Does attending a public or private university make a difference for students in Colombia?

ABSTRACT

Abstract: In this paper, we explore the difference in quality between public and private higher education institutions (HEIs) in Colombia. We test whether the differences in the national exam that measures student performance (Saber Pro) between public and private institutions is statistically significant by employing a propensity matching score approach based on common financial characteristics to avoid issues of selection bias. The results indicate that the difference in student performance between public and private institutions is positive and statistically significant. There is evidence that students in private HEIs perform better in most areas of the Saber Pro than their public counterparts. This performance difference can be attributed to the substantial differences in the patterns of teaching expenditures and income per student between public and private HEIs. The results are robust, since we controlled for statistical differences between private and public universities in terms of growth of revenue, number of undergraduates, number of full-time professors, and income per student by using propensity matching estimators for counterfactual samples.

I. INTRODUCTION

During the 1960s and 1970s, the traditional model of Latin American public higher education institutions (HEIs) was primarily centered on the pillars of autonomy from government control and the role of the HEI as a political agent in societal change. However, during the following decades, this model was abandoned mainly due to the deterioration in quality and a lack of governance in public HEIs (Bernasconi, 2008). These governability problems and the perceived sensation of chaos among public HEIs helped indirectly to

increase student enrollment in private sector HEIs in the region. In the specific case of Colombia, in the national higher education system, private HEIs are responsible for mass enrollment, and access to public universities is restricted for the majority of the student population (Geiger, 1988). Students who enroll in public universities tend to have better academic records, and students who are excluded generated the excess demand that fueled the growth of private HEIs. However, in the last two decades, private and public universities in Latin America (and Colombia is not an exception) have migrated to the U.S. research HEI model (Bernasconi, 2008), in which quality is measured in terms of output, such as scientific impact, student performance and graduate employability, among other indicators. The quantitative indicators generated by these quality measures are used by regulatory government agencies to assign financial resources to public and private HEIs (Breneman, 1993; Williams, de Rassenfosse, Jensen & Marginson, 2013).

The method proposed for analyzing a national higher education system that has a mix of public and private universities such as Colombia should focus on the following: 1) the differences between public and private universities that comprise the system, 2) the consequences of these differences, and 3) how the consequences of the differences can be encompassed in public policy to enhance the impact of higher education as a whole (Geiger, 1988). In Colombia, as of 2013, approximately 1,511,000 students were enrolled in 145 HEIs. Public universities accounted for approximately 40% of the total student enrollment and 45% of the total operating income. Of the 41 public universities in Colombia, four receive 45% of the public operating income but only account for only 20% of the total public student enrollment. In addition, the four biggest public universities receive 60% of the total public financing. The four biggest private universities receive 22% of the private operating income and are responsible for 12% of the private student enrollment. Most private university income

is derived from tuition (Nota, 2015). This trend is similar to that in other countries in Latin America where 65 public universities account for half of the student enrollment. Public HEIs usually rank better in terms of research output and postgraduate teaching than their private counterparts (Arocena & Sutz, 2005).

One of the characteristics of the Colombian public system is its selectivity in terms of student enrollment, which leaves a huge gap between supply and demand for higher education. During the 1990s and 2000s, student enrollment around the world increased dramatically. In Colombia, tertiary enrollment increased 195% from 1999 to 2013 (UNESCO, 2015). In Colombia, the gap between excess demand and lack of supply was covered by private universities that have different levels of quality. One central criticism regarding the growth of private HEIs, similar to their counterparts in other countries, is that much of the growth was achieved by offering programs of dubious quality usually targeted to the low-income population (Cellini, 2012).

The consequences of the involvement of the private sector versus the public sector is widely discussed in the higher education literature. Those who object to the massification of higher education by the private sector usually argue that by treating higher education as a commodity the general welfare of society is put at risk because of the negative impact that market forces have on the quality of the education imparted due to profit-seeking activities. However, critics of public universities often argue that public HEIs are not truly public because they fail to fulfill the mission of providing a "public good" in the pure sense of the word due to selective student enrollment. Therefore, if higher education is a public good, then all members of society should have access to higher education independent of their academic credentials. As this is not the case in Colombia as in other countries of the world, private universities play an important societal role by fulfilling the excess demand that public

universities are unable to fulfill (Arocena & Sutz, 2005; Gomes, Robertson & Dale, 2012; Longden & Bélanger, 2013; Torres & Schugurensky, 2002).

However, some private institutions have become world class. Many scholars agree on a hybrid system in which a national system benefits from having public and private HEIs. The most compelling argument in favor of the "third way" is that for national governments find it easier to regulate HEIs than to directly manage them. Therefore, in the hybrid system governments are responsible for enacting regulation that enhances the quality of HEIs through various measures of standardized student performance (Altbach & Salmi, 2011; Jamil, 2007; Patrick & Stanley, 1998). Because national governments are still a major source of direct and indirect financing for public and private HEIs, enforcing regulation is relatively easy. If HEIs want to have access to these resources, the HEIs have to comply with government requirements for quality or performance (Alexander, 2000).

In Colombia, one direct output of teaching quality is the national exam that measures student performance, the Saber Pro, a mandatory prerequisite for graduation in any discipline. The exam measures general competencies, as well as specific competencies based on the student's major. This study focuses on the five general competencies common to all programs: critical reading, civic competencies, quantitative reasoning, English as a foreign language, and written communication. The only other country that has a similar exam is Brazil, and as in Brazil, the regulatory authorities in Colombia use the exam as a measure for ranking HEIs in terms of quality (ICFES, 2009; Pedrosa, Amaral & Knobel, 2013).

Although national exams that measure student performance are not the only measure of graduate quality, they are a reasonable proxy quality indicator by which regulatory agencies can rank HEIs' output in terms of teaching quality. Many public HEIs that ranked lower than private HEIs on this quality measure contend that certain variables such as student

socioeconomic status, flexibility of the governance systems, and financial differences are not considered. However, most of the public HEIs that criticize the system argue that the main cause is the increased financial restriction compared to that of their private counterparts (Semana, 2015).

In Colombia, as is common in most parts of the world, resources, in the financial sense of the word, are an important determinant of quality. In the context of quality assurance in higher education, financial strength extends beyond accounting measures and should be linked to other measures of quality, such as students and academic personal-quality conditions. A legal mandate issued by a regulatory body in 2014 made it clear that "the net income surpluses should be reinvested in the core functions of the institution" (CNA, 2014, p.13). HEIs that do not comply with the mandate will not be eligible for government financial aid programs in the short term, and the HEIs' accreditation could be revoked in the long term.

Therefore, the main objective of this paper is to investigate whether the differences between public and private HEIs in selected determinants of student performance are statistically significant when controlling for similar financial characteristics to account for confounding effects between public and private institutions in terms of financial strength. The remainder of the paper is organized as follows: In section II, we describe the data used, in section III, we explain the method, in section IV, we present the results, and in section V, we conclude.

II. DATA

For this study, we merged three datasets. The first dataset is the Colombian Grand Report of HEIs 2013 (the first of its kind available to the public), which was launched by a local economics magazine called *La Nota*. The report provides financial information for the 2013 fiscal year for 95 private and 50 public HEIs. The report provides detailed information

about the revenue, operating expenses, earnings before interest expenses, net income, assets, equity, liabilities, number of students, and number of academic personnel and their type of contract (full-time, part-time, or adjunct lecturer). The report included other operational financial indicators, such as teacher expense per student, assets per student, operating expenses per student, and tuition payments per student (Nota, 2015). The second dataset consists of the 2012 and 2013 results for the Saber Pro. This dataset contains information on the Saber Pro results for all 205 public and private HEIs that grant undergraduate degrees. The dataset contains categorized information about the average results per program and the number of students who took the test in a particular year and reports the results for the five competencies. In addition, all HEIs are ranked in quantiles in order to compare different populations; 5 is the highest score and 1 is the lowest for critical reading, civic competencies, and quantitative reasoning. In English, proficiency is ranked in terms of letters, with A− the lowest level and B+ the highest[1]. Finally, written communication is ranked at eight levels, with N1 the lowest and N8 the highest (ICFES, 2013).

To merge the two datasets and obtain comparable measures, we averaged all the scores in all the programs for each HEI. In addition, to control for different population sizes, we estimated the quantiles, proficiency in English, and the written communication levels in percentages. The third dataset is the historical student dropout rate reported by all HEIs from 2000 to 2014. This information was obtained from the National System for the Prevention of Desertion in Higher Education (SPADIES) provided by the Ministry of Education (MEN, 2015). After we merged the three databases, the final database consisted of 123 institutions (82 private HEIs and 41 public HEIs), and of these institutions, 28 have high quality

[1] Colombia uses the common European framework or references of languages.

accreditations, and 95 are non-accredited. Table 1 presents the descriptive statistics of the final sample.

[Insert Table 1 about here]

The average revenue of HEIs in 2013 was 83,616 million Colombian pesos (COP; approximately USD 45 million). The average operating expenses were COP 75,875 million (USD 41 million); approximately 49% was for teacher expenses and 39% for administrative expenses. The average net income was COP 7,342 million (USD 4 million). The average assets were COP 213,617 million (USD 115 million). The average undergraduate population was 8,515 students, and the average income per student at the national level was COP 9.39 million (approximately USD 5,000). The large difference between the tuition revenue and the total revenue is explained by direct public transfers to public universities, which also explains the difference between income per student and tuition income. The average public transfer for public HEIs was about COP 73,938 million (USD 39 million). The highest public transfer was USD 408 million, and the lowest USD 1 million. Finally, the average score on the Saber Pro exam was 10.10; scores ranged from 11.60 to 9.29. Any score above 11 was Excellent, a score from 11 to 10.7 was Very Good, a score from 10.6 to 10.3 was Good, and a score below 10.3 was Below Average (Sanchez, 2011).

III. MODEL AND VARIABLES

To estimate the impact of financial characteristics on the Saber Pro exam results, we ran the following least squares regression with the natural logarithms of the dependent and explanatory variables with Newey-West corrected errors:

$$\ln SP2013_t = \alpha_t + \beta_1 \ln E_t + \beta_2 \ln L_t + \beta_3 \ln OTI_t + \beta_4 \ln T_t + \beta_5 \ln AR_t + \beta_6 \ln TE_t + \beta_7 \ln AE_t + \beta_8 \ln NI_t + \varepsilon_t \quad (1)$$

where t represents time, $SP2013_t$ is the score for the 2013 Saber Pro exam for each HEI, E_t is the amount of equity reported in the balance sheet for each HEI in the sample, L_t is the liability reported in the balance sheet for each HEI, OTI_t is the revenue for each HEI that comes from sources other than tuition, public transfers, or academic rights at time t, T_t is the revenue for each HEI that comes from tuition, AR_t is the revenue for each HEI that comes from academic fees other than tuition, TE_t is the operating expenses for each HEI related to expenses for academic personnel, AE_t is the operating expenses for each HEI related to administrative expenses, and NI_t is the reported net income for each HEI.

We disaggregated the total revenue and the operating expenses in order to observe the effect that each source of income or major item of expense had on the 2013 Saber Pro score. We also used the accounting identity (equity + liability = assets) to account for the effects of the capital structure of each HEI on the score.

In the next step, we used the variables from equation (1) to obtain the implied probability of being a public institution by using the following logit form:

$$\Pr(D_{public,t} = 1 \mid X_{i,t}) = (1 + \exp(-\alpha_o - \beta_{i,t} X_{i,t} - \varepsilon_{i,t}))^{-1} \quad (2)$$

where $D_{public,t}$ is an indicator function that takes the value of (1) if the HEI is public or zero (0) otherwise, and $X_{i,t}$ is a vector that contains all the explanatory variables from equation (1). Once we obtained the coefficients of interest and the predicted probabilities of the cumulative standard logistic distribution ($\Pr(D_{public,t} = 1)$) from equation (2), we computed the fitted cumulative probability to determine whether the observation was a public HEI (our "treated" variable) or a private HEI (our "non-treated" variable):

$$p_{i,t} = 1 - \Pr(\mathrm{D}_{public,t} = 1 \mid X_{i,t}) \tag{3}$$

Once we estimated these probability values for all the HEIs at each point in time, we implemented a matching procedure that we now describe.

The procedure for testing differences in spreads is based on the average treatment effect on the treated (ATET) framework. This procedure uses the probabilities obtained in equation (3) and the original data in Table 1 to select counterfactual values based on propensity score matching. This procedure has certain advantages over traditional sampling and predicted values difference testing as the procedure effectively addresses the problem of selection bias of comparable sample groups drawn from private HEIs. One key advantage of this method is that we can compare the actual values of descriptive data without forgoing the richness contained in the observable characteristics of a regression model. Moreover, with ATET it is possible to determine which private institutions are more closely related in terms of common financial characteristics to public institutions, which can have important implications for policy making.

This method was originally developed by Rosenbaum and Rubin (1983) to address the non-randomness of treated vs. non-treated groups in medical trials. Since then, the method has been applied to other social sciences, such as labor economics, policy research, and finance. In this paper, we modify the framework proposed by Nssah (2006) in how to apply ATET to economic policy programs and reframe it for this specific context.

Here, the "treated" group is characterized by a dummy that represents public institutions (D=1), and the "non-treated" dummy represents private institutions (D=0). Therefore, by dividing the data in this study into two vectors that represent the data of

public ($\{data_{public}\}$) and private ($\{data_{private}\}$) institutions by using the algorithm in equation (7), we have the following equation:

$$\{g_i\} = \left(\{data_{public}\} - \{data_{private}\}\right) \tag{4}$$

where the average value of the vector $\{g_i\}$ is equal to the ATET. In addition, if we assume that there is unit homogeneity,[2] we can rewrite $\{g_i\}$ in the conditional probability form, where:

$$ATET = E\left(\{g_i\}|X, D=1\right) = E\left(\{data_{public}\}|X, D=1\right) - E\left(\{data_{private}\}|X, D=0\right) \tag{5}$$

and where X is the vector of common observable characteristics represented by the explanatory variables from equation (2), and the averages of $E\left(\{\Delta\%y_1\}|X, D=1\right)$ and $E\left(\{\Delta\%y_0\}|X, D=0\right)$ represent the mean of the "treated" group and the counterfactual mean of the "non-treated" group, respectively, or, in this setup, public and private HEIs. ATET using propensity-matching estimators represents an interesting framework for testing for differences because the method yields strong estimates under the assumption of conditional independence (Abadie et al., 2004). The assumption can be formally defined as:

$$\left(data_{public}, data_{private}\right) \perp D|X \tag{6}$$

In other words, conditional on observable characteristics (X), participation (D) is independent of the potential outcomes of $\left(data_{public}, data_{private}\right)$. To be in line with the principle of conditional independence, the idea behind propensity matching is to randomly

[2] Unit homogeneity refers to the fact that participants cannot choose to participate in the experiment; therefore, the experimental group is composed of volunteers and non-volunteers. There is no bias based on the willingness of the participants to be part of a given experiment.

select a sample from the public (non-treated) HEIs that most closely resembles the characteristics of the sample in the private (treated) HEIs. In other words, conditional on the common variables, the counterfactual observations of the private institutions will be the ones that more closely resemble the observations of public HEIs in terms of conditional variance. As the counterfactual group is selected randomly based on the closest characteristics with a treated observation, any source of endogeneity due to selection bias is addressed effectively.

Using the probability values from equation (3), we implemented the algorithm in equation (7) to find the vector with nearest neighbor matching estimators:

$$c(p_{\text{matched},t}) = \left\{ j \left| \min \left\| p_{public,t} - p_{private,t} \right\| \right. \right\} \tag{7}$$

where $c(p_{\text{matched},t})$ represents the vector of matched accredited and non-accredited spreads based on the nearest difference propensity scores, which are simply one minus the cumulative probabilities obtained using equation (3), where (p_{public}) are the cumulative probabilities for the observations for public institutions, and (p_{private}) are those of the private HEIs. The vector that represents private HEIs ($\{data_{private}\}$) is constructed by selecting the private institution data that match the corresponding data points of the p_{private} cumulative probabilities obtained with equation (7). Therefore, we can find evidence of a difference between the data for public and private HEIs by testing whether the average of the matched vector $\{g_i\}$ is statistically significant via ANOVA test where the null of no differences in a certain vector versus the alternative is formally defined as:

$$\begin{aligned} H_0 &: \overline{data_{public}} = \overline{data_{private}} \\ H_1 &: \overline{data_{public}} \neq \overline{data_{private}} \end{aligned} \tag{8}$$

In this hypothesis, $\overline{data_{public}}$ and $\overline{data_{private}}$ are the mean values of the observations in the different data vectors $\{data_{public}\}$ and $\{data_{private}\}$ according to the matched propensity scores in vector $c(p_{\text{matched},t})$. In this way, we can observe the differences between public HEIs in the data compared to counterfactuals for private HEIs with similar financial characteristics. This approach is not new to the literature and has been employed previously to explore the question of student performance and the impact of financial aid on private universities in Mexico (Canton & Blom, 2010)

IV. RESULTS

In Table 2, the statistically significant financial characteristics in relation to the Saber Pro exam are equity and liabilities, and both characteristics have a positive sign. We used financing sources instead of current and fixed assets as a proxy for institutional assets because the data do not discriminate in fixed assets between property, plant, and equipment and intangible assets which can lead to errors in interpretation as the roles of both types of assets are important in universities. Therefore, by focusing on equity and liabilities, we have two proxy variables that represent institutional assets from the perspective of financing. In general, the bigger the Colombian HEIs in terms of assets, the greater the impact on the Saber Pro scores. The only component of revenue that is statistically significant is other revenue; it has a positive sign. In Colombia, other revenue in universities is represented by multiple sources, such as academic consultancy, income from university hospitals, etc., which are related to the engagement of the institution with its different stakeholders. One interpretation

is that HEIs with more engagement with multiple stakeholders can attract a better pool of students who, in turn, have better exam performance. The only statistically significant expense variable with a negative sign is administrative expenses. Thus, the more an HEI spends on administrative staff, the worse the students' performance on the Saber Pro.

[Insert Table 2 about here]

Tables 3 and 4 present the results from running equations (2) to (8). There was a difference between public (treated) and private (non-treated) selected random HEI counterfactuals in Colombia. Table 3 presents the differences between all the components of the Saber Pro 2013 exam. To test for robustness, the differences in the Saber Pro 2012 exam are presented in Table 4 in order to test for consistency.

[Insert Table 3 and 4 about here]

As shown in Panel A in Tables 3 and 4, students at private institutions performed better on all general areas of the exam in 2012 and 2013. What is even more important is that, on average, all private institutions performed in the Good range or above (> 10.3), whereas the public institutions performed Below Average (< 10.3) for the two years observed. This finding is robust because the selection of the private group of counterfactuals is random and based on similar financial characteristics. To control for the size of the population of public and private HEIs who took the exam, we analyzed the performance in quantiles according to the percentage of the population in a specific quantile. In Panel B, in Tables 3 and 4, in 2012 and 2013, 50.09% and 50.4%, respectively, of the private HEI population ranked in the highest quantiles (Q4 and Q5) in contrast to 38.2% and 37.86%, respectively, of the public HEI population. In 2012 and 2013, 43.11% and 42.34%, respectively, of the public HEI population ranked in the lowest quantiles (Q1 and Q2) in contrast to 31.22% and 30.37%,

respectively, of the private HEI population. In the writing quantiles results shown in Panel C for 2012 and 2013, there were statistically significant differences in 2013: 24.95% of public institutions were ranked above the N4, N5, and N6 levels (Good to Very Good) in contrast to 27.30% of private institutions. The difference between the type of institution in the highest quantiles (N7 and N8) was statistically insignificant. In 2012, the highest quantiles had statistically significant differences in which 76.93% of the public institution population and 85.48% of the private institution population ranked N4 (Good) or above. For English levels (Panel D), in 2012 and 2013, 22.96% and 22.10%, respectively, of the students at public institutions ranked above the B+ (Competent) level in contrast to 52.32% and 51.30%, respectively, of the private institution population. The differences between public and private institutions were statistically significant with the exception of the A2 English level in 2012 and 2013 where there was no statistically significant difference between the performances of public and private institutions. Previous studies have shown that socioeconomic status is an important determinant of student performance (Sackett, Kuncel, Arneson, Cooper & Waters, 2009). In Colombia, all citizens are assigned a socioeconomic status by the local goverments on a scale from 1 to 6 based on their place of residence where 1 is below the poverty line and 6 is upper middle class and above. These categories are used at the national level, and students at Colombian HEIs are required to report their status when they enroll in a higher education program by bringing supporting documentation such as place of residence. In the sample, the average socioeconomic status score was 2.32 for public universities and 3.1 for private universities, which is considerably higher. Therefore, there is a clear difference in socioeconomic status that can account for the difference in student performance among other factors for Colombian HEIs. To provide a more complete picture of the reasons behind the differences between the performance of public and private institutions, we performed the

same matching procedure for other quality indicators based on similar financial characteristics. In Table 5, we present the results of the differences among selected quality indicators.

[Insert Table 5 about here]

Table 5 yields some very interesting results about the differences in standard quality indicators of public and private universities. First, the difference between most quality indicators was statistically insignificant with the exception of the following four indicators: number of part-time professors, tuition per student, teaching expenses per student, and number of campuses. For the other quality indicators shown in Table 5, the difference between private and public institutions was not statistically significant. Certain quality indicators such as revenue growth and number of undergraduates were the same at both types of institutions; thus, one can infer that proportionally to the student population, they receive similar revenues. In addition, the difference between the number of full-time professors and adjunct lecturers was not statistically significant. However, private institutions had a higher number of part-time professors than public institutions (approximately 98 more on average), and the difference was statistically significant. For income per student, there was no statistically significant difference; this result can be explained by government transfers. However, when we analyzed tuition per student, private HEIs commanded a premium of COP 6.13 million (approximate USD 2,000 at the current exchange rate), and the difference is statistically significant. For teaching expenses per student, private HEIs expend on average COP 1.85 million (USD 600) more than public HEIs, and the difference was statistically significant. For the number of campuses, the difference was statistically significant between public and private institutions; on average, private HEIs have more campuses than public

HEIs. Finally, when we compared assets per student and teachers per student, which are proxy measures for the physical resources devoted to students, the difference between public and private institutions was not statistically significant.

Although public and private institutions have similar revenues, number of undergraduates, and teaching resources, the difference in student performance can be explained in part by the resources that are effectively spent on the student directly (teaching expenses). In addition, there is evidence than private HEIs rely more on part-time professors than public HEIs do, and this can have a positive impact on student performance. One reason is that part-time professors at private institutions likely devote most of their time to teaching activities instead of research, and this is an indication that more time in the classroom by professors can help improve student performance. Another variable of concern is the statistically nonsignificant difference between income per student in public and private HEIs. This is a clear sign that although public institutions receive the same amount of money in the form of government transfers, as reflected by income per student, as private institutions, public institutions invest substantially less money in the actual classroom than their private counterparts do in the form of teaching expenses. Although we do not deny the pivotal role that public HEIs in Colombia play in providing affordable education to low-income students; certain measures for improving the effectiveness of delivery could help reduce the disparities between student performance in private and public universities. One possible suggestion is tying public funding to student performance for public and private HEIs as in Chile, where funding is allocated based on a series of quality indicators that emphasizes the coherence and alignment of institutional objectives directly with student performance (de Fanelli, 2014).

V. CONCLUSIONS

By using a propensity-matching estimator approach, we tested for statistically significant differences between public and private HEIs in Colombia. The counterfactuals among private HEIs were randomly selected based on similar financial characteristics to avoid selection bias. The results show that there is a positive statistically significant difference in performance on the national exam that measures student performance (Saber Pro) between students at private and public institutions. The difference can be attributed to other statistically significant differences in quality indicators such as the number of part-time professors, tuition per student, and teaching expense per student. There is evidence that students at private Colombian HEIs perform better in most areas than students at public HEIs do. However, there were no significant differences between private and public universities in the growth of revenue, number of undergraduates, number of full-time professors, and income per student.

In Colombia, to strengthen the quality of the education provided to students at public and private HEIs, these findings can serve as the basis for a more in-depth discussion about how public resources are being distributed. Ultimately, the state is also responsible for ensuring minimum standards of student performance. One way to enforce quality is to ensure measures that link student performance to student funding for private and public HEIs.

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Table 1-Descriptive statistics of selected Colombian HEI indicators for 2013

	Revenue	Tuition	Academic Rights	Operating Expenses	Administrative Expenses	Teaching Expenses	Net Income
Mean	83,616.07	42,091.06	3,065.49	75,875.76	29,134.76	37,174.39	7,342.81
Median	42,038.00	21,479.50	1,712.00	36,932.50	14,424.00	19,881.00	3,293.50
Maximum	1,188,639.00	385,839.00	22,077.00	1,114,074.00	426,831.00	240,897.00	94,303.00
Minimum	628.00	749.00	2.00	24.00	54.00	205.00	-15,384.00
Std. Dev.	129,491.59	57,183.67	3,657.98	122,704.58	49,518.68	46,485.37	13,121.34
Skewness	5.34	3.40	2.42	5.26	5.25	2.41	3.38
Kurtosis	40.86	17.84	10.18	39.81	37.89	9.36	18.46
Observations	145	142	127	144	143	140	144

	Assets	Current Assets	Equity	Liabilities	Current Liabilities	Full-Time Professors	Number of Adjunct Lecturers
Mean	213,617.00	56,364.14	163,385.30	44,964.72	24,065.28	264.00	434.99
Median	93,492.50	26,921.50	58,911.00	16,306.50	12,470.00	159.00	313.00
Maximum	3,515,611.00	650,328.00	3,420,434.00	582,046.00	220,705.00	2,244.00	4,202.00
Minimum	476.00	13.28	748.00	362.00	6.00	1.00	11.00
Std. Dev.	402,151.40	97,895.80	359,384.40	84,139.49	34,499.23	327.71	542.40
Skewness	5.03	3.85	6.09	4.42	3.11	3.00	3.96
Kurtosis	36.09	20.52	50.33	25.50	15.38	14.76	24.26
Observations	144	144	144	144	144	129	123

	Part-Time Professors	Students per Teacher	Tuition per Student	Number of Undergraduate Students	Assets per Student	Operating Expense per Student	Teaching Expense per Student
Mean	115.81	16.62	5.27	8,515.67	7.20	8.81	4.55
Median	54.00	14.00	4.47	4,915.00	3.95	6.80	3.40
Maximum	1,358.00	162.00	22.56	56,447.00	130.80	76.44	76.44
Minimum	0.00	1.84	0.55	38.00	0.11	0.70	0.19
Std. Dev.	175.44	15.64	4.21	9,716.66	13.33	8.25	6.85
Skewness	3.86	6.68	1.44	2.47	6.59	4.62	8.76
Kurtosis	23.89	59.06	5.32	10.65	56.77	34.62	91.43
Observations	118	133	142	135	140	140	135

Table 1-Continued

	Income per Student	Number of Campuses	Score Saber Pro 2012	Score Saber Pro 2013	Public Transfers (Public only)	Dropout Rate 2013
Mean	9.39	2.20	10.12	10.10	73,938.13	15%
Median	7.52	1.00	10.03	10.05	43,580.50	14%
Maximum	60.63	22.00	11.54	11.60	763,527	35%
Minimum	1.31	1.00	9.27	9.29	1,838	0%
Std. Dev.	7.28	2.98	0.42	0.40	117,963.5	6%
Skewness	3.25	4.59	0.88	1.06	4.47	60%
Kurtosis	19.90	27.58	3.97	4.74	25.79	4.28%
Observations	140	145	129	123	48	125

Note: All financial data in Table 1 are in millions of Colombian pesos (1USD = 1,869 on average in 2013). Tuition is the part of the revenue that comes from tuition payments. Academic rights are the part of total revenue that comes from sources such as graduation fees, sport activities fees, etc. Similarly, administrative expenses and teaching expenses are the parts of the operating expenses that correspond to payments to administrative staff and academic personnel. Current assets is the part of the assets that is cash, temporal investments, or can be converted to cash in less than one year, on the other hand, current liabilities is the part of liabilities such as short-term loans and accounts payable that have to be paid in less than one year. Tuition per student is a part of total income per student, and corresponds to the income that comes from tuition payments.

Table 2-Base regression of common financial characteristics and their effect on the Colombian national exams of student performance (Saber Pro)

Financial Characteristics	**Saber Pro 2013**
Equity	0.0091***
	(0.0030)
Liabilities	0.0071*
	(0.0038)
Other Revenue	0.0051***
	(0.0018)
Tuition Revenue	0.0053
	(0.0047)
Academic Fees Revenue	-0.0025
	(0.0035)
Teaching Expenses	-0.0033
	(0.0051)
Administrative Expenses	-0.0084*
	(0.0049)
Net Income	-0.0001
	(0.0011)
R-squared	0.2692
Adjusted R-squared	0.2020
S.E. of regression	0.0367
F-statistic	4
Probability (F-statistic)	0.0004

Note: In Table 2, we present the results obtained by running equation (3) where the natural logarithm of the financial characteristics of equity, liabilities, other revenue, tuition revenue, academic fees revenue, teaching expenses, administrative expenses, and net income of all the Colombian HEIs for 2013 act as explanatory variables for each HEI's results in the national exams of student performance (Saber Pro) in 2013.

Table 3-Significant effect on the difference of selected indicators between public and private Colombian institutions for Saber Pro 2013

Saber Pro 2013-General areas

PANEL A	Public	Private	Difference	p.value
Civic Competencies	10,02	10,31	-0,29	0,015**
Written Communication	10,09	10,32	-0,23	0,006***
English	10,13	10,97	-0,84	0,000***
Critical Reasoning	10,20	10,51	-0,32	0,010***
Quantitative Reasoning	10,05	10,41	-0,36	0,006***
Total Saber Pro	10,10	10,51	-0,41	0,002***

Saber Pro 2013-Quantiles according to performance

PANEL B	Public	Private	Difference	p.value
Q1 (Lowest)	22,69%	14,56%	8,14%	0,003***
Q2	19,65%	15,81%	3,84%	0,009***
Q3	19,80%	19,23%	0,57%	0,381
Q4	18,99%	22,42%	-3,43%	0,003***
Q5 (highest)	18,87%	27,98%	-9,12%	0,006***

Saber Pro 2013-Writing Quantiles

PANEL C	Public	Private	Difference	p.value
N1 (Lowest)	39,48%	28,41%	11,06%	0,002***
N2	20,33%	23,41%	-3,08%	0,004***
N3	14,24%	19,63%	-5,39%	0,006***
N4	11,75%	10,95%	0,80%	0,049**
N5	9,28%	11,19%	-1,92%	0,000***
N6	3,96%	5,16%	-1,20%	0,011**
N7	0,94%	1,21%	-0,28%	0,109
N8 (Highest)	0,04%	0,03%	0,00%	0,509

Saber Pro 2013-English Levels

PANEL D	Public	Private	Difference	p.value
A- (Lowest)	27,38%	12,94%	14,44%	0,000***
A1	33,87%	19,55%	14,31%	0,000***
A2	16,65%	16,21%	0,43%	0,692
B+	6,89%	23,16%	-16,26%	0,000***
B1 (Highest)	15,21%	28,14%	-12,92%	0,000***

Note: In Table 3, we present the results obtained from running equations (2) to (8). The column difference denotes the Average Effect on The Treated or the difference between public (treated) and private (non-treated) institutions that compose our sample paired by common financial characteristics. Q1 represents the worst performing students in the test as part of the total population that took the test in 2013 and Q5 represents the best performing students. The writing quintiles and the English levels also represent the students as a percentage of the population that took the test with N1 being the lowest and N8 the highest score in writing and A- the lowest performers and B1 the highest performers in English. *** 99%, **95%, *90% significance level.

Table 4-Significant effect on the difference of selected indicators between public and private Colombian institutions for Saber Pro 2012

Saber Pro 2012-General areas

PANEL A	Public	Private	Difference	p.value
Civic Competencies	10,10	10,40	-0,03	0,021**
Written Communication	10,25	10,54	-0,28	0,001***
English	10,13	11,02	-0,89	0,000***
Critical Reasoning	10,08	10,36	-0,28	0,018**
Quantitative Reasoning	10,01	10,36	-0,35	0,003***
Total Saber Pro	10,11	10,53	-0,42	0,001***

Saber Pro 2012-Quantiles according to performance

PANEL B	Public	Private	Difference	p.value
Q1 (Lowest)	22,44%	15,02%	7,42%	0,007***
Q2	20,67%	16,20%	4,47%	0,003***
Q3	18,68%	18,69%	-0,01%	0,988
Q4	19,88%	22,93%	-3,05%	0,008***
Q5 (highest)	18,32%	27,16%	-8,84%	0,009***

Saber Pro 2012-Writing Quantiles

PANEL C	Public	Private	Difference	p.value
N1 (Lowest)	2,55%	1,18%	1,37%	0,001***
N2	5,36%	2,92%	2,44%	0,000***
N3	15,18%	10,42%	4,76%	0,000***
N4	28,45%	25,94%	2,50%	0,039**
N5	25,04%	29,07%	-4,03%	0,000***
N6	16,02%	20,25%	-4,23%	0,002***
N7	6,53%	8,48%	-1,96%	0,037**
N8 (Highest)	0,89%	1,74%	-0,85%	0,004***

Saber Pro 2012-English Levels

PANEL D	Public	Private	Difference	p.value
A- (Lowest)	26,19%	12,38%	13,81%	0,000***
A1	35,18%	20,61%	14,57%	0,000***
A2	15,67%	14,78%	0,89%	0,522
B+	7,18%	24,42%	-17,24%	0,000***
B1 (Highest)	15,78%	27,81%	-12,03%	0,000***

Note: In Table 4, we present the results obtained from running equations (2) to (8). The column difference denotes the Average Effect on The Treated or the difference between public (treated) and private (non-treated) institutions that compose our sample paired by common financial characteristics. Q1 represents the worst performing students in the test as part of the total population that took the test in 2012 and Q5 represents the best performing students. The writing quintiles and the English levels also represent the students as a percentage of the population that took the test with N1 being the lowest and N8 the highest score in writing and A- the lowest performers and B1 the highest performers in English. *** 99%, **95%, *90% significance level.

Table 5-Significant effect on the difference of selected quality indicators between public and private Colombian institutions

	Difference in Quality Indicators-2013			
	Public	**Private**	**Difference**	**p.value**
Average Revenue Growth (2011-13)	11,8%	12,9%	-1,1%	0,468
Number Undergraduates	14441,48	15939,97	-1498,49	0,710
Number Full Time Professors	490,52	557,11	-66,59	0,654
Number Part Time Professors	103,76	201,32	-97,56	0,065*
Number Adjunct Lecturers	663,21	952,86	-289,64	0,990
Income per Student	8,37	9,94	-1,57	0,365
Tuition per Student	1,84	7,97	-6,13	0,000***
Operating Expense per Student	8,32	9,57	-1,26	0,365
Teaching Expense per Student	3,71	5,56	-1,85	0,006***
Teachers per Student	13,29	12,75	0,54	0,760
Asset per Student	7,21	6,04	1,17	0,599
Number of campuses	2,77	6,40	-3,63	0,029**

Note: In Table 5, we present the results obtained from running equations (2) to (8). The column difference denotes the Average Effect on The Treated or the difference between public (treated) and private (non-treated) institutions that compose our sample paired by common financial characteristics. In this table, we present some common measures of quality indicators for the year 2013. Financial indicators such as income per student and assets per student are stated in millions of pesos.