

Infrastructure and Educational Outcomes in Bolivia

Infraestructura y resultados educativos en Bolivia

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ABSTRACT

This article analyzes how the levels of enrollment, promotion, dropout and failure are affected by access to basic infrastructure services such as electricity, drinking water, and sanitation services, as well as by access to basic facilities such as classrooms, sports fields, laboratories, libraries, and computer rooms. Based on Bolivian data for the entire universe of schools and colleges at the pre-school, primary, and secondary levels, an empirical study was carried out on the impact of educational infrastructure during the period 2015-2020. It is analyzed whether the results vary depending on whether the schools are public, are located in urban centers and whether they offer a humanistic degree. Consistently, the findings show that access to basic infrastructure can play a fundamental role in generating positive educational outcomes, but when the analysis is disaggregated by geographic region and educational levels, there emerge significant differences.

Keywords: Bolivia, infrastructure, educational outcomes

RESUMEN

En este artículo, se analiza cómo los niveles de matriculación, promoción, abandono y reprobación son afectados por el acceso a servicios de infraestructura básica como la electricidad, agua potable, y servicios sanitarios, así como por el acceso a instalaciones básicas como aulas, campos deportivos, laboratorios, bibliotecas y salas de computación. Con base en datos bolivianos para todo el universo de escuelas y colegios en los niveles preescolar, primario y secundario, se realizó un estudio empírico sobre el impacto de la infraestructura educativa durante el periodo 2015-2020. Se analiza si los resultados varían dependiendo de si las escuelas son públicas, se encuentran en centros urbanos y si las mismas ofrecen un título humanístico. De manera consistente, los resultados indican que el acceso a infraestructura básica puede jugar un papel fundamental en la generación de desenlaces educativos positivos, pero cuando el análisis se desagrega por región geográfica y por niveles educativos, existen importantes diferencias.

Palabras clave: Bolivia, infraestructura, resultados educativos



INTRODUCTION

Bolivia is a lower-middle-income and predominantly urban developing country. In 2022, Bolivia had a GDP per capita of approximately \$3600 and was ranked 118th on the United Nations Human Development Index (HDI = 0.692), with a literacy rate of 94 percent. About 70% of the population lives in urban areas. In 2020, public expenditure on education represented 9.8% of GDP, significantly higher than the average for Latin America at 4.6% and the global average of 4.3 percent.¹

Despite a steady increase in public expenditure on education since 2010, the quality of the infrastructure in schools at all levels –*i. e.*, at pre-primary through tertiary levels– still lags behind what is observed in many countries with similar development levels. This is particularly evident in rural communities, where, as Regalsky and Laurie (2007) note, school facilities often consist of simple adobe dwellings.

Educational outcomes are likely the result of many factors, such as parental support and availability, the student's socioeconomic background, and their natural disposition toward learning. In addition to the previously mentioned factors, however, access to infrastructure facilities and services has also been shown to play an important role, especially in developing countries like Bolivia, where the quality of basic school infrastructure is often suboptimal.

The significance of school infrastructure cannot be overstated. It plays a crucial role in shaping a country's educational landscape and fostering a conducive learning environment for students. Proper school infrastructure ensures that students have access to safe and well-equipped facilities, including classrooms, libraries, laboratories, and recreational areas, which are essential for their overall development. Additionally, well-maintained facilities enhance motivation and engagement for both students and teachers, enhancing the learning experience. By investing in modern and inclusive infrastructure, Bolivia can bridge the educational gap between urban and rural areas, promoting equal opportunities for all children to receive

¹ The source for all demographic, development, literacy, and public expenditure statistics is the World Bank Development Indicators: <https://data.worldbank.org/indicator/SE.XPD.TOTL.GD.ZS?locations=BO>

a quality education. Hence the timeliness of this study that uses the largest dataset of school institutions in the country to determine whether school infrastructure generates the aforementioned effects on key educational outcomes.

The objective of this study is to analyze the impact of school infrastructure on educational outcomes in the pre-primary, primary, and secondary levels during the 2015-2020 period. More specifically, how enrollment, promotion, abandonment, and failure levels are affected by access to basic infrastructure services like electricity, running water, and restroom facilities; and by access to basic infrastructure facilities like classrooms, sports fields, laboratories, libraries, and computer rooms. We also test whether school outcomes are affected by attending schools in urban centers; attending public schools; and offering a humanistic degree. The analysis is done at the aggregate level; by geographical region; and by school grade levels.

Even though the objective described above is clear, it is important to point out that education at all levels in Bolivia is a complex phenomenon likely to be affected by more than just available physical infrastructure. Among the many factors not explicitly accounted for in this study, the following are a few that ought to be considered when analyzing education in Bolivia: i) *Urban vs. Rural Disparities*: there is a significant gap between urban and rural areas in terms of teacher availability and quality. Urban schools tend to attract more qualified and experienced teachers due to better living conditions, professional opportunities, and resources. Rural areas, however, often face teacher shortages, and the teachers who do work there may have less training and fewer resources. This disparity directly affects the quality of education, as students in rural areas often experience less consistent, lower-quality instruction; ii) *Cultural and Linguistic Diversity*: Bolivia's student population is culturally and linguistically diverse, with significant indigenous communities. The education system's ability to cater to different languages and cultural contexts is crucial for equitable education. However, the current system often fails to fully accommodate this diversity, leading to lower educational outcomes for indigenous students; iii) *Poverty and Access to Education*: Poverty is a major barrier to education. Students from low-income families, particularly in rural areas, face difficulties accessing education due to costs associated

with schooling (*e. g.*, transportation, uniforms, and supplies) and the need to contribute to household income; iv) Income Inequality: Income inequality in Bolivia is stark and directly impacts educational opportunities. Children from wealthier families have access to better schools, private tutoring, and extracurricular activities, which enhances their educational outcomes. In contrast, children from poorer families often attend underfunded public schools, leading to a cycle of educational inequality; and v) Urban vs Rural Outlook: In urban areas, students may have higher expectations for future employment, particularly in professional or skilled jobs, which can motivate them to pursue higher education. In contrast, in rural areas, limited job opportunities and the need to work in agriculture or low-skilled jobs can reduce the perceived value of education, leading to higher dropout rates and lower educational attainment. Future lines of research would benefit from including these factors, emphasizing the impact of teacher training on sociocultural diversity, and analyzing the impact of introducing technology in rural schools, such as e-learning platforms or mobile education units, as a way to overcome infrastructure limitations and improve educational quality and coverage in remote areas.

In summary, our findings indicate that infrastructure services and facilities can have a significant positive impact on enrollment and promotion, though in most cases certain types of services and facilities, like basic utilities, computer rooms, and sports fields, have a comparatively larger impact. In terms of abandonment and failure, principal deterrents are access to sports facilities and the possibility of attending private schools in urban settings. A principal takeaway of the empirical findings is that improving basic infrastructure services and facilities can produce positive school outcomes. Our findings also indicate that other factors are important in explaining school outcomes, including type of school, geographical location, and whether the school offers a humanistic education.

Additionally, cultural and social factors influence Bolivian students' decisions to continue or abandon school. In rural and indigenous communities, traditional customs and the need for children to contribute to household labor, particularly in agriculture, can pressure students to leave school early. Gender roles also influence education-

al decisions, with girls often expected to prioritize domestic responsibilities over education. Additionally, the lack of culturally relevant curricula and language barriers, especially for indigenous students, can lead to disengagement and dropout. Social expectations and the perception that education may not lead to better job opportunities, particularly in rural areas, further contribute to school abandonment. An analysis of these factors is beyond the scope of this paper, but surely need to be kept in one's mind as the results presented here are analyzed and dissected.

The rest of the paper is organized as follows. Section 2 presents the literature review; the data and methodology are described in Section 3. Section 4 reports the results, and section 5 concludes.

LITERATURE REVIEW

The impact of infrastructure on school outcomes has been analyzed in detail both at the individual country level and for sets of countries. A sample of works includes Barrett *et al.* (2019) who provide a comprehensive review of current research studies that focus on how school infrastructure affects children's learning outcomes; Cuesta *et al.* (2016) examine the economics and education literature from 1990 to 2012 to assess the extent to which specific types of school infrastructure have a causal impact on student learning and enrollment. They find some, but not conclusive evidence that access to toilets, laboratories, and drinking water facilities increases enrollment; and Evans and Mendez (2021), focusing on Africa and finding that, among many other factors, new school constructions have a positive impact on enrollment in Burkina Faso, Zambia, and Niger.

Studies that focus on specific countries include Cohen and Bhatt (2012), who analyze the United States and conclude that a lack of educational infrastructure is one factor that stymies efforts to improve literacy instruction; Belmonte *et al.* (2020), focusing on Italy and finding that after the 2012 Northern earthquake, spending on school infrastructure increased standardized test scores in Mathematics and Italian language, with the effect being stronger for lower-achieving students and in Mathematics; and Choudhuri and

Desai (2021) examining the relationship between piped water and access to liquefied petroleum gas (LPG) and children's educational outcomes in rural India and finding that children aged 6-14 years, living in households that rely on the free collection of water and cooking fuel, have lower mathematics scores and benefit from lower educational expenditures than children living in households that do not collect water and fuel.

Several authors have also analyzed different aspects of education in Bolivia, including Faguet and Sánchez (2008), Arrueta and Avery (2012), Liberato *et al.* (2006), Neiva de Figueiredo and Marca Barrientos (2013), Moreno Cely *et al.* (2021) and Canelas and Niño-Zarazúa (2019). Specifically in Bolivia, some studies address infrastructure's impact. For example, Newman *et al.* (2002) focus on how school infrastructure projects in rural Bolivia affect education outcomes and finding little evidence of improvement; a reason for the lack of improvement, they argue, may lie in the fact that these projects only address infrastructure improvement without addressing other concerns like teaching quality or access to nutritional meals; Popova and Fabre (2017) offer a mostly qualitative description of a project aimed at digital inclusion in the department of La Paz that improves teachers' abilities to generate more effective interactive teaching methods and better learning environments; and Farfán *et al.* (2015), also with a descriptive, qualitative analysis of digital inclusion in the Department of Tarija and its mostly positive impact on both teacher's ability to integrate information and communications technologies into the educational process and students' skills to access educational resources.

It is evident that much remains to be learned about how infrastructure impacts school outcomes, particularly in developing countries. From the perspective of Bolivia, there is a lack of systematic, empirical analysis on this topic in Bolivia, hence the timeliness of this study that utilizes the most comprehensive database on all pre-primary, primary, and secondary schools in the country to empirically test the impact of various infrastructure variables on specific school outcomes.

DATA AND METHODOLOGY

Data

Data on infrastructure and school outcomes were sourced from the Bolivia's General Planning Directorate at the Ministry of Education.² The data cover the period 2015-2020 for all pre-primary, primary, and secondary schools in the nine departments of the country. The average number of schools across all levels during this period is 15 955 and the maximum number of observations for the entire period is 95 766. The four outcome variables are yearly numbers of enrollment, promotion, abandonment, and failure.³ Infrastructure data consists of facilities (number of classrooms, sports fields, laboratories, computer rooms, and libraries) and services (access to electricity, potable water, and functioning bathrooms; these three are captured in the 'basic utilities' variable.⁴

Additional variables tested include school location (urban or rural), school type (public or private), and whether the school offers a humanistic degree. A humanistic degree refers to the number of specialized seminars aimed at promoting technical skills; these seminars are available in schools that offer a 'humanistic education' in line with the Education Law passed by the Plurinational Legislative Assembly in 2010.⁵ The dataset is also disaggregated by sex (men and women). Tables 1a and b provides descriptive statistics for all variables and Appendix 1a, b, expands on the description of the dataset by presenting a sample of yearly statistics by region and grade level.

²https://seie.minedu.gob.bo/reportes/mapas_unidades_educativas

³ Failure refers to students who do not meet basic requirements to advance to the next grade, and hence remain in the current grade level for an additional academic year.

⁴ Access to the Internet was also considered but was ultimately dropped from the empirical analysis due to a lack of sufficient observations.

⁵https://www.minedu.gob.bo/files/documentos-normativos/leyes/LEY_070_AVELINO_SINANI_ELIZARDO_PEREZ.pdf

■ Table 1. Descriptive Statistics

	All		Beni		Cochabamba		Chuquisaca		La Paz		Oruro		Pando		Potosí		Santa Cruz		Tarja	
	Mean (St Dev)	# obs	Mean (St Dev)	# obs	Mean (St Dev)	# obs	Mean (St Dev)	# obs	Mean (St Dev)	# obs	Mean (St Dev)	# obs	Mean (St Dev)	# obs	Mean (St Dev)	# obs	Mean (St Dev)	# obs	Mean (St Dev)	# obs
Enrollment	183.796*** (266.840)	95,747	162.655*** (215.615)	881	285.598*** (323.027)	6,482	125.271*** (214.313)	8,602	171.345*** (274.853)	29,988	196.570*** (270.588)	8,812	90.962*** (163.157)	2,318	98.595*** (159.229)	13,243	265.292*** (295.509)	19,604	161.201*** (239.358)	19,604
Men	94.212*** (138.782)	95,747	83.824*** (108.995)	881	146.919*** (163.723)	6,482	64.378*** (113.386)	8,602	87.659*** (140.102)	29,988	100.719*** (160.266)	8,812	47.010*** (83.567)	2,318	51.004*** (86.215)	13,243	135.755*** (149.400)	19,604	82.269*** (124.615)	19,604
Women	89.728*** (134.399)	95,747	78.204*** (105.476)	881	139.915*** (162.444)	6,482	61.120*** (109.262)	8,602	83.776*** (136.705)	29,988	95.844*** (149.696)	8,812	43.953*** (79.945)	2,318	47.591*** (83.255)	13,243	129.756*** (147.897)	19,604	76.530*** (118.189)	19,604
Promoted	173.729*** (256.008)	79,779	152.545*** (203.423)	734	272.096*** (313.312)	5,401	118.119*** (200.944)	7,168	164.955*** (268.449)	24,987	187.269*** (261.156)	7,343	81.709*** (149.012)	1,931	92.588*** (150.712)	11,034	246.204*** (279.712)	16,334	151.429*** (227.459)	16,334
Men	87.877*** (131.316)	79,779	77.766*** (101.883)	734	137.699*** (155.946)	5,401	59.740*** (104.330)	7,168	83.605*** (135.600)	24,987	94.970*** (132.004)	7,343	41.548*** (74.773)	1,931	47.442*** (80.600)	11,034	123.943*** (139.900)	16,334	76.340*** (117.428)	16,334
Women	85.852*** (130.447)	79,779	74.779*** (102.290)	734	134.927*** (158.927)	5,401	58.380*** (103.873)	7,168	81.330*** (134.590)	24,987	92.300*** (140.198)	7,343	40.102*** (74.565)	1,931	45.146*** (80.518)	11,034	122.261*** (142.000)	16,334	75.089*** (114.308)	16,334
Abandonment	5.092*** (9.450)	79,779	7.601*** (11.841)	734	6.612*** (11.450)	5,401	3.442*** (7.443)	7,168	4.073*** (7.620)	24,987	4.332*** (7.755)	7,343	4.748*** (8.710)	1,931	3.370*** (6.516)	11,034	8.590*** (12.900)	16,334	4.340*** (9.218)	16,334
Men	2.990*** (6.054)	79,779	4.377*** (7.126)	734	4.028*** (7.779)	5,401	2.024*** (4.770)	7,168	2.364*** (5.004)	24,987	2.591*** (5.661)	7,343	2.722*** (5.219)	1,931	1.902*** (4.117)	11,034	5.010*** (7.890)	16,334	2.637*** (5.990)	16,334
Women	2.103*** (3.821)	79,779	3.233*** (5.133)	734	2.584*** (4.101)	5,401	1.418*** (3.051)	7,168	1.712*** (3.024)	24,987	1.741*** (2.938)	7,343	2.026*** (3.795)	1,931	1.467*** (2.831)	11,034	3.510*** (5.380)	16,334	1.704*** (3.538)	16,334
Falling	4.512*** (11.847)	79,779	4.147*** (10.550)	734	7.028*** (15.218)	5,401	4.484*** (12.780)	7,168	2.326*** (8.084)	24,987	4.198*** (12.371)	7,343	3.026*** (8.683)	1,931	2.696*** (7.931)	11,034	8.490*** (16.000)	16,334	4.189*** (9.640)	16,334
Men	3.106*** (8.433)	79,779	2.857*** (7.220)	734	5.494*** (10.990)	5,401	2.942*** (6.981)	7,168	1.729*** (3.085)	24,987	2.896*** (10.175)	7,343	2.040*** (5.859)	1,931	1.738*** (5.602)	11,034	5.720*** (10.700)	16,334	2.890*** (6.807)	16,334
Women	1.407*** (4.180)	79,779	1.290*** (3.549)	734	2.134*** (4.627)	5,401	1.542*** (4.895)	7,168	0.603*** (2.424)	24,987	1.302*** (4.813)	7,343	0.986*** (3.091)	1,931	0.958*** (3.422)	11,034	2.780*** (5.696)	16,334	1.300*** (3.294)	16,334
Basic utilities	0.849*** (0.218)	77,598	0.756*** (0.250)	623	0.856*** (0.230)	4,982	0.790*** (0.238)	7,223	0.872*** (0.195)	26,880	0.854*** (0.212)	7,779	0.671*** (0.270)	1,257	0.804*** (0.240)	121,168	0.985*** (0.216)	1,433	0.920*** (0.169)	1,433
Water	1.000 (0.000)	1,000	1.000 (0.000)	444	1.000 (0.000)	5,487	1.000 (0.000)	7,385	1.000 (0.000)	26,138	1.000 (0.000)	1,000	1.000 (0.000)	950	1.000 (0.000)	11,346	1.000 (0.000)	1,000	1.000 (0.000)	1,000
Electricity	1.000 (0.000)	68,873	1.000 (0.000)	343	1.000 (0.000)	5,123	1.000 (0.000)	5,201	1.000 (0.000)	25,508	1.000 (0.000)	1,000	1.000 (0.000)	622	1.000 (0.000)	10,296	1.000 (0.000)	1,000	1.000 (0.000)	1,000

	All		Beni		Cochabamba		Chuquiaca		La Paz		Oruro		Pando		Potosí		Santa Cruz		Tarija	
	Mean (St Dev)	# obs	Mean (St Dev)	# obs	Mean (St Dev)	# obs	Mean (St Dev)	# obs	Mean (St Dev)	# obs	Mean (St Dev)	# obs	Mean (St Dev)	# obs	Mean (St Dev)	# obs	Mean (St Dev)	# obs	Mean (St Dev)	# obs
Working bathrooms	1,000 (0,000)	58,139	1,000 (0,000)	357	1,000 (0,000)	4,668	1,000 (0,000)	5,726	1,000 (0,000)	19,929	1,000 (0,000)	5,731	1,000 (0,000)	614	1,000 (0,000)	7,722	1,000 (0,000)	8,695	1,000 (0,000)	4,697
Internet	1,000 (0,000)	9,105	1,000 (0,000)	33	1,000 (0,000)	898	1,000 (0,000)	413	1,000 (0,000)	3,052	1,000 (0,000)	1,927	1,000 (0,000)	48	1,000 (0,000)	366	1,000 (0,000)	1,479	1,000 (0,000)	889
Classrooms	4,963*** (6,395)	70,407	3,917*** (4,571)	543	7,170*** (8,324)	4,365	4,100*** (5,337)	7,246	5,147*** (6,846)	24,731	5,624*** (6,584)	6,992	3,391*** (4,015)	1,370	3,574*** (4,395)	11,688	5,656*** (6,610)	8,653	5,033*** (6,601)	4,620
Laboratories	1,410*** (0,945)	5,750	1,154*** (0,376)	13	1,414*** (0,978)	618	1,556*** (1,033)	189	1,338*** (0,997)	2,583	1,597*** (0,802)	811	2,000 (0,722)	24	1,360*** (0,667)	450	1,370*** (0,889)	754	1,386*** (1,134)	308
Libraries	1,039*** (0,214)	8,251	1,026*** (0,160)	39	1,063*** (0,262)	742	1,027*** (0,163)	770	1,035*** (0,215)	3,241	1,038*** (0,190)	1,038	1,092*** (0,292)	65	1,040*** (0,228)	894	1,065*** (0,246)	972	1,014*** (0,119)	490
Computer rooms	1,052*** (0,238)	13,009	1,000 (0,000)	38	1,081*** (0,298)	956	1,101*** (0,341)	553	1,048*** (0,238)	6,321	1,026*** (0,160)	1,750	1,000 (0,000)	67	1,070*** (0,256)	1,278	1,059*** (0,236)	1,269	1,036*** (0,187)	777
Sports fields	1,342*** (0,716)	54,831	1,211*** (0,657)	417	1,344*** (0,901)	3,427	1,217*** (0,486)	5,495	1,410*** (0,729)	19,327	1,311*** (0,727)	6,130	1,121*** (0,346)	1,035	1,260*** (0,562)	8,250	1,389*** (0,882)	6,718	1,391*** (0,709)	4,032
Humanistics degree	0,111*** (0,559)	95,766	0,022*** (0,204)	881	0,152*** (0,662)	6,482	0,129*** (0,677)	8,603	0,137*** (0,636)	29,988	0,171*** (0,578)	8,817	0,005 (0,072)	2,319	0,092*** (0,474)	13,248	0,049*** (0,373)	19,611	0,116*** (0,608)	5,817

Notes.

1. Values in table reflect average estimates for all schools (pre-primary, primary, and secondary levels) during the period 2015-2020

2. Enrollment, promoted, abandonment, failing, classrooms, laboratories, libraries, computer rooms, sports fields, and humanistic degrees reflect 'numbers'; basic utilities, working bathrooms and internet represent 'shares of total'

3. Basic utilities refer to access to electricity, water, and working bathrooms

4. *p<0.1; **p<0.05; ***p<0.01

An initial assessment of the descriptive data over the six-year period (2015-2020) is that average enrollment is highest in Cochabamba (285.5 students), followed by Santa Cruz (265.3) and Oruro (196.7); the lowest enrollment occurs in Pando (90.9); the trend for average number of students promoted follows a similar pattern. For students who drop out, the highest average occurs in Santa Cruz (8.5 students), followed by Beni (7.6) and Cochabamba (6.6); abandonment is lowest in Potosí (3.4). The highest average number of students who fail to progress to the following grade occurs in Santa Cruz (8.5 students), followed Cochabamba (7.6) and Chuquisaca (4.5) thereafter; the lowest is recorded in La Paz (2.3). Access to basic utilities, such as electricity, water, and sanitation is highest in Tarija (92.0 percent) and lowest in Pando (67.1 percent). With infrastructure facilities, Pando has the lowest access to most percent of these facilities and Cochabamba has the highest access to classrooms (7.2). Oruro is where the highest number of specialized seminars were imparted (0.2), and Pando records the lowest number (0.0). Though Pando seems to fall short on most indicators, the data does not show a consistent pattern between infrastructure access and educational outcomes across departments in the country – Santa Cruz, La Paz, Cochabamba, and Tarija – fare better than the rest.⁶

METHODOLOGY

A dated panel data is used throughout the study.⁷ The following equation is estimated using Generalized Least Squares (GLS):⁸

$$A_i = \beta_0 + \beta_1 + \text{BasicUtilities}_i + \beta_2 + \text{Facility}_i + \beta_3 \text{Other}_i + \varepsilon_i \quad (1)$$

where A_i ⁹ measures levels of enrollment, promotion, abandonment

⁶ The assumption is that departments with greatest output, as reflected in GDP, are wealthier. Yearly departmental GDP data for 2015-2018 was obtained from Bojanic (2019).

⁷ As Hsiao (2007) demonstrates, the utilization of panel data is useful for a number of reasons. It allows to control for the impact of omitted variables; it uncovers dynamic relationships decreasing collinearity problems; it generates more accurate predictions for individual outcomes by pooling the data, and measurement errors are decreased. Given the large data set employed here, with multiple variables, disaggregated by departments and for a six-year period, a dated panel seems the appropriate choice.

⁸ GLS allows for the incorporation of different covariance structures in the error term. This flexibility makes it suitable for handling various types of data, such as clustered or panel data, where the observations within clusters or over time may have different variances.

⁹ Ideally, and to account for school size differences, the outcome variables should represent 'rates' of enrollment, promotion, abandonment, and failure rather than 'numbers' of

or failure in school i ; Basic Utilities and Facility are the causing variables of interest; Other is an additional variable of interest (*i. e.*, urban school, public school or humanistic degree); and ε_i is a standard error term.

When A_i is levels of enrollment or promotion, we assume β_1 will be positive, as greater access to electricity, water, and working bathrooms –captured in the variable basic utilities– should exert a positive effect on attendance and performance. A similar argument can be made for β_2 , access to classrooms, sports fields, computer rooms, laboratories, and libraries should positively influence students’ desire to attend school and do well. With β_3 , the correlation depends on the regressor being considered. The expected sign of β_3 depends on the specific regressor. For example, if the variable represents an urban school, we expect a positive coefficient, indicating better facilities and resources in urban schools (*i. e.*, with more and better teachers, greater access to basic equipment and services, and greater access to financial resources) than their rural counterparts; and it is expected to be negative when the variable is public school due to the systematic limitations of public educational institutions, including insufficient governmental funding. The impact of humanistic degree is uncertain given that Bolivia’s efforts to expand technical education are still in early stages.

When A_i represents level of abandonment or failure, we generally expect is that greater access to services and infrastructure facilities should deter students’ desire to quit school and/or perform poorly, but it is recognized that other factors may influence these variables. School type and location may also impact student performance and abandonment rates; however, no a priori assumptions are made about their effects on these variables.

RESULTS

Table 2 presents the results of specification (1) using the full dataset, with enrollment levels as the dependent variable¹⁰ Columns 1-4 show results for the full sample, 5-8 for men, and 9-12 for women.

students enrolled, promoted, abandoning, and failing. However, because our dataset lacks information on the number of school-aged children in each Departmental unit, we are unable to estimate rates and must settle for dependent variables that reflect numbers.

¹⁰ Enrollment is likely the result of several factors not accounted for in our specification, including geographic population distribution and agglomeration effects. The utilization of panel data lessens the impact of not including variables that affect enrollment levels.

■ Table 2. Determinants of Enrollment

	All				Men				Women			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Basic utilities	327.495***	182.165**	169.200**	164.881**	163.375***	89.668*	82.857*	79.538*	167.171***	94.847**	88.031**	86.979**
	(92.609)	(85.232)	(84.509)	(84.555)	(51.688)	(48.355)	(47.999)	(48.005)	(47.621)	(44.093)	(43.703)	(43.744)
Classrooms	12.200***	5.964**	6.408***	6.348***	6.068**	2.904***	3.138***	3.092***	6.225***	3.120***	3.353***	3.338***
	(0.887)	(0.883)	(0.873)	(0.880)	(0.495)	(0.501)	(0.499)	(0.500)	(0.456)	(0.457)	(0.455)	(0.455)
Sports fields	30.965***	36.134***	33.875***	34.232***	16.704***	19.335***	18.142***	18.419***	14.278***	16.866***	15.684***	15.771***
	(5.399)	(4.955)	(4.928)	(4.934)	(3.013)	(2.811)	(2.799)	(2.801)	(2.776)	(2.563)	(2.548)	(2.553)
Computer rooms	104.137***	115.615***	114.588***	109.037***	60.686***	66.468***	65.921***	61.654***	41.474***	47.193***	46.679***	45.327***
	(25.725)	(23.578)	(23.370)	(23.745)	(14.358)	(13.377)	(13.274)	(13.481)	(13.229)	(12.198)	(12.085)	(12.284)
Laboratories	25.709**	24.104**	23.157**	20.801**	17.579***	16.721***	16.216***	14.401**	6.980	6.142	5.631	5.057
	(11.040)	(10.115)	(10.027)	(10.185)	(6.162)	(5.739)	(5.695)	(5.783)	(5.677)	(5.233)	(5.185)	(5.269)
Libraries	87.744***	74.286**	68.344**	59.474**	0.926	-5.848	-8.908	-15.729	86.293***	79.537***	76.281***	74.122***
	(33.586)	(30.780)	(30.527)	(31.257)	(18.746)	(17.463)	(17.338)	(17.746)	(17.271)	(15.924)	(15.787)	(16.170)
Urban school	-	332.400***	287.084***	286.803***	-	168.648***	144.788***	144.571***	-	165.474***	141.683***	141.614***
		(18.482)	(20.021)	(20.018)		(10.485)	(11.371)	(11.365)		(9.561)	(10.354)	(10.356)
Public school	-	-	-111.627***	-112.508***	-	-	-58.783***	-59.463***	-	-	-58.621***	-58.836***
			(19.874)	(19.882)			(11.288)	(11.288)			(10.278)	(10.286)
Humanistic degree	-	-	-	7.812	-	-	-	6.005*	-	-	-	1.902
				(5.947)				(3.376)				(3.076)
# of observations	1,692	1,692	1,692	1,692	1,692	1,692	1,692	1,692	1,692	1,692	1,692	1,692
Adj. R2	0.25	0.37	0.38	0.38	0.21	0.31	0.33	0.33	0.25	0.36	0.37	0.37

Notes:

1. Structure of workforce is dated panel data: the identifier variables are 'Year' and 'Department'

2. Standard errors in parentheses

3. GLS weights: period weights

4. All regressions include an intercept: not shown in table

5. *p<0.1; **p<0.05; ***p<0.01

As expected, access to basic *utilities*, *classrooms*, *sports fields*, and *computer rooms* are positively correlated with levels of enrollment. All coefficients are positive and statistically significant at standard levels, reflecting that these infrastructure services and facilities play an important role in school enrollment. Across all samples, men, and woman access to basic utilities has the largest impact on enrollment. For instance, in column (1), all else equal, a coefficient of 327.495 means that for every unit increase in basic utilities, levels of enrollment increase by approximately 327.5 students. Classrooms, on the other hand, have the lowest impact, with an increase of only 12.2 students (column 1) per additional classroom.

Laboratories have a positive and significant impact for the entire sample and for men, but insignificant for women, highlighting that this facility does not seem to motivate women to enroll in school. A similar argument can be made for *libraries*: it has the expected positive and significant correlation for the full sample and women, but for men its coefficient is consistently insignificant. While these results do not elucidate the reasons why laboratories and libraries are conducive for enrollment to one group but not the other, they clearly point to the need for government or for the private institutions running the schools to address the disparities to ensure that these vital school facilities are equally supportive of all students, regardless of sex.

The coefficients for *urban school* and *public school* are the expected ones, reflecting that attending an urban school is positively correlated with enrollment and attending a public school is not. Specifically, and concentrating on the results depicted in column (4), all else equal, attending a school in an urban center would increase total enrollment by approximately 287 students, and attending a government-funded school would decrease it by roughly 112 students. The impact of humanistic degree is unclear; it is only statistically significant for men (at the 0.10 level).

Table 3 presents the results with promotion as the dependent variable, defined as students meeting the requirements to advance to the next grade. Results are reported for the full sample and disaggregated by sex.

■ Table 3. Determinants of Promotion

	All												Men						Women							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)		
Basic utilities	332.888*** (98.503)	192.343** (90.709)	177.547** (89.604)	173.904** (89.669)	163.682*** (54.065)	93.701* (50.620)	85.766* (50.051)	82.967* (50.070)	169.451*** (51.197)	98.865** (47.440)	91.919** (46.980)	91.100** (47.029)														
Classrooms	12.061*** (0.944)	6.031*** (0.940)	6.548*** (0.932)	6.497*** (0.934)	5.878*** (0.518)	2.879*** (0.525)	3.153*** (0.521)	3.114*** (0.521)	6.183*** (0.490)	3.153*** (0.492)	3.395*** (0.488)	3.384*** (0.490)														
Sports fields	32.423*** (5.742)	37.423*** (5.273)	34.81*** (5.225)	35.114*** (5.233)	18.024*** (3.152)	20.51*** (2.943)	19.113*** (2.943)	19.347*** (2.922)	14.452*** (2.985)	16.971*** (2.758)	15.745*** (2.740)	15.812*** (2.745)														
Computer rooms	101.047*** (27.366)	112.094*** (25.096)	110.804*** (24.782)	106.136*** (25.183)	60.166*** (15.020)	65.658*** (14.005)	64.960*** (13.843)	61.369*** (14.062)	40.747*** (14.223)	46.292*** (13.125)	45.704*** (12.993)	44.656*** (13.208)														
Laboratories	28.211*** (11.744)	26.621** (10.767)	25.481** (10.633)	23.500** (10.802)	19.123*** (6.446)	18.318*** (6.008)	17.706*** (5.939)	16.179*** (6.032)	8.881 (6.104)	8.068 (5.631)	7.556 (5.575)	7.111 (5.666)														
Libraries	83.658** (35.724)	70.567** (32.759)	63.726** (32.868)	56.260* (33.147)	-5.324 (19.608)	-11.817 (18.281)	-15.436 (18.080)	-21.178 (18.509)	89.264*** (18.567)	82.691*** (17.133)	79.434*** (16.971)	77.758*** (17.385)														
Urban school	-	-	-	-	269.488*** (32.229)	269.488*** (32.229)	269.488*** (32.229)	269.488*** (32.229)	269.488*** (32.229)	269.488*** (32.229)	269.488*** (32.229)	269.488*** (32.229)														
Public school	-	-	-	-	-	-	-	-	-	-	-	-														
Humanistic degree	-	-	-	-	-	-	-	-	-	-	-	-														
# of observations	1,409	1,409	1,409	1,409	1,409	1,409	1,409	1,409	1,409	1,409	1,409	1,409														
Adj. R2	0.26	0.38	0.40	0.40	0.22	0.33	0.34	0.34	0.26	0.37	0.38	0.38														
Notes:																										

1. Structure of workforce is dated panel data; the identifier variables are 'Year' and 'Department'

2. Standard errors in parentheses

3. GLS weights; period weights

4. All regressions include an intercept; not shown in table

5. *p<0.1; **p<0.05; ***p<0.01

The results are similar to the ones reported for enrollment and this is not entirely surprising, as one would expect most students to steadily move through the school system over time.¹¹ Infrastructure services and facilities play the expected, positive role, and the variable basic utilities has the consistently larger impact. For instance, and concentrating on column (1), all else equal, an additional unit of basic utilities would increase the level of students promoted by approximately 333. As was the case with enrollment, access to laboratories only seems to have the expected positive and significant impact on promotion in the full sample and for men; for women, the impact of this variable is statistically insignificant. Similarly, access to libraries is conducive for greater number of students promoted in the full sample and for women. For men, libraries do not seem conducive to greater promotion levels.

Similar to enrollment, laboratory access has a positive, significant impact on promotion for the full sample and men, but is statistically insignificant for women. The impact of schools offering a humanistic degree does not have a statistically significant impact on the dependent variable.

Table 4 presents results when the dependent variable is levels of abandonment. Abandonment refers to students who drop out of school before completing a school term.

■ Table 4. Determinants of Abandonment

	All				Men				Women			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Basic utilities	-1.755 (2.894)	-2.653 (2.897)	-2.037 (2.836)	-1.701 (2.830)	-0.999 (2.015)	-1.602 (2.018)	-1.171 (1.975)	-0.984 (1.973)	-0.897 (1.112)	-1.180 (1.115)	-0.997 (1.102)	-0.850 (1.098)
Classrooms	0.114*** (0.028)	0.075** (0.030)	0.054* (0.030)	0.059** (0.029)	0.074*** (0.019)	0.049** (0.021)	0.034* (0.021)	0.036* (0.021)	0.040*** (0.011)	0.028** (0.012)	0.021* (0.011)	0.023*** (0.011)
Sports fields	-1.129*** (0.169)	-1.097*** (0.168)	-0.987*** (0.165)	-1.015*** (0.165)	-0.743*** (0.117)	-0.722*** (0.117)	-0.645*** (0.115)	-0.661*** (0.115)	-0.378*** (0.065)	-0.368*** (0.065)	-0.336*** (0.064)	-0.349*** (0.064)
Computer rooms	0.440 (0.804)	0.511 (0.802)	0.555 (0.784)	0.986 (0.795)	0.737 (0.560)	0.786 (0.558)	0.817 (0.546)	1.059** (0.554)	-0.306 (0.309)	-0.284 (0.308)	-0.270 (0.305)	-0.084 (0.308)
Laboratories	0.220 (0.345)	0.210 (0.344)	0.250 (0.337)	0.433 (0.341)	0.063 (0.240)	0.056 (0.240)	0.085 (0.234)	0.187 (0.238)	0.160 (0.133)	0.157 (0.132)	0.168 (0.131)	0.248* (0.132)
Libraries	1.531 (1.050)	1.447 (1.046)	1.738* (1.024)	2.422** (1.046)	0.649 (0.731)	0.593 (0.729)	0.796 (0.713)	1.180* (0.729)	0.855** (0.403)	0.828** (0.403)	0.915** (0.398)	1.213*** (0.406)
Urban school	-	2.054***	4.205***	4.226***	-	1.382***	2.884***	2.896***	-	0.648***	1.285***	1.294***

¹¹ In most years, more than 95% of students are promoted to the next grade level.

	All				Men				Women			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		(0.628)	(0.672)	(0.670)		(0.438)	(0.468)	(0.467)		(0.242)	(0.261)	(0.260)
Public school	-	-	5.298***	5.366***	-	-	3.699***	3.737***	-	-	1.567***	1.596***
			(0.667)	(0.666)			(0.465)	(0.464)			(0.259)	(0.258)
Humanistic degree	-	-	-	-0.604***	-	-	-	-0.339**	-	-	-	-0.262***
				(0.199)				(0.139)				(0.077)
# of observations	1,409	1,409	1,409	1,409	1,409	1,409	1,409	1,409	1,409	1,409	1,409	1,409
Adj. R2	0.04	0.04	0.08	0.09	0.03	0.04	0.08	0.08	0.03	0.04	0.06	0.07

Notes:

1. Structure of workforce is dated panel data; the identifier variables are 'Year' and 'Department'
2. Standard errors in parentheses
3. GLS weights: period weights
4. All regressions include an intercept; not shown in table
5. *p<0.1; **p<0.05; ***p<0.01

The decision to drop out may involve factors beyond infrastructure or school type, so the results reported in Table 4 should be interpreted with caution. Emphasis is placed on those variables that are consistently significant and have the greatest impact on the dependent variable. For example, the coefficient for sports fields is consistently negative and significant, suggesting that access to sports fields reduces student dropout rates. In column (1), other things equal, an additional sports field would deter 1.129 students from abandoning school. The size of the coefficient diminishes when the regression is carried out for men and women but remains consistently negative and significant. Library access shows a positive correlation with drop out, and for women, it is statistically significant in all specifications, implying that access to this facility increases the number of people –especially women– dropping out of school. This result is a clear indication that libraries are not fulfilling their mandate of providing free access to books, magazines, newspapers, journals, and other resources that promote literacy, lifelong learning, and personal growth.¹² While the coefficient for classrooms is positive and significant, its small size suggests a negligible real-world impact on dropout rates.

The coefficients for urban school and public school are also positive and statistically significant, implying that attending schools

¹² The coefficient for libraries is also positive and significant in two specifications in the full sample (columns 3 and 4) and one specification for men (column 8), but it is consistently positive and significant in all women's specifications (columns 9-12).

in urban centers and funded by the government increase levels of abandonment. The coefficient for humanistic degree is negative and significant in all cases, implying that offering this specialized degree is an important deterrent for abandonment.

Table 5 presents results when the dependent variable is levels of failure. Failure refers to the number of students who fail to advance to the next grade.

■ Table 5. Determinants of Failure

	All				Men				Women			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Basic utilities	-3.507 (5.459)	-7.485 (5.372)	-5.929 (5.130)	-7.003 (5.081)	-2.138 (4.273)	-4.913 (4.223)	-3.797 (4.069)	-4.601 (4.035)	-1.659 (1.841)	-2.858 (1.818)	-2.404 (1.752)	-2.671 (1.744)
Classrooms	0.199*** (0.052)	0.028 (0.056)	-0.029 (0.053)	-0.044 (0.053)	0.160*** (0.041)	0.040 (0.044)	-0.001 (0.042)	-0.012 (0.042)	0.041** (0.018)	-0.010 (0.019)	-0.027 (0.018)	-0.031* (0.018)
Sports fields	-1.411*** (0.318)	-1.269*** (0.312)	-0.976*** (0.299)	-0.886*** (0.297)	-1.035*** (0.249)	-0.936*** (0.246)	-0.729*** (0.237)	-0.661*** (0.235)	-0.371*** (0.107)	-0.328*** (0.106)	-0.241** (0.102)	-0.219** (0.102)
Computer rooms	0.592 (1.516)	0.882 (1.486)	0.961 (1.419)	-0.407 (1.427)	0.621 (1.187)	0.824 (1.168)	0.872 (1.125)	-0.155 (1.133)	-0.024 (0.511)	0.065 (0.503)	0.098 (0.484)	-0.239 (0.490)
Laboratories	0.481 (0.651)	0.439 (0.638)	0.540 (0.609)	-0.043 (0.612)	0.287 (0.509)	0.258 (0.501)	0.330 (0.483)	-0.109 (0.486)	0.161 (0.219)	0.147 (0.216)	0.176 (0.208)	0.032 (0.210)
Libraries	4.268** (1.980)	3.889** (1.940)	4.616** (1.853)	2.429 (1.878)	2.153 (1.550)	1.886 (1.525)	2.411* (1.470)	0.773 (1.491)	2.019*** (0.668)	1.904*** (0.657)	2.106*** (0.633)	1.564** (0.645)
Urban school	-	9.116*** (1.165)	14.825*** (1.215)	14.744*** (1.203)	-	6.371*** (0.916)	10.401*** (0.964)	10.340*** (0.955)	-	2.717*** (0.394)	4.406*** (0.415)	4.387*** (0.413)
Public school	-	-	14.014*** (1.207)	13.789*** (1.196)	-	-	9.889*** (0.958)	9.721*** (0.949)	-	-	4.157*** (0.412)	4.102*** (0.410)
Humanistic degree	-	-	-	1.924*** (0.357)	-	-	-	1.445*** (0.284)	-	-	-	0.474*** (0.123)
# of observations	1,409	1,409	1,409	1,409	1,409	1,409	1,409	1,409	1,409	1,409	1,409	1,409
Adj. R2	0.02	0.06	0.15	0.16	0.02	0.05	0.12	0.13	0.02	0.05	0.11	0.12

Notes:

1. Structure of workfile is dated panel data; the identifier variables are 'Year' and 'Department'
2. Standard errors in parentheses
3. GLS weights: period weights
4. All regressions include an intercept; not shown in table
5. *p<0.1; **p<0.05; ***p<0.01

Student failure to advance to the next level is also likely the result of many conflicting factors, including lack of effort, such as financial stress, and individual family dynamics, hence the need to take the results shown in Table 5 with caution. As was the case with

abandonment, particular emphasis is placed on variables that are consistently significant and have the greatest impact on levels of failure. Access to sports fields appears to be the strongest deterrent against student failure. In all specifications, the coefficient for this variable is negative and statistically significant, implying that, all else equal and focusing on column (1), a unit increase in sports fields decreases the number of students failing to advance to the next level by 1.411. Key drivers of higher failure rates include attendance at public urban schools, availability of humanistic degrees, and access to libraries (especially for women and girls).¹³

Thus far, results have been analyzed at an aggregate level. However, in a country like Bolivia, where regional differences are significant, it may be the case that the results are contingent on the sample being analyzed. To examine regional differences, we applied specification (1) to four subsets: Cochabamba, La Paz, Santa Cruz, and all other departments combined.¹⁴ Table 6 presents the results when the dependent variable is levels of enrollment.

¹³ The coefficient for classrooms is also statistically significant in certain cases (specifications (1), (5), (9), and (11)), but the lack of consistency and the negligible absolute size of the coefficients makes this regressor unimportant.

¹⁴ Bolivia is divided into nine Departments. Cochabamba, La Paz, and Santa Cruz are the departments that contribute the most to GDP; the remaining departments are Beni, Chuquisaca, Oruro, Pando, Potosí, and Tarija.

■ Table 6. Determinants of Enrollment by Region

	Cochabamba			La Paz			Santa Cruz			Remaining Departments		
	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women
Basic utilities	775.750* (448.898)	366.168* (220.331)	415.181* (233.398)	137.292 (104.043)	68.221 (54.153)	68.961 (52.381)	-269.653 (220.867)	-179.062* (106.829)	-82.648 (128.946)	75.569 (130.336)	45.225 (98.101)	30.839 (65.394)
Classrooms	3.280* (1.905)	1.684* (0.935)	1.993** (0.991)	9.154** (1.472)	4.974** (0.766)	4.169** (0.741)	17.251** (2.289)	9.064** (1.107)	8.314** (1.336)	5.056** (1.617)	2.349** (1.217)	2.706** (0.811)
Sports fields	61.429** (12.469)	33.372** (6.120)	27.904** (6.483)	59.966** (9.400)	32.720** (4.893)	27.288** (4.733)	11.257 (19.430)	7.469 (9.398)	3.921 (11.344)	45.741** (8.630)	20.801** (6.496)	24.985** (4.330)
Computer rooms	-23.057 (58.046)	-3.563 (28.490)	-28.828 (30.180)	164.835** (28.837)	80.228** (15.009)	84.564** (14.518)	-178.340 (127.811)	-178.340 (61.820)	-103.326 (74.618)	19.724 (54.909)	-3.296 (41.329)	22.767 (27.550)
Laboratories	5.956 (26.451)	6.163 (12.983)	-4.080 (13.753)	8.445 (16.430)	16.922** (8.552)	-8.455 (8.272)	32.820 (34.249)	12.464 (16.565)	15.638 (19.995)	47.045** (13.939)	29.626** (10.491)	17.260** (6.993)
Libraries	351.600** (67.951)	166.789** (33.352)	182.832** (35.330)	59.592 (47.052)	-37.178 (24.490)	96.582** (23.688)	-321.665** (99.610)	-259.738** (48.180)	-65.239 (58.154)	-635.783** (134.158)	-306.539** (100.978)	-328.807** (67.312)
Urban school	323.326** (62.440)	157.448** (30.647)	164.535** (32.465)	317.474** (28.403)	151.735** (14.783)	165.782** (14.299)	-33.589 (79.852)	-18.749 (38.623)	-15.980 (46.619)	266.478** (32.831)	151.309** (24.711)	114.985** (16.472)
Public school	140.493** (46.606)	71.625** (22.876)	59.974** (24.232)	-129.231** (31.683)	-74.013** (16.490)	-55.432** (15.951)	-249.885** (44.624)	-139.696** (21.584)	-118.917** (26.052)	-56.042 (40.361)	-15.011 (30.379)	-41.485** (20.251)
Humanistic degree	-34.125** (15.023)	-15.839** (7.373)	-16.719** (7.811)	-38.392** (8.739)	-19.405** (4.548)	-18.976** (4.399)	36.461 (24.592)	14.471 (11.895)	23.080* (14.357)	92.035** (10.875)	47.593** (8.185)	44.362** (5.456)
# of observations	294	294	294	636	636	636	288	288	288	474	474	474
Adj. R2	0.42	0.45	0.39	0.55	0.53	0.55	0.28	0.34	0.21	0.45	0.28	0.42

Notes:

1. Structure of workforce is dated panel data; the identifier variables are 'Year' and 'Department'
2. Standard errors in parentheses
3. GLS weights: period weights
4. All regressions include an intercept; not shown in table
5. * p<0.1; ** p<0.05; *** p<0.01

Results reveal clear regional differences in how various factors — such as access to basic utilities and infrastructure— affect enrollment levels. Classrooms are the only variable with a consistent positive impact on enrollment across all sub-samples. Access to basic utilities driver higher enrollment only in Cochabamba, where its coefficient is positive and statistically significant in all cases; everywhere else, the impact of this variable is insignificant.¹⁵ Access to sports fields is positively and significantly correlated with enrollment in all departments except Santa Cruz, perhaps reflecting that in this Department —located in the lowlands of the country— there is much greater availability of public recreational spaces than are available in the valleys (Cochabamba, Chuquisaca, Tarija), the highlands (La Paz, Oruro, Potosí), and relatively poorer lowland regions of the country (Beni and Pando). In La Paz, access to computer rooms significantly boosts enrollment, while in the ‘Remaining Departments’ sub-sample, laboratory access is a key driver. Library access has mixed impact on the dependent variable: in Cochabamba, it is a significant driver for greater enrollment but in the ‘Remaining Departments’ subset it is a deterrent for it. This disparity may stem from poorer departments having less equipped libraries than wealthier areas like Cochabamba. The results with this variable for La Paz and Santa Cruz are less clear. Access to schools in urban centers is an important driver for greater enrollment everywhere except Santa Cruz, where there is seemingly little difference between rural and urban schools. Public schools are a drive higher enrollment in Cochabamba but a deterrent in La Paz and Santa Cruz, perhaps reflecting a relatively higher quality of public education in Cochabamba. Offering a humanistic degree deters enrollment in Cochabamba and La Paz, but an important driver in the ‘Remaining Departments’ sub-sample, a reflection of the importance of learning technical skills in the relatively less-developed regions of the country. To emphasize the importance of this variable in those departments, all else equal, a unit increase in humanistic degree would increase the level of enrollment between 44 (women) and 92 (total) students.

Table 7 shows the determinants of promotion, defined as students advancing to the next grade, across different regions.

¹⁵ In Santa Cruz, this variable is negative and statistically significant at the 10% level in the men sub-sample.

■ Table 7. Determinants of Promotion by Region

	Cochabamba				La Paz				Santa Cruz				Remaining Departments		
	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women
Basic utilities	748.197 (477.851)	343.933 (233.864)	404.404* (249.064)	154.071 (112.934)	77.745 (58.768)	76.299 (57.022)	-202.998 (233.215)	-147.841 (112.358)	-55.285 (139.864)	57.944 (136.363)	34.865 (99.131)	23.594 (69.972)			
Classrooms	3.698* (2.030)	1.594 (0.994)	2.104** (1.058)	9.269*** (1.598)	5.029*** (0.831)	4.234*** (0.807)	17.156*** (2.416)	9.140*** (1.164)	8.018*** (1.449)	5.047*** (1.691)	2.304* (1.230)	2.740*** (0.868)			
Sports fields	59.421*** (13.273)	32.585*** (6.496)	26.849*** (6.918)	59.705*** (10.203)	32.737*** (5.310)	27.006*** (5.152)	8.511 (20.516)	5.497 (9.884)	3.023 (12.304)	47.488*** (9.029)	22.374*** (6.564)	25.136*** (4.633)			
Computer rooms	-31.562 (61.842)	-1.241 (30.265)	-30.323 (32.234)	161.150*** (31.301)	76.268*** (16.288)	84.835*** (15.804)	-161.051 (134.956)	-60.732 (65.019)	-100.368 (80.936)	38.267 (57.448)	11.886 (41.763)	26.393 (29.479)			
Laboratories	5.798 (28.174)	8.369 (13.788)	-2.641 (14.685)	6.330 (17.834)	16.787* (9.280)	-10.425 (9.005)	36.406 (36.163)	14.268 (17.423)	22.013 (17.688)	53.715*** (14.583)	33.253*** (10.601)	20.462*** (7.483)			
Libraries	351.728*** (72.334)	165.986*** (35.401)	185.846*** (37.702)	56.143 (51.072)	-42.262 (26.577)	98.099*** (25.787)	-294.219*** (105.179)	-256.608*** (50.673)	-37.452 (63.078)	-61.479*** (140.362)	-288.998*** (102.038)	-325.589*** (72.024)			
Urban school	304.114*** (66.473)	146.409*** (32.532)	157.733*** (36.647)	303.171*** (30.830)	141.648*** (16.043)	161.522*** (15.566)	-39.114 (84.316)	-21.470 (40.622)	-17.622 (50.566)	249.838*** (34.349)	139.684*** (24.970)	110.101*** (17.625)			
Public school	95.265** (49.730)	46.759** (24.337)	48.414* (25.922)	-134.200*** (34.390)	-78.687*** (17.896)	-55.736*** (17.364)	-263.085*** (47.119)	-145.762*** (22.701)	-117.472*** (28.258)	-73.821* (42.228)	-28.209 (30.698)	-45.899** (21.668)			
Humanistic degree	-30.320** (15.993)	-14.592* (7.827)	-15.741* (8.336)	-38.491*** (9.485)	-19.729*** (4.936)	-18.765*** (4.789)	44.733* (25.967)	18.371 (12.510)	26.348* (15.573)	86.493*** (11.378)	43.449*** (8.271)	42.986*** (5.838)			
# of observations	244	244	244	530	530	530	240	240	240	395	395	395			
Adj. R2	0.43	0.46	0.40	0.54	0.52	0.55	0.30	0.37	0.21	0.46	0.30	0.43			

Notes:

1. Structure of workforce is dated panel data; the identifier variables are 'Year' and 'Department'

2. Standard errors in parentheses

3. GLS weights: period weights

4. All regressions include an intercept; not shown in table

5. *p<0.1; **p<0.05; ***p<0.01

The results are similar to those found when with enrollment as the dependent variable. Access to classrooms is important in all cases.¹⁶ Sports fields are significant drivers for promotion everywhere except in Santa Cruz; computer rooms are only important in La Paz; Libraries foment promotion in Cochabamba but deter it in the ‘Remaining Departments’; attending school in urban centers is conducive for greater enrolment everywhere except Santa Cruz; public schools are positively and significantly correlated with the dependent variable in Cochabamba; everywhere else, public education is a deterrent for greater enrollment; finally, a humanistic degree is only conducive for greater promotion in the ‘Remaining Departments’ subset.

Table 8 presents the regional determinants of abandonment, defined as the number of students who drop out before the school term ends.

¹⁶ In Cochabamba, the coefficient for classrooms in the Men sub-sample is positive but statistically insignificant.

■ Table 8. Determinants of Abandonment by Region

	Cochabamba			La Paz			Santa Cruz			Remaining Departments		
	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women
Basic utilities	5.379 (12.776)	-0.847 (9.186)	6.574 (4.413)	-0.338 (3.182)	-0.507 (2.062)	-0.087 (1.368)	-11.293 (8.123)	-7.537 (5.452)	-3.389 (3.060)	3.229 (5.358)	2.808 (4.008)	0.314 (2.068)
Classrooms	0.239*** (0.054)	0.186*** (0.039)	0.052*** (0.019)	0.052 (0.045)	0.029 (0.029)	0.027 (0.019)	-0.023 (0.084)	-0.034 (0.056)	0.010 (0.032)	-0.025 (0.066)	-0.043 (0.050)	0.017 (0.026)
Sports fields	0.019 (0.355)	-0.071 (0.255)	0.084 (0.123)	-0.381 (0.287)	-0.260 (0.186)	-0.104 (0.124)	-0.720 (0.715)	-0.356 (0.480)	-0.392 (0.269)	-1.038*** (0.355)	-0.645** (0.265)	-0.373*** (0.137)
Computer rooms	-0.517 (1.653)	-0.057 (1.188)	-0.421 (0.571)	1.551* (0.882)	1.527*** (0.572)	-0.081 (0.379)	-2.613 (4.700)	-1.411 (3.155)	-0.948 (1.771)	-6.702*** (2.257)	-4.588*** (1.689)	-2.125** (0.871)
Laboratories	-2.697*** (0.753)	-1.927*** (0.541)	-0.759*** (0.260)	3.857*** (0.502)	1.938*** (0.326)	1.841*** (0.216)	1.935 (1.260)	1.537* (0.845)	0.447 (0.475)	-0.801 (0.573)	-0.361 (0.429)	-0.416* (0.221)
Libraries	0.522 (1.934)	0.783 (1.391)	-0.247 (0.668)	-1.648 (1.439)	-1.439 (0.933)	-0.265 (0.619)	-3.252 (3.663)	-3.050 (2.459)	-0.142 (1.380)	-5.843 (5.516)	-3.154 (4.126)	-2.779 (2.129)
Urban school	-3.469** (1.777)	-2.536** (1.278)	-1.004* (0.614)	3.604*** (0.869)	2.454*** (0.563)	1.077*** (0.374)	3.557 (2.937)	2.104 (1.971)	1.362 (1.106)	6.352*** (1.350)	4.529*** (1.010)	1.717*** (0.521)
Public school	8.826*** (1.328)	5.743*** (0.955)	3.072*** (0.459)	3.602*** (0.969)	2.262*** (0.628)	1.338*** (0.417)	5.537*** (1.641)	3.893*** (1.101)	1.593** (0.618)	8.783*** (1.659)	5.769*** (1.241)	2.944*** (0.641)
Humanistic degree	-1.321*** (0.428)	-0.793** (0.307)	-0.543*** (0.148)	-0.818*** (0.267)	-0.432** (0.173)	-0.341*** (0.115)	-2.583*** (0.904)	-1.757*** (0.607)	-0.813** (0.341)	0.863** (0.447)	0.607* (0.334)	0.233 (0.173)
# of observations	244	244	244	530	530	530	240	240	240	395	395	395
Adj. R2	0.30	0.28	0.27	0.18	0.16	0.18	0.10	0.09	0.08	0.13	0.10	0.09

Notes:

1. Structure of workforce is dated panel data; the identifier variables are 'Year' and 'Department'
2. Standard errors in parentheses
3. GLS weights: period weights
4. All regressions include an intercept; not shown in table
5. *p<0.1; **p<0.05; ***p<0.01

As mentioned previously, the interpretation of results with levels of abandonment as the outcome variable is nuanced. The only consistent regressor found to increase abandonment rates across models is public school attendance. In all cases, the positive coefficient suggests that public schools may create environments more conducive to student dropout. Specifically, all else equal, a unit increase in public schools increases abandonment levels between 1.338 (La Paz, women) and 8.826 (Cochabamba, total) students. In La Paz, laboratory access is another significant driver of abandonment, with positive and significant coefficients suggesting that laboratories may discourage academic engagement. Urban school attendance is a catalyst for higher dropout rates in La Paz and in the sub-group ‘Remaining Departments’, highlighting issues in public education that should be addressed by regional and national authorities. In Cochabamba, the number of classrooms is also a driver for greater abandonment levels, but the absolute size of the coefficients for the three subsets (total, men, women) is negligible.

Factors that reduce dropout rates include access to sports fields and computer rooms in the remaining departments; access to laboratories and attending schools in urban centers in Cochabamba; and the offering of a humanistic degree in Cochabamba, La Paz, and Santa Cruz.¹⁷ The consistently negative and significant coefficients, reflecting that specific regional factors discourage students from abandoning school.

Table 9 reports findings when the dependent variable is levels of failure.

¹⁷ The humanistic degree coefficient for Total and Men in the ‘Remaining Departments’ subset is positive and statistically significant at the 5 and 10% levels, respectively.

■ Table 9. Determinants of Failure by Region

	Cochabamba			La Paz			Santa Cruz			Remaining Departments		
	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women
Basic utilities	20.876 (21.613)	14.472 (15.202)	6.695 (7.215)	-12.184** (4.402)	-8.333** (3.206)	-3.952** (1.361)	-38.360** (11.847)	-26.686** (7.482)	-9.349* (5.290)	3.396 (12.045)	2.382 (10.721)	0.766 (3.782)
Classrooms	-0.012 (0.092)	0.010 (0.065)	-0.028 (0.031)	0.160** (0.062)	0.099** (0.045)	0.062** (0.019)	-0.182 (0.123)	-0.077 (0.078)	-0.087 (0.055)	0.036 (0.149)	0.076 (0.133)	-0.035 (0.047)
Sports fields	-0.270 (0.600)	-0.167 (0.422)	-0.097 (0.200)	-0.196 (0.398)	-0.155 (0.290)	-0.046 (0.123)	1.744* (1.042)	1.460** (0.658)	0.221 (0.465)	-1.608** (0.798)	-1.317* (0.710)	-0.220 (0.250)
Computer rooms	-5.191* (2.797)	-4.078** (1.967)	-1.011 (0.994)	0.127 (1.220)	0.604 (0.889)	-0.467 (0.377)	-15.298** (6.856)	-10.319** (4.330)	-4.255 (3.061)	-6.177 (5.075)	-5.913 (4.517)	-0.041 (1.598)
Laboratories	0.322 (1.274)	-0.013 (0.896)	0.329 (0.425)	-0.395 (0.695)	-0.283 (0.506)	-0.166 (0.215)	1.343 (1.837)	0.843 (1.160)	0.374 (0.820)	-0.624 (1.288)	-0.271 (1.147)	-0.395 (0.404)
Libraries	9.705** (3.272)	7.018** (2.301)	2.538** (1.092)	-2.851 (1.991)	-1.865 (1.450)	-0.860 (0.616)	-2.618 (5.343)	-7.205** (3.374)	3.644 (2.386)	-29.387** (12.399)	-22.926** (11.035)	-5.208 (3.892)
Urban school	15.186** (3.007)	11.443** (2.115)	3.716** (1.004)	8.712** (1.202)	6.496** (0.875)	2.212** (0.372)	3.164 (4.283)	2.752 (2.705)	13.798** (3.034)	9.619** (2.701)	4.087** (0.953)	
Public school	21.021** (2.250)	15.669** (1.582)	5.359** (0.751)	5.455** (1.341)	4.001** (0.976)	1.448** (0.415)	13.183** (2.394)	8.606** (1.512)	4.788** (1.069)	19.076** (3.730)	13.686** (3.320)	5.253** (1.171)
Humanistic degree	-0.265 (0.723)	0.055 (0.509)	-0.306 (0.241)	0.842** (0.370)	0.644** (0.269)	0.198* (0.114)	-2.868** (1.319)	-2.338** (0.833)	-0.533 (0.589)	6.316** (1.005)	4.360** (0.895)	1.796** (0.316)
# of observations	244	244	244	530	530	530	240	240	240	395	395	395
Adj. R2	0.32	0.35	0.21	0.22	0.22	0.17	0.18	0.19	0.13	0.19	0.13	0.15

Notes:

1. Structure of workforce is dated panel data; the identifier variables are "Year" and "Department"

2. Standard errors in parentheses

3. GLS weights; period weights

4. All regressions include an intercept; not shown in table

5. *p<0.1; **p<0.05; ***p<0.01

As was the case with abandonment, public school attendance is a driver for increasing numbers of students failing to advance to the next level, in all subsets, its coefficient is positive and statistically significant, reflecting that regardless of geography, attending publicly-funded schools increases the number of students with deficient academic performance. Attending to schools in urban centers -specifically in Cochabamba, La Paz, and the remaining departments- is an additional driver for greater failures. Lastly, schools offering a humanistic degree in La Paz and the remaining departments also seem to induce a greater number of students failing the grade. In La Paz, the number of classrooms is a driver for failure, but the absolute size of the coefficient in the three subsets (total, men, women) renders its real impact trivial.

Deterrents for failure include access to basic utilities in La Paz and Santa Cruz; access to computer rooms in Cochabamba and Santa Cruz;¹⁸ access to libraries in the remaining departments;¹⁹ and schools offering a humanistic degree in Santa Cruz.²⁰

Finally, Table 10 presents the determinants of enrollment based on the grade-level offerings of different schools. Computer rooms in Cochabamba and Santa Cruz; libraries in the remaining departments; and humanistic degree offerings in Santa Cruz. The hypothesis is that enrollment (along with promotion, abandonment, and failure rates) may vary not only by geographical location of the school, but also based on their different grade-level offerings. Appendices 2, 3, and 4 provides determinants of promotion, abandonment, and failure based on grade-level offerings.²¹

¹⁸ The computer room coefficient for women in Cochabamba and Santa Cruz is negative but statistically insignificant.

¹⁹ The libraries coefficient for women in the Remaining Departments is negative but statistically insignificant.

²⁰ The humanistic degree coefficient for women in Santa Cruz is negative but statistically insignificant.

²¹ For pre-primary and primary-only schools, the specification does not include the regressors laboratories and humanistic degree as these two variables are unlikely to play a significant role in the outcome of interest (enrollment, promotion, abandonment, and failure). Laboratories begin to be utilized extensively in secondary; a humanistic degree is only offered by schools with secondary grade levels

■ Table 10. Determinants of Enrollment by School Grade Level

	Pre-primary, Primary			Secondary			Primary, Secondary			All levels		
	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women
Basic utilities	94.901** (47.304)	44.767* (24.877)	50.112** (23.175)	44.239 (65.867)	19.249 (59.600)	25.095 (35.675)	-0.096 (90.952)	4.706 (62.833)	-4.799 (47.140)	355.374** (132.146)	174.421** (69.067)	182.472** (68.672)
Classrooms	9.853*** (0.846)	5.125*** (0.445)	4.725*** (0.415)	2.391*** (0.856)	0.558 (0.775)	1.828*** (0.464)	2.679** (1.235)	0.712 (0.853)	1.960*** (0.640)	13.604*** (1.254)	6.666*** (0.656)	7.127*** (0.652)
Sports fields	17.443** (8.530)	6.435 (4.486)	10.982*** (4.179)	-0.191 (4.338)	-2.350 (3.925)	2.167 (2.350)	5.940 (6.084)	0.695 (4.203)	5.284* (3.153)	76.114*** (6.957)	42.232*** (3.636)	33.852*** (3.616)
Computer rooms	52.523** (20.420)	28.796*** (10.739)	23.734** (10.004)	-57.584** (25.507)	-25.197 (23.080)	-32.331** (13.815)	155.777*** (32.336)	87.384*** (22.339)	68.242*** (16.759)	-35.482 (40.812)	0.786 (21.331)	-39.438* (21.209)
Laboratories	-	-	-	22.497** (10.374)	26.514*** (9.387)	-4.050 (5.619)	63.481*** (14.413)	47.434*** (9.957)	16.074** (7.470)	-86.908*** (16.895)	-43.179*** (8.830)	-46.783*** (8.780)
Libraries	221.177*** (38.011)	117.699*** (19.990)	103.572*** (18.622)	-84.334** (33.357)	-50.649* (30.183)	-33.476* (18.067)	-214.475*** (48.189)	-116.001*** (33.291)	-98.277*** (24.976)	215.817*** (41.635)	39.290* (21.761)	174.521*** (21.636)
Urban school	258.640*** (15.575)	129.422*** (8.191)	129.218*** (7.631)	309.303*** (18.264)	168.682*** (16.526)	140.551*** (9.892)	318.074*** (25.939)	172.441*** (17.919)	145.538*** (13.444)	409.150*** (29.913)	193.211*** (15.635)	214.969*** (15.545)
Public school	289.519*** (44.874)	143.675*** (23.599)	145.833*** (21.984)	275.266*** (74.166)	138.511** (67.109)	136.100*** (40.170)	-188.628*** (42.402)	-84.205*** (29.293)	-104.832*** (21.976)	83.431*** (28.188)	24.832* (14.733)	52.863*** (14.649)
Humanistic degree	-	-	-	29.378*** (4.572)	16.095*** (4.137)	13.272*** (2.476)	42.262*** (6.342)	22.086*** (4.381)	20.157*** (3.287)	-19.301 (12.687)	-4.045 (6.631)	-14.313** (6.593)
# of observations	852	852	852	588	588	588	666	666	666	846	846	846
Adj. R2	0.57	0.55	0.58	0.49	0.25	0.43	0.48	0.34	0.44	0.50	0.47	0.50

Notes:

1. Structure of workforce is dated panel data; the identifier variables are 'Year' and 'Department'

2. Standard errors in parentheses

3. GLS weights: period weights

4. All regressions include an intercept; not shown in table

5. *p<0.1; **p<0.05; ***p<0.01

The results indicates that classrooms and urban schools are the only regressors showing a positive correlation with enrollment levels. Across all sub-groups, the coefficients for these variables are positive and statistically significant, indicate that classroom access and education in urban centers are important drivers for greater enrollment, regardless of the grades offered by a school.²² Access to basic services induce greater enrollment in schools offering pre-primary and primary levels and in schools offering all levels; access to sports fields is only consistently correlated with greater number of students enrolling in school in those institutions offering all levels;²³ access to computer rooms is consistently significant and positively correlated with the dependent variable in the pre-primary, primary and primary, secondary sub-groups; likewise with laboratories in the secondary and primary, secondary sub-groups;²⁴ access to libraries is important for greater enrollment in the pre-primary, primary sub-group and in schools offering all grade levels; public school is also important in promoting enrollment in schools offering pre-primary and primary levels, as well as in those offering all levels; and finally, humanistic degree is only important in those schools offering secondary, and primary and secondary education.

Regarding deterrents to enrollment, laboratories appears to reduce enrollment in schools offering all grade levels. This findings highlights both a problem and an opportunity for an impactful intervention, be it from the government or the private institutions administering a school. Libraries access also does not support higher enrolment in the secondary and primary, secondary sub-groups; lastly, the coefficient for public schools is consistently negative and significant for the primary, secondary sub-group, highlighting another potential area for improving public education in schools offering both primary and secondary education.

Overall, the empirical findings seem to confirm the expectations outlined in section 3.2 although notable differences emerge when analyzing by geographical region and grade-level offerings.

²² For the Secondary and the Primary, Secondary sub-groups, the coefficient for classrooms in the Men subset is positive but statistically insignificant

²³ The coefficient for sports fields is also positive and significant in certain cases in the pre-primary and primary sub-group (total and women subsets) and in the primary, secondary sub-group (women subset).

²⁴ For the Secondary sub-group, the coefficient for laboratories in the women subset is negative but statistically insignificant.

CONCLUSIONS

As noted in section 1, socioeconomic inequities in Bolivia can significantly the impact of infrastructure affects educational outcomes. In poverty-stricken areas—particularly rural regions in the highlands—students may face additional barriers such as poverty-stricken, limited access to school materials, or family obligations that detract from their ability to benefit fully from improved infrastructure. Wealthier areas with better infrastructure—primarily urban centers in the lowlands—may see more immediate educational gains. At the same time, disadvantaged communities might experience slower progress due to the compounded effects of inequality. These disparities can produce uneven outcomes, as the impact of infrastructure may be diminished or delayed in areas with greater socioeconomic challenges. With these caveats in mind, we present a summary of our principal findings below.

The study used Bolivian data to empirically analyze of the impact of school infrastructure on education outcomes was carried out for nationwide at the pre-primary, primary, and secondary levels during the 2015-2020 period. Specifically, the examined how enrollment, promotion, abandonment, and failure levels are influenced by access to essential infrastructure services like electricity, running water, and working bathrooms; and by access to basic infrastructure facilities like classrooms, sports fields, laboratories, libraries, and computer rooms. We also tested the impact of urban centers, attending public schools, and offering a humanistic degree impact school outcomes. A dated panel dataset was employed with results reported at the aggregate level; by geographical region; and by school grade levels.

The findings consistently demonstrate that infrastructure services and facilities significantly boost enrollment and promotion. However, certain elements—such as basic utilities, computer rooms, and sports fields—tend to have a stronger impact. At the aggregate level, urban school attendance significantly boosts enrollment and promotion. However, regional analysis, the results show that in Santa Cruz education in urban schools does not have a statistically significant effect on enrollment or promotion. At the aggregate level, public schools are shown to be a deterrent for enrollment and promotion, but when the analysis is carried by geographical area, the findings

demonstrate that in Cochabamba attending government-funded schools increases levels of enrollment and promotion. Similarly, access to basic utilities is a primary driver for greater enrollment and promotion across all groups (all, men and women) at the aggregate level. Regionally, however, it only has a positive and significant impact in Cochabamba; its impact on promotion levels is only positive and significant (at the 10% level) in the women subset in Cochabamba. While offering a humanistic degree does not influence enrollment at the aggregate level but it is an important driver of it in the sub-group ‘remaining departments’ (Beni, Chuquisaca, Oruro, Pando, and Potosí); it is also an important driver for promotion in Santa Cruz (total and women) and in the remaining departments.

At the aggregate level, in terms of abandonment, principal deterrents are the existence of sports fields and the offering of a humanistic degree. Regionally, sports fields deter abandonment only in the remaining departments. In the remaining departments, access to computer rooms is a restraint on abandonment as is access to laboratories and attending urban schools in Cochabamba. Offering a humanistic degree significantly reduces abandonment in Cochabamba, La Paz, and Santa Cruz.

At the aggregate level, the main deterrent to failure is access to sports fields. Regionally, access to basic utilities is an important obstacle to failure in La Paz and Santa Cruz. In both Cochabamba and Santa Cruz (total and men groups), access to computer rooms reduces failure rates. Libraries are also important in preventing failure in the remaining departments (total, men). Lastly, offering a humanistic degree reduces failure rates in Santa Cruz (total and men groups). A similar analysis can be done when the determinants of school outcomes are studied based on school grade levels.

The main conclusion of this study is that both infrastructure services and facilities serve as significant positive determinant of school outcomes. The challenge for both government and private institutions is to ensure that new or renewed infrastructure serves the entire school-aged community and not only privileged sectors –*i. e.*, urban areas vs rural areas; men vs women; wealthier departments vs poorer departments –within Bolivian society.

Future research could build on these findings. Specifically, given that physical infrastructure is important in determining school

outcomes –a key finding of this study– subsequent research could examine how targeted teacher training programs that focus on cultural competence and bilingual education can improve educational outcomes for indigenous and rural students. Longitudinal studies that track students from different socioeconomic backgrounds could also provide insights into how income inequality affects educational and professional outcomes; these types of studies would inform, and guide policies aimed at reducing educational disparities and promoting social mobility. Lastly, as discussed in Section 1, future studies could focus on integrating technology in rural schools to address infrastructure limitations.

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■ Appendix 1. Yearly Descriptive Statistics
by Region and School Grade Level, 2015 - 2020

	Pre-Primary					Pre-Primary, Primary					Pre-Primary, Secondary				
	Mean enrollment	Basic utilities	Classrooms	Sportsfields	# schools	Mean enrollment	Basic utilities	Classrooms	Sportsfields	# schools	Mean enrollment	Basic utilities	Classrooms	Sportsfields	# schools
All															
2015	154.633	0.920	6.263	1.176	617	155.751	0.845	4.597	1.331	10,875	400.600	0.917	10.333	1.000	5
2016	156.914	0.922	6.346	1.205	626	159.629	0.846	4.555	1.328	10,820	422.000	0.933	10.333	1.000	5
2017	156.441	0.918	6.160	1.200	615	163.004	0.845	4.577	1.327	10,807	421.500	0.933	10.333	1.000	5
2018	153.302	0.918	6.161	1.171	595	166.032	0.846	4.596	1.329	10,869	387.000	0.867	8.750	1.000	5
2019	154.902	0.922	6.239	1.192	601	167.735	0.846	4.601	1.332	10,858	443.833	0.867	9.500	1.000	5
2020	155.092	0.917	6.392	1.203	611	169.847	0.846	4.587	1.329	10,843	383.167	0.933	12.750	1.000	5
Beni															
2015	326.000	0.667	1.000	na	2	242.268	0.767	5.826	1.100	82	-	-	-	-	-
2016	325.000	0.333	na	na	1	259.397	0.761	6.079	1.250	73	-	-	-	-	-
2017	184.000	0.750	3.000	1.000	5	195.712	0.775	4.048	1.158	66	-	-	-	-	-
2018	83.500	0.778	6.000	1.000	2	234.927	0.725	4.568	1.250	82	-	-	-	-	-
2019	131.000	0.333	4.000	na	1	250.474	0.795	6.386	1.229	78	-	-	-	-	-
2020	160.600	0.889	6.000	na	5	260.429	0.752	4.587	1.206	63	-	-	-	-	-
Cochabamba															
2015	131.511	0.886	5.490	1.095	88	284.916	0.830	7.367	1.354	630	363.000	1.000	7.000	1.000	1
2016	116.976	0.900	5.255	1.182	84	293.934	0.839	7.316	1.359	609	345.000	1.000	7.000	1.000	1
2017	119.149	0.903	4.889	1.100	87	308.389	0.837	7.588	1.368	610	324.000	1.000	7.000	1.000	1
2018	122.600	0.877	5.019	1.095	84	302.645	0.836	7.335	1.401	636	339.000	1.000	7.000	1.000	1
2019	113.098	0.913	5.019	1.200	82	292.590	0.833	7.018	1.370	632	331.000	1.000	7.000	1.000	1
2020	119.571	0.874	4.922	1.100	91	308.290	0.841	7.347	1.408	617	292.000	1.000	7.000	1.000	1
Chuquisaca															
2015	130.724	0.952	5.857	1.429	58	129.254	0.815	4.433	1.262	716	-	-	-	-	-
2016	139.594	0.923	6.294	1.556	64	127.189	0.819	4.373	1.251	697	-	-	-	-	-
2017	145.390	0.892	5.903	1.375	59	127.815	0.815	4.443	1.257	708	-	-	-	-	-
2018	141.771	0.928	5.806	1.375	61	127.136	0.820	4.449	1.241	701	-	-	-	-	-
2019	144.246	0.921	6.091	1.333	61	125.909	0.818	4.382	1.253	706	-	-	-	-	-
2020	145.983	0.932	6.000	1.500	60	123.374	0.820	4.385	1.256	700	-	-	-	-	-
La Paz															
2015	130.858	0.942	7.475	1.250	120	144.076	0.846	4.652	1.363	3,885	86.000	0.667	4.000	1.000	1
2016	143.879	0.934	7.303	1.267	124	146.277	0.868	4.657	1.361	3,881	89.000	0.667	4.000	1.000	1
2017	139.959	0.935	7.563	1.412	123	149.323	0.867	4.659	1.366	3,869	94.000	0.667	4.000	1.000	1
2018	139.578	0.931	7.627	1.250	116	151.562	0.867	4.701	1.363	3,882	89.000	0.667	4.000	1.000	1
2019	141.261	0.926	7.767	1.236	115	150.976	0.867	4.679	1.366	3,876	82.000	0.667	4.000	1.000	1
2020	132.397	0.942	7.571	1.294	116	152.139	0.867	4.687	1.359	3,882	81.000	0.667	4.000	1.000	1
Oruro															

	Pre-Primary					Pre-Primary, Primary					Pre-Primary, Secondary				
	Mean enrollment	Basic utilities	Classrooms	Sportsfields	# schools	Mean enrollment	Basic utilities	Classrooms	Sportsfields	# schools	Mean enrollment	Basic utilities	Classrooms	Sportsfields	# schools
2015	265.000	0.876	8.364	1.300	49	133.859	0.847	5.070	1.300	964	-	-	-	-	-
2016	243.909	0.893	8.217	1.286	55	141.093	0.854	5.008	1.285	960	-	-	-	-	-
2017	244.962	0.884	8.043	1.286	52	147.775	0.854	5.114	1.283	963	-	-	-	-	-
2018	243.481	0.894	7.520	1.273	52	153.850	0.852	5.001	1.269	959	-	-	-	-	-
2019	239.216	0.877	8.042	1.273	51	155.528	0.853	5.128	1.291	964	-	-	-	-	-
2020	234.925	0.884	9.885	1.375	53	158.754	0.854	5.080	1.281	957	-	-	-	-	-
Pando															
2015	230.000	0.889	1.000	1.000	3	78.725	0.659	3.410	1.118	342	-	-	-	-	-
2016	275.667	0.889	1.000	1.000	3	81.795	0.661	3.315	1.131	341	-	-	-	-	-
2017	255.333	0.889	1.000	1.000	3	87.680	0.659	3.412	1.146	341	-	-	-	-	-
2018	239.667	0.889	1.000	1.000	3	90.506	0.661	3.437	1.129	344	-	-	-	-	-
2019	252.667	0.889	1.000	1.000	3	93.888	0.654	3.384	1.136	340	-	-	-	-	-
2020	247.000	0.889	1.000	1.000	3	96.546	0.661	3.288	1.123	346	-	-	-	-	-
Potosí															
2015	220.861	0.982	7.111	1.071	43	68.507	0.782	3.027	1.273	1.772	-	-	-	-	-
2016	225.093	0.982	7.111	1.071	43	67.660	0.782	3.027	1.273	1.772	-	-	-	-	-
2017	225.209	0.982	7.111	1.071	43	66.792	0.782	3.027	1.273	1.770	-	-	-	-	-
2018	220.605	0.982	7.111	1.071	43	66.302	0.782	3.027	1.273	1.770	-	-	-	-	-
2019	227.628	0.982	7.111	1.071	43	65.903	0.782	3.027	1.273	1.771	-	-	-	-	-
2020	226.070	0.982	7.111	1.071	43	66.051	0.782	3.027	1.273	1.772	-	-	-	-	-
Santa Cruz															
2015	142.847	0.913	5.141	1.121	216	266.491	0.880	5.691	1.374	1.786	378.000	na	na	na	1
2016	146.976	0.923	5.229	1.114	211	279.320	0.878	5.464	1.372	1.783	374.000	na	na	na	1
2017	143.864	0.916	5.031	1.118	206	286.499	0.878	5.488	1.353	1.784	522.000	na	na	na	1
2018	140.091	0.924	5.125	1.129	197	293.488	0.880	5.639	1.376	1.793	713.000	na	na	na	1
2019	141.525	0.920	5.015	1.152	202	306.565	0.881	5.767	1.382	1.791	850.000	na	na	na	1
2020	147.348	0.915	5.164	1.114	204	311.175	0.879	5.642	1.372	1.799	429.000	na	na	na	1
Tarija															
2015	158.579	0.929	6.278	1.154	38	127.274	0.922	4.565	1.400	698	588.000	1.000	20.000	1.000	2
2016	161.146	0.944	7.050	1.200	41	130.148	0.919	4.575	1.391	704	543.000	1.000	20.000	1.000	2
2017	170.432	0.938	6.450	1.231	37	130.440	0.918	4.515	1.375	696	533.500	1.000	20.000	1.000	2
2018	156.297	0.919	5.950	1.133	37	132.641	0.921	4.545	1.388	702	546.000	1.000	20.000	1.000	2
2019	170.070	0.935	6.095	1.143	43	135.876	0.921	4.559	1.380	700	534.500	1.000	20.000	1.000	2
2020	166.333	0.917	5.950	1.143	36	135.627	0.922	4.475	1.384	707	530.500	1.000	20.000	1.000	2

	Primary					Primary, Secondary					Secondary				
	Mean enrollment	Basic utilities	Classrooms	Sportsfields	# schools	Mean enrollment	Basic utilities	Classrooms	Sportsfields	# schools	Mean enrollment	Basic utilities	Classrooms	Sportsfields	# schools
All															
2015	117.166	0.787	2.483	1.148	2,224	371.182	0.869	9.055	1.487	351	359.686	0.919	11.019	1.669	1,887
2016	113.348	0.782	2.524	1.150	2,269	386.375	0.876	9.529	1.529	357	363.900	0.918	11.043	1.669	1,880
2017	112.442	0.785	2.531	1.147	2,272	413.524	0.863	9.750	1.521	361	352.720	0.923	11.081	1.678	1,891
2018	112.820	0.785	2.501	1.152	2,250	394.405	0.873	9.808	1.532	356	346.996	0.920	10.861	1.678	1,874
2019	111.169	0.781	2.525	1.152	2,239	386.017	0.875	9.466	1.495	355	353.833	0.921	11.021	1.652	1,899
2020	112.134	0.781	2.478	1.153	2,266	395.421	0.866	9.670	1.529	349	344.305	0.922	11.000	1.662	1,884
Beni															
2015	28.947	0.756	1.462	1.000	38	99.235	0.694	2.933	1.273	17	222.125	0.834	7.333	3.000	8
2016	24.489	0.759	2.478	1.227	47	109.950	0.813	2.882	1.250	20	304.167	0.860	1.000	3.000	6
2017	19.822	0.796	2.265	1.043	45	174.579	0.644	4.364	1.333	19	352.583	0.708	22.333	3.500	12

	Primary					Primary, Secondary					Secondary				
	Mean enrollment	Basic utilities	Classrooms	Sportsfields	# schools	Mean enrollment	Basic utilities	Classrooms	Sportsfields	# schools	Mean enrollment	Basic utilities	Classrooms	Sportsfields	# schools
2018	22.022	0.893	1.483	1.111	45	166.636	0.667	2.000	1.000	11	271.833	0.583	11.600	1.000	6
2019	27.643	0.681	1.500	1.045	42	138.944	0.769	2.462	1.273	18	263.250	0.611	6.750	1.667	8
2020	34.113	0.737	1.643	1.133	62	142.364	0.750	3.125	1.000	11	254.800	0.889	11.000	1.500	5
Cochabamba															
2015	176.139	0.879	3.715	1.091	180	450.583	0.905	12.118	1.786	36	438.683	0.898	13.275	1.333	145
2016	166.754	0.848	4.066	1.125	191	460.133	0.931	13.095	2.000	45	438.168	0.891	13.909	1.269	149
2017	155.609	0.843	3.941	1.101	192	453.442	0.927	11.500	1.941	43	426.762	0.897	14.313	1.400	147
2018	163.041	0.862	4.079	1.211	171	441.122	0.920	11.222	1.786	41	427.253	0.900	13.681	1.378	146
2019	152.369	0.856	4.144	1.130	174	481.105	0.941	13.533	2.083	38	447.776	0.899	14.000	1.283	152
2020	138.380	0.847	3.417	1.123	184	499.000	0.879	11.619	1.882	42	429.774	0.906	16.083	1.457	146
Chuquisaca															
2015	53.435	0.712	1.991	1.130	496	306.039	0.814	7.932	1.364	77	372.012	0.944	14.391	1.205	87
2016	54.967	0.710	1.961	1.133	517	303.242	0.822	8.510	1.375	66	388.517	0.930	13.922	1.171	89
2017	52.646	0.718	2.048	1.128	511	360.465	0.833	8.796	1.367	71	369.047	0.940	14.933	1.270	85
2018	50.619	0.781	1.970	1.133	514	315.130	0.816	8.245	1.460	69	354.557	0.922	14.023	1.194	88
2019	52.576	0.712	2.000	1.139	507	315.099	0.822	8.400	1.365	71	370.146	0.931	14.830	1.225	89
2020	49.496	0.709	2.000	1.141	514	319.973	0.813	8.825	1.389	73	358.322	0.939	13.894	1.211	87
La Paz															
2015	83.981	0.794	1.839	1.138	317	486.462	0.919	14.250	1.778	78	339.419	0.923	10.479	1.848	597
2016	91.997	0.795	1.898	1.140	325	522.325	0.922	15.190	1.889	80	339.257	0.924	10.571	1.900	587
2017	87.313	0.795	1.901	1.141	335	533.167	0.917	14.795	1.800	78	331.840	0.931	10.556	1.866	592
2018	86.861	0.796	1.886	1.140	324	491.419	0.906	15.400	1.850	86	319.844	0.928	10.287	1.853	588
2019	82.583	0.797	1.877	1.154	331	478.723	0.919	15.317	1.722	83	317.556	0.930	10.493	1.853	592
2020	85.617	0.796	1.803	1.137	321	473.447	0.914	14.511	1.829	85	309.003	0.928	10.347	1.872	593
Oruro															
2015	223.944	0.817	2.677	1.123	177	388.588	0.978	8.818	1.800	17	350.654	0.891	10.531	1.534	263
2016	206.011	0.789	2.676	1.148	176	375.611	0.961	10.545	1.727	18	351.172	0.885	10.472	1.566	261
2017	210.698	0.796	2.738	1.144	172	416.118	0.917	9.364	1.727	17	348.479	0.886	10.256	1.535	263
2018	189.593	0.801	2.591	1.136	177	324.778	0.961	9.250	1.750	18	344.740	0.888	10.107	1.542	261
2019	186.071	0.793	2.603	1.126	170	401.588	0.958	9.273	2.000	17	353.903	0.890	10.149	1.548	267
2020	193.497	0.802	2.800	1.129	177	372.941	0.958	9.600	1.800	17	337.317	0.880	10.494	1.537	265
Pando															
2015	9.828	0.639	1.429	1.000	29	316.600	0.667	8.333	1.000	5	350.143	1.000	8.750	1.250	7
2016	11.036	0.606	1.563	1.000	28	273.667	0.667	6.500	1.000	6	336.750	0.952	8.750	1.250	8
2017	12.069	0.639	1.438	1.000	29	327.000	0.667	8.333	1.000	5	257.571	1.000	8.750	1.250	7
2018	10.964	0.576	1.400	1.000	28	338.800	0.667	8.333	1.000	5	297.286	1.000	8.750	1.250	7
2019	9.700	0.636	1.389	1.000	30	301.500	0.750	7.750	1.000	6	291.000	1.000	8.750	1.250	8
2020	7.077	0.555	1.400	1.000	26	365.200	0.667	8.333	1.000	5	271.714	1.000	8.750	1.250	7
Potosí															
2015	175.466	0.833	3.678	1.090	163	281.700	0.967	7.538	1.364	20	257.510	0.918	8.585	1.256	210
2016	174.607	0.833	3.678	1.090	163	293.350	0.967	7.538	1.364	20	259.714	0.918	8.585	1.256	210
2017	175.479	0.833	3.678	1.090	163	300.800	0.967	7.538	1.364	20	259.229	0.918	8.585	1.256	210
2018	177.460	0.833	3.678	1.090	163	305.100	0.967	7.538	1.364	20	261.324	0.918	8.585	1.256	210
2019	178.325	0.833	3.678	1.090	163	312.200	0.967	7.538	1.364	20	263.652	0.918	8.585	1.256	210
2020	177.331	0.833	3.678	1.090	163	307.650	0.967	7.538	1.364	20	263.529	0.918	8.585	1.256	210
Santa Cruz															
2015	127.901	0.786	2.890	1.203	704	347.415	0.798	7.308	1.316	82	412.214	0.929	12.343	1.967	477
2016	124.208	0.784	2.920	1.180	706	356.129	0.797	7.264	1.342	85	419.586	0.935	12.289	1.899	483
2017	126.689	0.787	2.792	1.187	705	394.822	0.786	8.259	1.422	90	397.656	0.938	12.270	1.897	480
2018	132.499	0.783	2.957	1.181	714	383.460	0.815	7.759	1.325	87	393.698	0.933	12.413	2.031	474

	Primary					Primary, Secondary					Secondary				
	Mean enrollment	Basic utilities	Classrooms	Sportsfields	# schools	Mean enrollment	Basic utilities	Classrooms	Sportsfields	# schools	Mean enrollment	Basic utilities	Classrooms	Sportsfields	# schools
2019	132.608	0.781	2.910	1.191	707	369.744	0.797	7.482	1.333	86	401.560	0.934	12.196	1.891	480
2020	136.455	0.785	2.994	1.193	704	367.088	0.789	7.196	1.351	80	394.279	0.935	11.978	1.879	480
Tarja															
2015	134.008	0.871	2.098	1.292	120	450.368	1.000	9.545	1.545	19	354.495	0.947	15.370	1.756	93
2016	113.353	0.874	2.196	1.257	116	511.177	1.000	9.455	1.364	17	364.920	0.961	14.786	1.683	87
2017	116.983	0.873	2.245	1.307	120	501.556	1.000	9.692	1.308	18	352.042	0.969	14.449	1.745	95
2018	117.711	0.869	2.067	1.246	114	498.947	1.000	10.643	1.429	19	355.766	0.956	14.490	1.667	94
2019	108.696	0.864	2.391	1.278	115	466.813	1.000	8.909	1.364	16	385.903	0.960	15.583	1.681	93
2020	123.417	0.865	2.069	1.290	115.000	511.938	1.000	9.700	1.400	16	377.473	0.963	14.587	1.622	91

Notes

1. Numbers in table represent mean yearly values
2. Enrollment, classrooms and sports fields reflect 'numbers'; basic utilities represents 'share of total'
3. Number of schools reflects those where total enrollment > 0
4. Basic utilities refer to access to electricity, water, and working bathrooms

■ Appendix 2. Determinants of Promotion by School Grade Level

	Pre-primary, Primary			Secondary			Primary, Secondary			All levels		
	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women
Basic utilities	88.306*	41.797	46.541*	42.420	18.754	23.804	14.313	14.033	0.352	347.746**	164.892**	182.923**
	(51.463)	(27.080)	(25.296)	(68.493)	(59.761)	(38.339)	(97.141)	(64.793)	(50.895)	(138.426)	(72.388)	(72.984)
Classrooms	9.727***	5.047***	4.677***	2.508***	0.555	1.948***	2.783**	0.688	2.090***	13.811***	6.676***	7.139***
	(0.921)	(0.484)	(0.453)	(0.890)	(0.777)	(0.498)	(1.319)	(0.880)	(0.691)	(1.315)	(0.688)	(0.693)
Sports fields	19.636**	7.635	11.980***	3.499	0.521	2.979	9.772	3.670	6.134*	74.889***	41.636***	33.283***
	(9.280)	(4.883)	(4.562)	(4.511)	(3.936)	(2.525)	(6.498)	(4.334)	(3.404)	(7.288)	(3.811)	(3.843)
Computer rooms	54.105**	30.222**	23.894**	-68.093**	-33.422	-34.540**	148.626***	82.412***	66.211***	-38.785	2.910	-41.767*
	(22.215)	(11.690)	(10.920)	(26.524)	(23.142)	(14.847)	(34.536)	(23.036)	(18.095)	(42.766)	(22.364)	(22.548)
Laboratories	-	-	-	15.283	21.243**	-5.988	57.022**	42.755***	14.279*	-81.016***	-37.968***	-43.208***
				(10.787)	(9.412)	(6.038)	(15.393)	(10.267)	(8.065)	(17.702)	(9.257)	(9.333)
Libraries	215.586***	114.340***	101.320***	-75.516**	-42.896	-32.461*	-206.170***	-109.348***	-96.684***	211.191***	30.568	180.769***
	(41.353)	(21.760)	(20.327)	(34.687)	(30.265)	(19.416)	(51.468)	(34.330)	(26.966)	(43.615)	(22.808)	(22.996)
Urban school	255.905***	127.400***	128.523***	283.635***	149.869***	133.698***	291.164***	153.351***	137.735***	392.010***	180.619***	211.373***
	(16.945)	(8.916)	(8.329)	(18.992)	(16.571)	(10.631)	(27.704)	(18.479)	(14.515)	(31.336)	(16.386)	(16.521)
Public school	291.272***	144.328***	146.710***	258.452***	126.557*	131.550***	-221.217***	-106.740***	-114.674***	66.698**	14.780	51.750***
	(48.820)	(25.689)	(23.997)	(77.122)	(67.290)	(43.169)	(45.287)	(30.207)	(23.727)	(29.548)	(15.452)	(15.579)
Humanistic degree	-	-	-	28.026***	14.964***	13.048***	41.047***	21.165***	19.868***	-19.987	-4.325	-15.675**
				(4.754)	(4.148)	(2.661)	(6.773)	(4.518)	(3.549)	(13.297)	(6.953)	(7.011)
# of observations	710	710	710	490	490	490	555	555	555	704	704	704
Adj. R2	0.57	0.55	0.57	0.48	0.23	0.43	0.48	0.35	0.44	0.52	0.48	0.52

Notes:

1. Structure of workfile is dated panel data; the identifier variables are 'Year' and 'Department'
2. Standard errors in parentheses
3. GLS weights: period weights
4. All regressions include an intercept; not shown in table
5. *p<0.1; **p<0.05; ***p<0.01

■ Appendix 3: Determinants of Abandonment by School Grade Level

	Pre-primary, Primary			Secondary			Primary, Secondary			All levels		
	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women
Basic utilities	2.643** (1.242)	1.966** (0.780)	0.632 (0.577)	4.760 (4.422)	2.966 (3.330)	1.735 (1.629)	-2.739 (4.459)	-1.566 (3.241)	-1.365 (1.640)	0.206 (3.456)	0.084 (2.196)	0.086 (1.527)
Classrooms	0.124*** (0.022)	0.064*** (0.014)	0.063*** (0.010)	0.099* (0.057)	0.065 (0.043)	0.032 (0.021)	0.076 (0.061)	0.053 (0.044)	0.023 (0.022)	0.055* (0.033)	0.035* (0.021)	0.020 (0.014)
Sports fields	-0.967*** (0.224)	-0.514*** (0.141)	-0.441*** (0.104)	-1.768*** (0.291)	-1.220*** (0.219)	-0.539*** (0.107)	-1.903*** (0.298)	-1.291*** (0.217)	-0.598*** (0.110)	-0.478*** (0.182)	-0.298** (0.116)	-0.175** (0.080)
Computer rooms	-1.123** (0.536)	-0.499 (0.337)	-0.584** (0.249)	8.295*** (1.712)	6.223*** (1.290)	2.111*** (0.631)	5.504*** (1.585)	4.050*** (1.152)	1.459** (0.583)	-1.345 (1.067)	-0.274 (0.678)	-1.095** (0.472)
Laboratories	-	-	-	2.612*** (0.696)	1.849*** (0.524)	0.748*** (0.257)	2.110*** (0.707)	1.508*** (0.514)	0.608** (0.260)	-0.698 (0.442)	-0.835*** (0.281)	0.126 (0.195)
Libraries	4.056*** (0.998)	2.680*** (0.626)	1.372*** (0.464)	-2.617 (2.239)	-2.095 (1.687)	-0.413 (0.825)	-2.290 (2.362)	-1.751 (1.717)	-0.484 (0.869)	3.665*** (1.089)	1.948*** (0.692)	1.687*** (0.481)
Urban school	2.236*** (0.409)	1.309*** (0.257)	0.910*** (0.190)	5.828*** (1.226)	4.393*** (0.923)	1.426*** (0.452)	7.591*** (1.272)	5.387*** (0.924)	2.148*** (0.468)	2.273*** (0.782)	1.322*** (0.497)	0.904*** (0.346)
Public school	0.945 (1.178)	0.471 (0.740)	0.557 (0.548)	11.548** (4.979)	7.412** (3.750)	4.039** (1.835)	14.139*** (2.079)	9.583*** (1.511)	4.493*** (0.764)	3.020*** (0.737)	1.881*** (0.469)	1.101*** (0.326)
Humanistic degree	-	-	-	-1.002*** (0.307)	-0.636*** (0.231)	-0.366*** (0.113)	-1.040*** (0.311)	-0.689*** (0.226)	-0.352*** (0.114)	-0.416 (0.332)	-0.140 (0.211)	-0.283** (0.147)
# of observations	710	710	710	490	490	490	555	555	555	704	704	704
Adj. R2	0.18	0.15	0.16	0.20	0.19	0.12	0.19	0.18	0.13	0.05	0.04	0.05

Notes:

1. Structure of workfile is dated panel data; the identifier variables are 'Year' and 'Department'
2. Standard errors in parentheses
3. GLS weights: period weights
4. All regressions include an intercept; not shown in table
5. *p<0.1; **p<0.05; ***p<0.01

■ Appendix 4: Determinants of Failure by School Grade Level

	Pre-primary, Primary			Secondary			Primary, Secondary			All levels		
	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women
Basic utilities	1.386 (1.163)	0.856 (0.757)	0.506 (0.440)	-4.894 (8.016)	-3.284 (7.282)	-2.033 (2.439)	-15.016** (7.945)	-9.196 (6.792)	-6.222** (2.606)	13.178** (5.835)	8.602** (3.965)	4.463** (2.358)
Classrooms	0.071*** (0.021)	0.039*** (0.014)	0.031*** (0.008)	-0.008 (0.104)	0.032 (0.095)	-0.033 (0.032)	-0.011 (0.108)	0.035 (0.092)	-0.042 (0.035)	-0.006 (0.055)	-0.003 (0.038)	-0.001 (0.022)
Sports fields	-0.607*** (0.210)	-0.364*** (0.136)	-0.243*** (0.079)	-2.091*** (0.528)	-1.615*** (0.480)	-0.462*** (0.161)	-2.598*** (0.531)	-1.905*** (0.454)	-0.680*** (0.174)	0.451 (0.307)	0.242 (0.209)	0.180 (0.124)
Computer rooms	-1.200** (0.502)	-0.788** (0.327)	-0.433** (0.190)	-0.656 (3.104)	0.131 (2.820)	-0.926 (0.945)	3.255 (2.825)	2.167 (2.415)	1.016 (0.926)	-2.880 (1.803)	-1.123 (1.225)	-1.606** (0.728)
Laboratories	-	-	-	5.136*** (1.262)	3.666*** (1.147)	1.368*** (0.384)	4.301*** (1.259)	3.198*** (1.076)	1.071** (0.413)	-2.844*** (0.746)	-2.395*** (0.507)	-0.538* (0.301)
Libraries	-0.689 (0.935)	-0.446 (0.608)	-0.223 (0.354)	-8.896** (4.060)	-6.616* (3.688)	-2.056* (1.235)	-9.023** (4.210)	-6.419* (3.598)	-2.587* (1.381)	7.988*** (1.839)	4.002*** (1.249)	3.613*** (0.743)
Urban school	1.007***	0.776***	0.248*	19.540***	14.251***	5.178***	20.299***	14.450***	5.816***	17.408***	11.502***	5.748***

	(0.383)	(0.249)	(0.145)	(2.223)	(2.019)	(0.676)	(2.266)	(1.937)	(0.743)	(1.321)	(0.898)	(0.534)
Public school	1.386	1.023	0.395	18.407**	13.819*	4.590*	22.785***	16.350***	6.385***	15.510***	10.043***	5.342***
	(1.104)	(0.718)	(0.418)	(9.026)	(8.199)	(2.747)	(3.704)	(3.166)	(1.215)	(1.246)	(0.846)	(0.503)
Humanistic degree	-	-	-	2.545***	1.783***	0.737***	2.677***	1.811***	0.852***	-0.950*	-0.224	-0.687***
				(0.556)	(0.505)	(0.169)	(0.554)	(0.474)	(0.182)	(0.561)	(0.381)	(0.226)
# of observations	710	710	710	490	490	490	555	555	555	704	704	704
Adj. R2	0.05	0.05	0.05	0.25	0.18	0.18	0.25	0.19	0.18	0.25	0.24	0.20

Notes:

1. Structure of workfile is dated panel data; the identifier variables are 'Year' and 'Department'

2. Standard errors in parentheses

3. GLS weights: period weights

4. All regressions include an intercept; not shown in table

5. *p<0.1; **p<0.05; ***p<0.01