965)
MotherSecondaryEducation	13.33***	13.29***	12.28***	13.43***	15.36***	11.88***	8.383***	5.313*
	(0.1579)	(0.1690)	(0.1602)	(0.2069)	(0.4323)	(1.132)	(2.463)	(3.208)
MotherTechnicalEducation	24.24***	24.09***	23.93***	23.99***	24.71***	20.27***	16.21***	13.79***
	(0.2327)	(0.3071)	(0.2726)	(0.3157)	(0.6120)	(1.484)	(2.734)	(3.874)
MotherHigherEducation	35.26***	34.72***	24.74***	28.51***	31.67***	27.57***	27.98***	22.81***
	(0.3844)	(0.7850)	(0.4327)	(0.5251)	(1.019)	(2.178)	(3.537)	(4.749)
FatherPrimaryEducation	2.809***	2.812***	2.497***	3.346***	4.290***	2.712***	3.446***	0.3970
	(0.0932)	(0.0946)	(0.1078)	(0.1337)	(0.2736)	(0.6670)	(1.155)	(1.790)
FatherSecondaryEducation	8.618***	8.530***	7.702***	8.717***	9.359***	7.126***	8.872***	3.514*
	(0.1420)	(0.1772)	(0.1608)	(0.1978)	(0.3494)	(0.9053)	(1.627)	(2.047)
FatherTechnicalEducation	18.49***	18.30***	17.51***	18.39***	18.19***	14.11***	14.57***	4.886*
	(0.2278)	(0.3260)	(0.3302)	(0.3323)	(0.5044)	(1.168)	(2.040)	(2.850)
FatherHigherEducation	29.04***	28.53***	17.76***	21.41***	23.30***	22.11***	27.17***	18.63***
	(0.3989)	(0.7678)	(0.3886)	(0.4610)	(0.8052)	(1.771)	(2.636)	(3.509)
ComputerNo	-9.851***	-9.747***	-7.767***	-8.933***	-11.74***	-11.56***	-15.98***	-5.041
	(0.1395)	(0.1873)	(0.1369)	(0.1593)	(0.4061)	(1.583)	(3.373)	(5.236)
Fit statistics								
Observations	3,210,705	3,210,705	1,202,638	1,132,642	621,506	155,109	61,067	37,743
R^2	0.28667	0.28635	0.17639	0.16498	0.22556	0.37815	0.48205	0.54126
F-test (1st stage)		7,754.4	4,589.2	2,121.8	766.52	307.90	194.34	137.18

Notes: Clustered standard errors at the school level are reported in parentheses. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. The dependent variable is the standardized test score. Column (1) presents pooled OLS estimates. Column (2) shows pooled 2SLS estimates using the relative private school availability as an instrument. Columns (3) to (8) report 2SLS estimates separately for each socioeconomic stratum (Stratum 1 to 6, in ascending order). All models include municipality and cohort fixed effects.

effectiveness of private schooling. These results suggest that the academic benefits of private schooling grow with socioeconomic status, even after controlling for observable household characteristics.

Furthermore, first-stage F-statistics remain well above conventional thresholds across all strata, confirming that the instrument remains strong and relevant throughout the stratified populations. Table 7 (Appendix) shows that OLS estimates are consistently lower than the corresponding 2SLS estimates. This pattern indicates a downward bias in the OLS results, suggesting that, once endogeneity in school choice is addressed, the positive impact of private education on achievement is larger than implied by raw comparisons. Nevertheless, as previously stated, the socioeconomic gap in private school effects remains evident and persistent.

To formally assess whether the effects of private schooling differ statistically across socioeconomic strata, Table 4 presents results from the interacted 2SLS model with public school students in Stratum 1 represented as the baseline category. The first-stage F-statistics substantially exceed conventional thresholds, confirming the instrument's strength across all strata. Importantly, the coefficient on private education for the baseline group is negative and statistically significant at –21.74 points, consistent with the effect observed in the stratified regression for Stratum 1.

The coefficients for stratum capture significant differences in academic achievement among public school students. The results show a steady decline in test scores as socioeconomic level increases. Notably, students in Stratum 2 score 0.48 points below their Stratum 1 counterparts, while those in Stratum 6 score 37.76 points lower. This pattern likely reflects selection mechanisms related to the instrument's source of variation. Since relative private school availability is used as the instrument, and wealthier students are predominantly concentrated in private schools, those from higher strata who remain in public education likely reside in areas with limited access to private options. These areas are plausibly less urbanized and may offer lower-quality public education, which contributes to the negative association between stratum level and test scores within public schools.

The interaction terms between private education and socioeconomic strata are positive, statistically significant, and increase in magnitude with stratum level. These coefficients in Table 4 reveal how the effect of

private schooling on test scores varies by socioeconomic background. As described in the methodology, the effect for each stratum is obtained by summing the baseline private education coefficient and the corresponding interaction term. For example, the estimated effect of private education in Stratum 2 is a 1.96-point increase ($-21.74 + 23.70 = 1.96$), indicating a modest gain. In contrast, for Stratum 6, the estimated effect reaches 85.86 additional points ($-21.74 + 107.6 = 85.86$), reflecting a substantial advantage. Figure 5 shows the estimated LATE of private education across strata with confidence intervals. This pattern suggests that private schooling offers limited academic benefits to lower strata but significant returns for the socioeconomic elite, reinforcing our findings on educational inequality. Furthermore, despite the negative selection on the stratum indicators themselves, when adding the estimated private education effect for each stratum (LATE) to the corresponding stratum coefficient, the total predicted test scores for private school students in all strata except Stratum 1 exceed those of public school students in Stratum 1. This highlights the overall lower quality of public education.

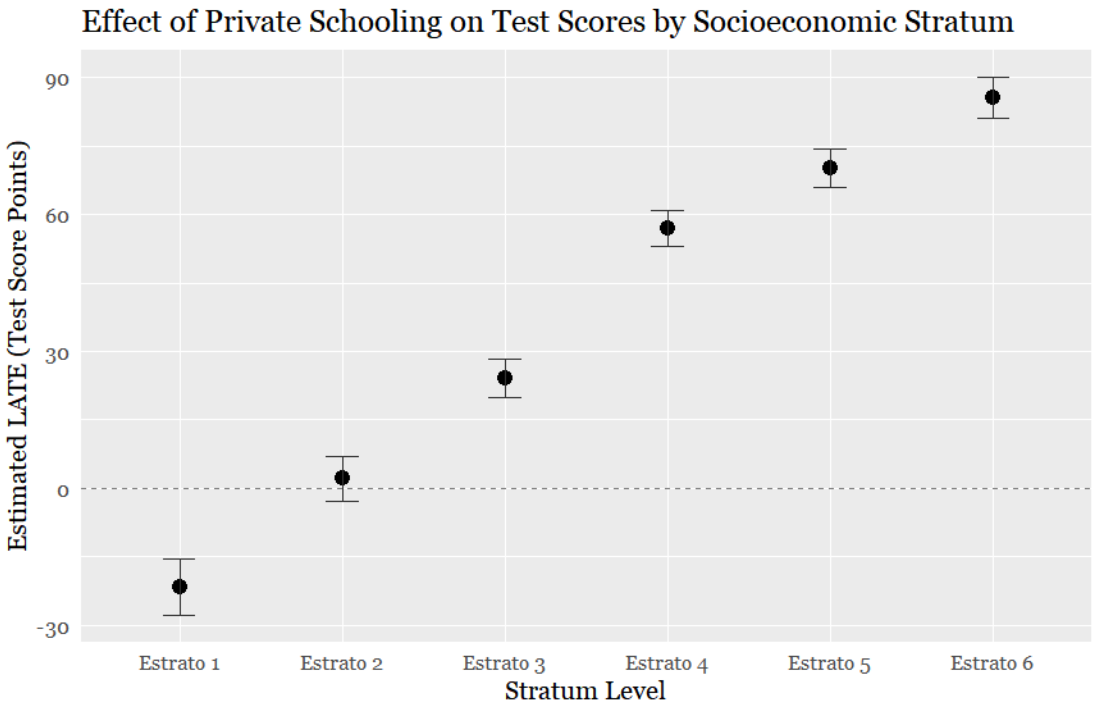

Figure 5: Local Average Treatment Effects (LATE) estimates of private education across strata, estimated from the interaction 2SLS model. Error bars represent 95% confidence intervals clustered at the school level.

Table 4: Effect of the interaction between Private Education and Socioeconomic Stratum on Test Scores

Model:	2SLS	
Baseline		
Public_Education x Stratum 1		
Independent Variables		
Private_Education	-21.74***	(3.16)
Stratum 2	-0.48*	(0.26)
Stratum 3	-5.50***	(0.56)
Stratum 4	-25.08***	(0.99)
Stratum 5	-31.33***	(1.22)
Stratum 6	-37.76***	(1.20)
Private_Education × Stratum 2	23.70***	(1.94)
Private_Education × Stratum 3	45.78***	(2.52)
Private_Education × Stratum 4	78.80***	(2.94)
Private_Education × Stratum 5	92.06***	(3.16)
Private_Education × Stratum 6	107.6***	(3.05)
Household controls		
MotherPrimaryEducation	5.25***	(0.10)
MotherSecondaryEducation	12.90***	(0.14)
MotherTechnicalEducation	23.18***	(0.23)
MotherHigherEducation	27.85***	(0.42)
FatherPrimaryEducation	2.96***	(0.09)
FatherSecondaryEducation	8.25***	(0.14)
FatherTechnicalEducation	17.42***	(0.24)
FatherHigherEducation	21.17***	(0.38)
ComputerNo	-8.77***	(0.12)
Fit Statistics		
Observations	3,210,705	
R^2	0.295	
First-Stage F-statistics:		
Private_educ	7,001	
Private × Stratum 2	30,931	
Private × Stratum 3	76,633	
Private × Stratum 4	334,046	
Private × Stratum 5	723,147	
Private × Stratum 6	1,005,340	

Notes: Clustered standard errors at the school level are reported in parentheses. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. The dependent variable is the standardized test score. The table presents 2SLS estimates that incorporate an interaction between private education and socioeconomic stratum, using the relative availability of private schools as an instrument. The model includes municipality and cohort fixed effects.

5.1 Robustness Check

Table 5 assesses the stability of our estimates when controlling for public education quality at the municipality level. The results show that these variables are only statistically significant for the aggregate sample (Column 2) and for the lowest socioeconomic stratum (Column 3), suggesting that public school quality mainly influences student achievement among the most disadvantaged. Importantly, the coefficient on private education remains stable in sign and magnitude across specifications. This indicates that the estimated private school advantage is not driven by differences in public sector quality or competition effects. The evidence supports the interpretation that the returns to private education are robust to variation in public schooling.

Table 6 reports estimates using an alternative instrument based on the historical intensity of social protest at the departmental level. This broader geographic level introduces more heterogeneity relative to our main municipality-cohort instrument, which results in larger standard errors and some attenuation in significance. Notably, the private school effect for student in Stratum 3 (Column 5) becomes statistically insignificant. Nevertheless, the core socioeconomic driven pattern persists: private school effects are negative or null in lower strata (Columns 3, 4, and 5) and increasingly positive in higher strata (Columns 6, 7, and 8). First-stage F-statistics are well beyond standard thresholds, confirming the strength of the instrument across specifications.

Several methodological aspects are to be highlighted from Table 6. First, using a departmental instrument limits the inclusion of municipality fixed effects; however, controlling for socioeconomic disadvantage (UBN) at the municipal level mitigates local confounding in educational achievement. Second, the R^2 values are generally within reasonable bounds, except for Stratum 1, where the negative value may reflect identification challenges for the most disadvantaged group. Third, while the magnitude of the coefficients differs from the main specification in Table 3 (e.g., 44.41 vs. 20.82 in Stratum 4), the consistency in direction and growing pattern across strata supports the robustness of our central finding: the impact of private schooling varies systematically with socioeconomic status, primarily benefiting upper strata.

Table 5: Effect of Private Education on Test Scores Accounting for Public School Quality

	OLS	2SLS					
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Independent variable								
Private_Education	1.995***	4.592	-7.388***	0.9137	12.72***	44.77***	38.64**	99.11***
	(0.7052)	(2.978)	(2.494)	(2.980)	(4.005)	(9.375)	(15.28)	(21.09)
Household controls								
MotherPrimaryEducation	5.020***	5.060***	4.967***	5.455***	7.784***	5.453***	1.826	6.097***
	(0.1025)	(0.1143)	(0.1103)	(0.1603)	(0.3363)	(0.7037)	(1.127)	(1.955)
MotherSecondaryEducation	13.32***	13.27***	12.26***	13.41***	15.29***	11.81***	8.398***	5.504*
	(0.1571)	(0.1685)	(0.1598)	(0.2069)	(0.4277)	(1.129)	(2.454)	(3.162)
MotherTechnicalEducation	24.22***	24.05***	23.90***	23.96***	24.61***	20.17***	16.15***	13.93***
	(0.2318)	(0.3066)	(0.2723)	(0.3155)	(0.6080)	(1.481)	(2.720)	(3.826)
MotherHigherEducation	35.17***	34.57***	24.69***	28.44***	31.52***	27.36***	27.75***	23.06***
	(0.3818)	(0.7832)	(0.4326)	(0.5251)	(1.017)	(2.172)	(3.510)	(4.671)
FatherPrimaryEducation	2.805***	2.808***	2.493***	3.340***	4.269***	2.724***	3.374***	0.4402
	(0.0927)	(0.0943)	(0.1075)	(0.1333)	(0.2728)	(0.6660)	(1.145)	(1.779)
FatherSecondaryeducation	8.610***	8.512***	7.687***	8.703***	9.320***	7.093***	8.691***	3.607*
	(0.1414)	(0.1772)	(0.1608)	(0.1978)	(0.3489)	(0.9013)	(1.610)	(2.029)
FatherTechnicaleducation	18.48***	18.27***	17.49***	18.35***	18.13***	14.09***	14.48***	5.015*
	(0.2267)	(0.3257)	(0.3304)	(0.3319)	(0.5036)	(1.162)	(2.017)	(2.825)
FatherHighereducation	28.97***	28.39***	17.73***	21.36***	23.19***	22.00***	26.92***	18.63***
	(0.3953)	(0.7658)	(0.3883)	(0.4613)	(0.8044)	(1.765)	(2.606)	(3.462)
ComputerNo	-9.842***	-9.725***	-7.756***	-8.913***	-11.69***	-11.47***	-15.85***	-5.428
	(0.1391)	(0.1873)	(0.1368)	(0.1590)	(0.4059)	(1.578)	(3.344)	(5.144)
Public Education Quality								
stu_teach_ratio_pub	-0.0102	-0.0087	0.1121**	-0.0904	-0.1318	-0.0852	-0.3906	0.0570
	(0.0452)	(0.0459)	(0.0457)	(0.0644)	(0.1081)	(0.2284)	(0.3782)	(0.4471)
pro_SGP_edu	7.628***	7.823***	9.412**	1.059	6.809*	17.00	1.536	-24.54
	(2.624)	(2.673)	(3.822)	(3.248)	(3.754)	(10.94)	(17.11)	(24.81)
Fit statistics								
Observations	3,210,050	3,210,050	1,202,415	1,132,545	621,425	155,003	60,988	37,674
R^2	0.28659	0.28618	0.17641	0.16483	0.22527	0.37755	0.48294	0.54374
F-test (1st stage)		7,739.8	4,575.2	2,118.0	764.42	305.04	193.46	137.81

Notes: Clustered standard errors at the school level are reported in parentheses. $*p < 0.1$, $**p < 0.05$, $***p < 0.01$. The dependent variable is the standardized test score. Column (1) presents pooled OLS estimates. Column (2) shows pooled 2SLS estimates using the relative private school availability as an instrument. Columns (3) to (8) report 2SLS estimates separately for each socioeconomic stratum (Stratum 1 to 6, in ascending order). All models include municipality and cohort fixed effects.

Table 6: Effect of Private Education on Test Scores using alternative instrument

	OLS	2SLS					
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Independent variable								
Private_Education	2.816***	-8.448	-70.27***	-8.263	-2.639	20.82*	52.06*	111.2**
	(0.7409)	(6.054)	(14.84)	(6.552)	(6.133)	(11.43)	(26.72)	(53.59)
Household controls								
MotherPrimaryEducation	4.716***	4.613***	4.324***	5.402***	7.795***	6.170***	1.359	4.688**
	(0.1205)	(0.1276)	(0.1730)	(0.1624)	(0.3387)	(0.7085)	(1.242)	(1.983)
MotherSecondaryeducation	12.55***	12.90***	11.28***	13.20***	16.36***	15.54***	7.200	1.576
	(0.1834)	(0.2562)	(0.2441)	(0.2767)	(0.5402)	(1.472)	(4.933)	(9.114)
MotherTechnicaleducation	23.29***	24.21***	24.07***	23.91***	26.25***	24.88***	14.35***	9.626
	(0.2553)	(0.5501)	(0.4890)	(0.5250)	(0.8223)	(1.913)	(5.347)	(11.04)
MotherHighereducation	35.05***	37.82***	27.76***	30.03***	35.93***	35.71***	27.40***	18.96
	(0.4167)	(1.522)	(1.133)	(1.017)	(1.532)	(2.962)	(7.208)	(14.51)
FatherPrimaryEducation	2.571***	2.688***	2.482***	3.687***	4.563***	3.816***	2.968*	0.1194
	(0.1168)	(0.1237)	(0.2059)	(0.1769)	(0.2926)	(0.7194)	(1.589)	(2.404)
FatherSecondaryEducation	7.590***	8.263***	7.401***	8.703***	10.34***	9.891***	7.827***	1.128
	(0.1853)	(0.3809)	(0.4424)	(0.4132)	(0.5430)	(1.186)	(2.980)	(4.804)
FatherTechnicalEducation	16.98***	18.15***	18.17***	18.18***	19.46***	17.30***	13.32***	2.874
	(0.2684)	(0.6623)	(0.8389)	(0.6571)	(0.7831)	(1.530)	(3.767)	(6.401)
FatherHigherEducation	28.54***	31.35***	20.47***	22.60***	26.66***	28.60***	27.33***	16.98*
	(0.4324)	(1.528)	(1.039)	(1.006)	(1.352)	(2.479)	(5.216)	(9.833)
ComputerNo	-11.33***	-12.20***	-9.364***	-9.676***	-14.75***	-20.84***	-16.77**	-2.482
	(0.1764)	(0.4978)	(0.3710)	(0.3213)	(0.6847)	(2.451)	(7.599)	(17.19)
Municipality controls								
UBN	-0.6085***	-0.6720***	-0.6145***	-0.6529***	-0.9907***	-0.9367***	-0.6678***	-0.1692
	(0.0158)	(0.0375)	(0.0481)	(0.0406)	(0.0481)	(0.0982)	(0.2328)	(0.4384)
Fit statistics								
Observations	3,210,587	3,210,587	1,202,537	1,132,632	621,503	155,106	61,067	37,742
R^2	0.25154	0.24330	-0.08279	0.12924	0.19883	0.37096	0.44955	0.50041
F-test (1st stage)		21,559.2	4,027.7	7,635.6	6,028.0	1,604.8	418.10	106.26

Notes: Clustered standard errors at the school level are reported in parentheses. $*p < 0.1$, $**p < 0.05$, $***p < 0.01$. The dependent variable is the standardized test score. Column (1) presents pooled OLS estimates. Column (2) shows pooled 2SLS estimates using the historical intensity of social protest movements as an instrument. Columns (3) to (8) report 2SLS estimates separately for each socioeconomic stratum (Stratum 1 to 6, in ascending order). All models include cohort fixed effects.

6 Discussion

This study examines the relationship between private school attendance and student achievement in Colombia. Accounting for potential endogeneity concerns, the results suggest that private school students, on average, achieve similar Saber 11 test scores to their public school counterparts. However, significant differences emerge when disaggregating the analysis by socioeconomic stratum. Primarily, findings reveal that students from disadvantaged backgrounds do not benefit academically from attending private schools. The latter aligns with concerns that private institutions serving these populations may lead to poor educational outcomes comparable to, or even lower than, those of public schools. In contrast, students from higher-income households were found to obtain large test score gains from private schooling, suggesting that the academic advantages of private education are concentrated among wealthier groups. Furthermore, considering that socioeconomic stratum reflects the capacity to afford tuition, these observations indicate that students from different strata are likely to attend different types of private institutions, ranging from low-fee to elite high-cost institutions. Overall, these patterns are consistent with existing literature on educational segregation in Colombia and highlight a stratified private sector that disproportionately benefits the upper strata.

These findings are particularly relevant for understanding the dynamics of educational inequality. Students in Strata 1 and 2, who represent more than half of the population enrolled in basic education, are predominantly concentrated in the public sector, with a small share attending low-cost private institutions. In contrast, socioeconomically advantaged students are more likely to access private education, and the academic gain associated with private schooling increases steadily from Stratum 3 to Stratum 6. The substantial test score advantage from higher socioeconomic strata, compared to the null or even negative effects for lower-income students, underscores the extent to which private education reinforces socioeconomic achievement gaps. Furthermore, the interaction model demonstrates that private school students in most strata, except for Stratum 1, achieve higher test scores than public school students in Stratum 1, emphasizing the systematic disadvantages faced by the lowest-income students regardless of whether they attend public or private schools.

The observed stratification in private school effects brings a further discussion on the mechanisms under-

lying achievement differences. One plausible explanation is heterogeneity in private education quality and school segregation. Wealthier families are more likely to afford high-fee private schools with better infrastructure, more qualified teachers, and stronger academic expectations. In contrast, private education for low-income students is often limited to low-fee schools with limited resources and insufficient qualifications, offering little to no advantage over public provision. Additionally, peer effects may also explain the stratified impact of private education. Students surrounded by socioeconomically advantaged peers may benefit from stronger learning environments and higher academic expectations. These peer effects can amplify the individual benefits of private schooling for higher stratum students, while their absence in lower-cost private schools may limit any potential gains for disadvantaged groups. Importantly, these stratified patterns persist even when controlling for a range of household-level characteristics, strengthening the conclusion that the heterogeneous returns to private schooling are at least partially driven by school-level factors, such as institutional quality and peer effects, rather than by household advantages. As a result, privatization can reproduce structural inequalities in both segregated access and outcomes.

From a policy perspective, these results carry important economic implications. First, they challenge the efficiency assumption that voucher systems or privatization policies deliver significant quality gains across all socioeconomic groups. The stratified outcomes indicate that market mechanisms in education may require stronger quality regulations and ensure more equitable access. However, since low-income students are disproportionately concentrated in the public sector, regulating private institutions alone is insufficient. The significant achievement gap between students attending higher-cost private schools and those in public schools highlights the need to strengthen the quality of public education. While wealthier students have a significant academic advantage through private institutions with better resources, stronger peer environments, and higher academic expectations, underprivileged students face limited opportunities. Their lower achievement restricts access to higher education and skilled employment, reinforcing inequality and hindering social mobility. These dynamics emphasize that enhancing public education quality is necessary for both equity and long-term development. Ultimately, the findings underscore that without deliberate policy interventions, Colombia's stratified basic education system will continue to perpetuate, rather than alleviate, educational inequality.

6.1 Limitations

Although this study provides robust evidence on the heterogeneous effects of private schooling in Colombia using fixed effects and an instrumental variable, several limitations must be acknowledged. While relative private school availability as an instrument improves upon OLS estimates, its design introduces challenges to causal identification. Commonly used instruments in the literature for exogeneity, such as religious affiliation, are not applicable in the Colombian context due to limited variation: Catholicism was the state religion until 1991, and minimal religious diversity has been historically recorded. As a result, the chosen instrument is based on geographical variation in school supply, though the exclusion restriction remains difficult to fully verify. For instance, the instrument may capture broader contextual effects that independently influence student outcomes: (1) competitive pressure increasing public school quality, (2) reduction in public education investment in areas with strong elite-driven private sectors, or (3) the emergence of private schools as a response to poor public performance.

Moreover, measuring relative private school availability at the municipality level may be too broad and could hide important intra-municipal disparities in access and quality. More localized data, such as school postcodes or neighborhoods, would allow for a more precise estimation and identification strategy. Additionally, despite addressing endogeneity in school choice, the analysis can't exclude the possibility that unobserved family characteristics, such as motivation, parental involvement, or educational aspirations, might influence self-selection into municipalities with more or better private schooling options, introducing residual selection bias.

Measurement-related limitations also require consideration. This study relies on the Saber 11 standardized test scores as the measure of academic achievement. While these scores provide a uniform metric for comparison, they may not fully reflect comprehensive learning outcomes and are potentially influenced by access to test preparation. Furthermore, socioeconomic stratum in Colombia is strictly defined by residential characteristics, and may not fully account for within-stratum differences in income, parental education, or household conditions. A more comprehensive index incorporating multiple household-level variables would provide a more accurate representation of students' socioeconomic backgrounds. Finally, the analysis treats

private schools as a uniform category, even though private institutions vary widely in fees, resources, and quality. While stratifying results by socioeconomic status helps capture school heterogeneity through tuition affordability proxies, the lack of school-level data limits the differentiation between low-fee private schools and elite ones. Access to this information could significantly strengthen our conclusions by revealing how different types of private schools contribute differently to educational outcomes.

Future research would benefit from access to longitudinal, student-level data that tracks academic progress over time. This would allow a more comprehensive analysis of the lasting effects of private schooling. Current conclusions based on Saber 11 scores are limited to students who completed their secondary education, excluding those who dropped out of basic education. Incorporating earlier standardized assessments, such as PISA tests evaluated in grades 3, 5, and 9, could help identify when achievement gaps first begin to emerge and capture educational impacts for a more representative student population. Similarly, investigating qualitative differences between public and private schools, such as curriculum content, teaching methods, and school infrastructure, could offer evidence on the mechanisms driving the observed disparities in student outcomes across socioeconomic groups. Lastly, it would be valuable to explore the use of historical social movement protest intensity at the municipality level as an alternative instrument, should data become available, as it may offer a stronger causal identification.

7 Conclusion

This study contributes to the growing literature on school choice and educational inequality by examining the effects of private school attendance on academic achievement in Colombia. Using fixed effects and an instrumental variable strategy to address selection bias, it offers strong evidence for heterogeneous private school academic advantages across different socioeconomic backgrounds. The results reveal that private education is increasingly beneficial for students from higher socioeconomic backgrounds, while the effect is null or even negative for economically disadvantaged students. These observations are particularly concerning as they reflect patterns of educational segregation, where disadvantaged students are relegated to public or low-fee private schools, while wealthier peers attend elite private institutions. In this context, private

school choice does not operate as a vehicle for equity, but rather as a mechanism that exacerbates existing inequalities in Colombia. By documenting these stratified effects, the study highlights the importance of considering both school quality and socioeconomic segregation in debates about education policy, and provides a framework for understanding how privatization of basic education operates in unequal societies.

8 Appendix

Table 7: Stratified Effects of Private Education on Test Scores

	Stratum 1		Stratum 2		Stratum 3		Stratum 4		Stratum 5		Stratum 6	
Model:	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Independent variable												
Private_Education	-10.91***	-7.673***	-3.760***	0.6903	5.424***	12.43***	18.58***	44.41***	30.33***	38.08**	43.61***	100.4***
	(0.8091)	(2.482)	(0.7618)	(2.976)	(0.8132)	(3.997)	(1.127)	(9.399)	(1.520)	(15.40)	(2.003)	(21.45)
Household controls												
MotherPrimaryEduc	4.957***	4.979***	5.418***	5.467***	7.727***	7.820***	5.762***	5.500***	1.866*	1.797	4.757***	6.136***
	(0.1087)	(0.1104)	(0.1520)	(0.1600)	(0.3267)	(0.3402)	(0.6683)	(0.7030)	(1.108)	(1.125)	(1.647)	(1.965)
MotherSecondaryEduc	12.27***	12.28***	13.50***	13.43***	15.74***	15.36***	14.35***	11.88***	9.455***	8.383***	12.41***	5.313*
	(0.1591)	(0.1602)	(0.1996)	(0.2069)	(0.3633)	(0.4323)	(0.6913)	(1.132)	(1.182)	(2.463)	(1.711)	(3.208)
MotherTechnicalEduc	23.98***	23.93***	24.22***	23.99***	25.43***	24.71***	23.67***	20.27***	17.36***	16.21***	22.14***	13.79***
	(0.2695)	(0.2726)	(0.2772)	(0.3157)	(0.4350)	(0.6120)	(0.7824)	(1.484)	(1.376)	(2.734)	(2.064)	(3.874)
MotherHigherEduc	24.96***	24.74***	29.12***	28.51***	33.22***	31.67***	33.16***	27.57***	29.62***	27.98***	34.32***	22.81***
	(0.4041)	(0.4327)	(0.3399)	(0.5251)	(0.4867)	(1.019)	(0.7832)	(2.178)	(1.305)	(3.537)	(1.857)	(4.749)
FatherPrimaryEduc	2.506***	2.497***	3.352***	3.346***	4.282***	4.290***	3.319***	2.712***	3.702***	3.446***	1.864	0.3970
	(0.1070)	(0.1078)	(0.1311)	(0.1337)	(0.2681)	(0.2736)	(0.6010)	(0.6670)	(1.020)	(1.155)	(1.496)	(1.790)
FatherSecondaryEduc	7.752***	7.702***	8.855***	8.717***	9.694***	9.359***	8.856***	7.126***	9.498***	8.872***	6.947***	3.514*
	(0.1564)	(0.1608)	(0.1780)	(0.1978)	(0.2848)	(0.3494)	(0.6130)	(0.9053)	(1.030)	(1.627)	(1.415)	(2.047)
FatherTechnicalEduc	17.63***	17.51***	18.65***	18.39***	18.78***	18.19***	16.36***	14.11***	15.36***	14.57***	9.710***	4.886*
	(0.3180)	(0.3302)	(0.2888)	(0.3323)	(0.3621)	(0.5044)	(0.7736)	(1.168)	(1.331)	(2.040)	(1.981)	(2.850)
FatherHigherEduc	17.94***	17.76***	21.95***	21.41***	24.53***	23.30***	26.44***	22.11***	28.37***	27.17***	26.54***	18.63***
	(0.3703)	(0.3886)	(0.2949)	(0.4610)	(0.3889)	(0.8052)	(0.7488)	(1.771)	(1.134)	(2.636)	(1.538)	(3.509)
ComputerNo	-7.772***	-7.767***	-9.037***	-8.933***	-12.33***	-11.74***	-15.70***	-11.56***	-17.60***	-15.98***	-18.42***	-5.041
	(0.1360)	(0.1369)	(0.1424)	(0.1593)	(0.2362)	(0.4061)	(0.5844)	(1.583)	(0.9723)	(3.373)	(1.425)	(5.236)
Fixed-effects												
Municipality	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fit statistics												
Observations	1,202,638	1,202,638	1,132,642	1,132,642	621,506	621,506	155,109	155,109	61,067	61,067	37,743	37,743
R^2	0.17691	0.17639	0.16653	0.16498	0.22953	0.22556	0.40252	0.37815	0.48303	0.48205	0.57035	0.54126
F-test (1st stage)		4,589.2		2,121.8		766.52		307.90		194.34		137.18

Notes: Clustered standard errors at the school level are reported in parentheses. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. The dependent variable is the standardized test score. 2SLS estimates use the relative private availability as an instrument for private education. All models include cohort and municipality fixed effects.

9 References

Abdulkadiroğlu, A., Pathak, P. A., & Walters, C. R. (2018). Free to choose: Can school choice reduce student achievement? *American Economic Journal: Applied Economics*, 10(1), 175–206. https://doi.org/10.1257/app.20160634

Adamson, F., Astrand, B., & Darling-Hammond, L. (Eds.) (2016). *Global education reform: How privatization and public investment influence education outcomes*. New York: Routledge.

Alderman, H., Orazem, P. F., & Paterno, E. M. (2001). School Quality, School Cost, and the Public/Private School Choices of Low-Income Households in Pakistan. *The Journal of Human Resources*, 36(2), 304–326. https://doi.org/10.2307/3069661

Alt, M. N., & Peter, K. (2002). *Private schools: A brief portrait* (NCES 2002–013). U.S. Department of Education, National Center for Education Statistics.

AlWindi, J. (2015). Low-cost private schools in the slums of Colombia. In *Handbook of International Development and Education* (p. 200).

Ammermueller, A. (2013). Institutional features of schooling systems and educational inequality: Cross-country evidence from PIRLS and PISA. *German Economic Review*, 14(2), 190–213. https://doi.org/10.1111/j.1468-0475.2012.00565.x

Anand, P., Mizala, A., & Repetto, A. (2009). Using school scholarships to estimate the effect of private education on the academic achievement of low-income students in Chile. *Economics of Education Review*, 28(3), 370–381. https://doi.org/10.1016/j.econedurev.2008.03.005

Angrist, J., Bettinger, E., Bloom, E., King, E., & Kremer, M. (2002). Vouchers for private schooling in Colombia: Evidence from a randomized natural experiment. *American Economic Review*, 92(5), 1535–1558. https://doi.org/10.1257/000282802762024629

Asadullah, M. N., & Maliki. (2018). Madrasah for girls and private school for boys? The determinants of school type choice in rural and urban Indonesia. *International Journal of Educational Development*, 62, 96–111. https://doi.org/10.1016/j.ijedudev.2018.02.006

Broer, M., Bai, Y., & Fonseca, F. (2019). A review of the literature on socioeconomic status and educational achievement. In *Socioeconomic Inequality and Educational Outcomes*. IEA Research for Education, vol 5. Springer, Cham. https://doi.org/10.1007/978-3-030-11991-1_2

Cárdenas, J. C., Fergusson, L., & García, M. (2021). *La quinta puerta: De cómo la educación en Colombia agudiza las desigualdades en lugar de remediarlas*. Dejusticia, Ediciones Ariel.

Castro-Aristizabal, G., Giménez-Esteban, G., Arango-Londoño, D., Moreno-Cediel, E., & Castillo-Caicedo, M. (2022). Spatial Variation in Educational Quality in Colombia Based on the Phenomena of Agglomeration and Academic Segregation. European Journal of Investigation in Health, Psychology and Education, 12(8), 1006-1020. https://doi.org/10.3390/ejihpe12080072

Castro Aristizábal, G., Giménez, G., & Ximénez-de-Embún, D. (2017). Desigualdades educativas en América Latina, PISA 2012: Causas de las diferencias en desempeño escolar entre los colegios públicos y privados. *Revista de Educación*, 376, 33–61. https://doi.org/10.4438/1988-592X-RE-2017-376-343

Cohen-Zada, D. (2009). An alternative instrument for private school competition. *Economics of Education Review*, 28(1), 29–37. https://doi.org/10.1016/j.econedurev.2007.11.001

Dixon, P., Egalite, A. J., Humble, S., & Wolf, P. J. (2019). Experimental results from a four-year targeted education voucher program in the slums of Delhi, India. *World Development*, 124, 104644. https://doi.org/10.1016/j.worlddev.2019.104644

Dréze, J., & Sen, A. (1996). Basic education as a political issue. In *India: Economic development and social opportunity* (Oxford; online ed.). Oxford Academic. https://doi.org/10.1093/oso/9780198290124.003.0006

Duarte, J., Bos, M. S., & Moreno, M. (2012). Calidad, igualdad y equidad en la educación colombiana (Análisis de la prueba SABER 2009). https://doi.org/10.18235/0010419

D'Agostino, A. (2016). Does Private School Competition Improve Country-Level Student Achievement? A Cross-Country Analysis Using PISA 2012. Graduate School of Arts and Sciences, Georgetown University. https://repository.library.georgetown.edu/handle/10822/1040786

Epple, D., & Romano, R. E. (1998). Competition between Private and Public Schools, Vouchers, and Peer-Group Effects. *The American Economic Review*, 88(1), 33–62. http://www.jstor.org/stable/116817

Epple, D., Romano, R. E., & Urquiola, M. (2017). School vouchers: A survey of the economics literature. *Journal of Economic Literature*, 55(2), 441–492. https://doi.org/10.1257/jel.20150679

Friedman, M. (1997). Public Schools: Make Them Private. *Education Economics*, 5(3), 341–344. https://doi.org/10.1080/09645299700000026

García, S., Rodríguez, C., Sánchez, F., & Bedoya, J. G. (2015). *La lotería de la cuna: La movilidad social a través de la educación en los municipios de Colombia* (No. 13816). Universidad de los Andes, Facultad de Economía, CEDE.

Fergusson, L., & Flórez, S. (2021). Distinción Escolar: Un análisis de los nombres de los colegios. En *La quinta puerta: De cómo la educación en Colombia agudiza las desigualdades en lugar de remediarlas.* Dejusticia, Ediciones Ariel.

Figlio, D., & Stone, J. (2000). School choice and student performance: Are private schools really better? *Research in Labor Economics*, 18, 115–140. https://doi.org/10.1016/S0147-9121(99)18021-X

García-González, J., & Skrita, A. (2019). Predicting academic performance based on students' family environment: Evidence for Colombia using classification trees. *Psychology, Society, & Education*, 11, 299–311. https://doi.org/10.25115/psye.v10i1.2056

García Villegas, M., & Gómez-Estrada, L. (2021). Ensayo sobre historia política de la educación en Colombia. En *La quinta puerta: De cómo la educación en Colombia agudiza las desigualdades en lugar de remediarlas.* Dejusticia, Ediciones Ariel.

Goldhaber, D. D. (1996). Public and private high schools: Is school choice an answer to the productivity problem? *Economics of Education Review*, 15(2), 93–109. https://doi.org/10.1016/0272-7757(95)00042-9

Härmä, J. (2021). *Low-fee private schooling and poverty in developing countries.* Bloomsbury Academic.

Heller-Sahlgren, G. (2018). Smart but unhappy: Independent-school competition and the wellbeing-efficiency trade-off in education. *Economics of Education Review*, 62, 66–81. https://doi.org/10.1016/j.econedurev.2017.10.005

Hossain, M., Shohel, T., & Jahan, N. (2017). Determinants of school choice: A study on Khulna City Corporation (KCC) area of Bangladesh. *Kulliyyah of Education Studies*, 14(1–2), 137–148. https://doi.org/10.53808/KUS.2017.14.1and2.1614-S

Howell, W. G., Wolf, P. J., Campbell, D. E., & Peterson, P. E. (2002). School vouchers and academic performance: Results from three randomized field trials. *Journal of Policy Analysis and Management*, 21(2), 191–217. https://doi.org/10.1002/pam.10023

Huber, E., Gunderson, J., & Stephens, J. D. (2019). Private education and inequality in the knowledge economy. *Policy and Society*, 39(2), 171–188. https://doi.org/10.1080/14494035.2019.1636603

Ministerio de Educación Nacional de Colombia. (2023). *Sistema Nacional de Información de la Educación Básica y Media (SINEB): Matrículas*. http://bi.mineducacion.gov.co:8380/eportal/web/sineb/matriculas

Merga, T., & Sofamo, B. (2020). Determinants of school choice: Understanding how parents choose primary school for their children in Arba Minch, Southern Ethiopia. *International Journal on Data Science and Technology*, 6(1), 37. https://doi.org/10.11648/j.ijdst.20200601.15

Moschetti, M., Verger, A., & Fontdevila, C. (2018). The expansion of private schooling in Latin America: Multiple manifestations and trajectories of a global education reform movement. *Education Policy Analysis Archives*, 26(105). https://doi.org/10.14507/epaa.26.3734

Najafizadeh, M., & Mennerick, L. A. (1988). Worldwide Educational Expansion from 1950 to 1980: The Failure of the Expansion of Schooling in Developing Countries. *The Journal of Developing Areas*, 22(3), 333–358. http://www.jstor.org/stable/4191670

Neal, D. (1997). The Effects of Catholic Secondary Schooling on Educational Achievement. *Journal of Labor Economics*, 15(1), 98–123. http://www.jstor.org/stable/2535316

Neuman, M. (2022). PISA data clusters reveal student and school inequality that affects results. *PLOS ONE, 17*(5), e0267040. https://doi.org/10.1371/journal.pone.0267040

OECD. (2023). *PISA 2022 results (Volume I): The state of learning and equity in education*. OECD Publishing. https://doi.org/10.1787/53f23881-en

Ornstein, A. C. (2010). Achievement gaps in education. *Social Science and Public Policy*, 47, 424–429.

Petrakis, P. E., & Stamatakis, D. (2002). Growth and educational levels: A comparative analysis. *Economics of Education Review*, 21(5), 513–521.

Ramírez-Giraldo, M. T., & Téllez-Corredor, J. P. (2006, March). *La educación primaria y secundaria en Colombia en el siglo XX* (Borradores de Economía; No. 379). Banco de la República. https://doi.org/10.32468/be.379

Rodríguez-Gómez, W. F., Rodríguez Gómez, E. Y., & Gomez-Gonzalez, J. E. (2024). The rural-urban student performance gap in Colombia. *Revista Desarrollo y Sociedad*, 97(3), 59–75.

Rutkowski, L., Rutkowski, D., & Plucker, J. (2012). International determinants of private school attendance. *Educational Research and Evaluation*, 18(4), 375–391. https://doi.org/10.1080/13803611.2012.686239

Siddiqui, N. (2017). Parental education as a determinant of school choice: A comparative study of school types in Pakistan. *Research in Education*, 99(1), 3–18. https://doi.org/10.1177/0034523717725862

Tooley, J., & Dixon, P. (2007). Private schooling for low-income families: A census and comparative survey in East Delhi, India. *International Journal of Educational Development*, 27(2), 205–219. https://doi.org/10.1016/j.ijedudev.2006.08.002

Verger, A., Fontdevila, C., & Zancajo, A. (2016). *The privatization of education: A political economy of global education reform*. Teachers College Press.

Wasserman, M. (2021). *La educación en Colombia*. Bogotá: Penguin Random House.

West, M. R., & Woessmann, L. (2010). 'Every Catholic child in a Catholic school': Historical resistance to

state schooling, contemporary private competition and student achievement across countries. *The Economic Journal*, 120(546), F229–F255. https://doi.org/10.1111/j.1468-0297.2010.02375.x

Wolf, P. J., Gutmann, B., Puma, M., Kisida, B., Rizzo, L., & Eissa, N. (2010). *Evaluation of the DC Opportunity Scholarship Program: Final report* (NCES 2010-4018). U.S. Department of Education, National Center for Education Evaluation and Regional Assistance.

World Bank. (2023). *Gini index - Colombia*. World Bank. https://data.worldbank.org/indicator/SI.POV.GINI?locations=CO

Yang, Y., & Guo, X. (2020). Universal basic education and the vulnerability to poverty: Evidence from compulsory education in rural China. *Journal of the Asia Pacific Economy*, 25(4), 611–633. https://doi.org/10.1080/13547860.2019.1699495