Impact of being admitted to high quality vs. low quality public universities on graduation rates, satisfaction and future earnings of university students in Ecuador.

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Abstract

The present study has been carried out with the objective of broadening the analysis of the Ecuadorian higher education system, to explore admission to quality public universities in relation to graduation rates, the level of future income and satisfaction with the chosen undergraduate program. The following experiment proposal, aims to propose a regression discontinuity model, which allows modeling the data accurately, taking as a continuous index the admission scores of the TRANSFORMAR exam, with a cutoff in the score needed to enter the desired university, from the databases found in SENECYT. The proposal consists of an exhaustive analysis of previous works related to the educational system, in order to formulate an econometric model, which allows to obtain empirical evidence about the impact of the quality of education on the level of future income, and the satisfaction of each student with the program of choice, allowing to generate a better decision making in the Ecuadorian educational system, based on the budget allocated to it.

1 Introduction

Access to higher education is of great interest to the population in general, since it affects the lives of individuals, communities and, therefore, societies. In Ecuador, as in many other countries, access to public higher education is an important pathway to social mobility and economic development. However, research has shown that students attending private schools are more likely to be admitted to public universities than those attending public schools. For example, in 2017, an analysis of student admission to the National Polytechnic School was conducted. This analysis showed that out of 1657 new students, 56% were from a private institution, and 44% were from public institutions [4].

This university stands out for having graduates mostly in technical careers, so the Vice Rector of ESPOL, pointed out that the wall of ESPOL's entrance qualifications is more easily surpassed by private schools that seem to have a better performance in the areas of the exam, which reveals an underlying problem in the medium education and not in the university [4]. This raises questions about the equity of the education system and the extent to which it provides equal opportunities to all students. Therefore, studying the probability of access to public higher education in Ecuador is an important topic that deserves further research.

In addition, it is relevant to broaden the study of the quality of education received by the individual in the public sphere, in order to understand the benefit that the educational system generates on personal growth and development. Given this, the points of study are taken as points of entry and the level of satisfaction that students and graduates have when studying in a university that guarantees a high degree of quality vs. those who are in universities that do not have such a high degree of quality. In Ecuador, the issue of access to higher education is particularly relevant due to the high demand for places in public universities and the limited resources available to support students from disadvantaged backgrounds. According to the head of Senescyt, Alejandro Rivadeneira, in 2021, 200,000 students were registered for the public university entrance exam and projected to more than 300,000 total enrollees, but there was room for only 120,000 applicants to the higher education system. However, there are significant disparities in access to higher education based on socioeconomic status and educational level. For example, a 2015 study found that students from higher-income families were more likely to enroll in higher education than those from lower-income families [4]. Thus further compounding the.

The need for a review of this issue is undeniable, yet the academic literature on the relationship between the quality of university education and subsequent academic achievement in college students is quite limited. A research agenda on the quality of universities and the impact on graduation rates, as well as on satisfaction and future earnings, is of great importance for both public policy makers and academia, since they can study these effects and propose changes in education. It is critical to understand the factors behind the graduation rates of quality public universities versus the rates of public universities that are not of high quality, since there is a possibility that better education will have a positive impact on future earnings and individual satisfaction. For this, it is necessary to carry out an exhaustive analysis, where the influence of educational quality on the individual can be evidenced, taking as a reference a series of studies carried out in the United States and Spain, given that within these, the effect of education on the quality of life of the individual can be measured, starting from the basis of the type of higher education that has been received.

To help fill the gap in this line of research, we propose to use a regression discontinuity model that allows for a more accurate assessment of the effect of admission grades on both academic and sociodemographic student outcomes. To this end, we propose to use admission scores as a continuous index and the cut-off score as a bench-

mark, to examine more precisely how university quality affects graduation rates, satisfaction with the program of study and future earnings of university students. A study focused on these topics may be important to reach conclusions related to the level of investment in higher education that is needed to raise the academic level of higher education institutions in the country, as this would achieve a more efficient use of state resources by achieving higher graduation rates. In addition, the return in state revenues from an investment in higher education can be explored. In Ecuador, understanding how the quality of universities influences the student experience and long-term outcomes is crucial to reduce social and educational gaps.

2 Literature review

The literature is vast in exploring the effects of admission cut scores on college graduation rates using regression discontinuity designs. Most of the existing studies show that the relationship between pre-college performance (admission test scores and preceding GPA) and subsequent college performance is fuzzy, with results showing positive, negative and mixed relationships between these two variables.

A study covering more than 25 countries conducted an exhaustive review of 53 publications from recognized databases such as Free Scientific Publication, Worldwide Science.org, and Directory of Open Access Journals (DOAJ), and found that 26 papers reveal a significant existence between admission scores and subsequent university performance, 4 academic articles indicate a negative relationship between these variables, 13 studies present ambiguous results, and the remaining 10 studies present differences in admission scores and university performance based on gender. In this review, it is evident that most of the pre-existing literature points to the fact that admission grades maintain a significant positive relationship with academic performance after university entrance. This would explain in part why in several educational centers in different countries the predominance of cut-offs in admission test scores as the main determinant for university entrance still continues.

These diverse results suggest that there are different approaches and applications to this topic. For example, a U.S. study explores the relationship between pre-existing undergraduate grades and the entrance exam and graduate school performance. The study analyzed 223 MPA students at the University of Arizona, divided into early career (less than 5 years of work experience), mid-career (more than 5 years of work experience) and graduate requirement exempt groups (in the sample they made up 2%), where the admission criteria were the Graduate Record Exam (GRE) and undergraduate grades, and these were used to find a correlation with students' academic performance in graduate school based on their GPA and graduation rates. The study found that these admission criteria, in conjunction with the undergraduate institution, are fairly certain predictors of subsequent academic performance in successfully completing a graduate program [2]. Thus, this article provides evidence in favor of cut-offs in admission grades and prerequisites as grades for subsequent good performance.

The analysis of the effects of standardized test scores and their relationship to academic achievement is of interest in different contexts and situations. Research conducted in China examines the impact of school quality on educational outcomes in rural areas of the country. Researchers Park, Hsieh, An. their study "Does School Quality Matter?: Evidence from a Natural Experiment in Rural China", conducted in 7 townships in Gansu Province, researchers Park, Hsieh, An., Park, Hsieh and An., in their study "Does School Quality Matter?: Evidence from a Natural Experiment in Rural China", use a regression discontinuity model to compare similarly situated students in terms of entrance exam scores that establish admission to China's top high schools (referred to as magnet schools). The results present interesting evidence of the quality of education in subsequent academic achieve-

ment. The study found that students who were close to the cutoff score for admission and attended these schools had a 9.4% lower chance of taking the college entrance exam, but if they did take it, they had an 18.47% higher chance of qualifying for college. This shows that educational quality can positively influence students' academic lives.

Similarly, the Selective Schools and Academic Achievement study offers other insights into the educational quality of elite schools and academic achievement in UK students. The research employs a quasi-experimental regression discontinuity model that uses data on entrance test scores as an exogenous source of variation in the probability of attending a selective school and estimates the causal effects of attending a selective secondary school in the UK on academic achievement. Attendance at these selective schools, yields interesting results. Given that although only the top 20% of students in the district are in these selective schools, and they create significant differences in educational quality between those who get in and those who do not, the regression discontinuities suggest that attending a selective high school has a small effect on university entrance qualifications, but that it has a large impact on course taking, and thus on university enrollment, and on potential future earnings in the labor market. These findings regarding the effects of attending educational units considered to be of high quality highlight the importance of exploring the long-term effects and not just immediate academic qualifications when assessing the impact of selective schools on college enrollment.

Analyses based on cut-off scores to determine entry to quality schools and graduation rates extend to diverse contexts, with controversial results. In Kenya, a study was conducted using a regression discontinuity model with test score data from KCPE administrative records (contains information on secondary school preferences, scores, gender, and elementary school) and KCSE (composite and subject KCSE score information for each student), as well as the school in which the student was enrolled at the time of the exam) from the Kenya National Examinations Council (KNEC) to explore whether attending these elite public schools (national schools) in Kenya translates to improved learning outcomes, and graduation rate [8]. The study comes up with quite interesting results given the reputation of these national schools in Kenya in terms of quality and value-added learning. The results show that the graduation rates of those who attended national schools are not very different from those who did not., but that students who managed to meet or exceed the established school admission cutoff scores were about 50 percent more likely to graduate from a national school compared to their peers who fell just short of the admission requirements. Thus the research in Kenya highlights the quality of schools to increase graduation rates, at least for individuals close to the cutoff for admission scores needed for entry to national schools.

It also shows evidence in favor of the effects of being admitted to the career of choice on academic performance. study was conducted in the Charlotte-Mecklenburg School District in North Carolina, where the impact of a public school choice lottery on college enrollment and completion was studied, and the results showed evidence of a significant increase in the academic performance of lottery winners who attend their first choice school, higher graduation and standardized test scores, as well as a greater likelihood of pursuing a college degree. This research shows positive evidence of being admitted to your first choice school.

As for satisfaction, although there is no clear consensus on how to measure it, it plays an important role in our lives. A study was conducted among criminology students and it was determined that although education as a whole does not have a relationship with career satisfaction, the perceived quality of the program of study does, and that in fact this satisfaction plays a very important role in the development in the area of study [10]. It is therefore of great interest to explore the role that satisfaction plays in the lives of college students, since satisfaction with the quality of the program of study may inspire

students to become better professionals and may even influence their subsequent earnings by having accumulated considerable human knowledge capital due to satisfaction with their undergraduate program.

In the same vein, there is evidence that the admission cut-off score also influences the performance of undergraduate students. A study in Portugal found that there may be an interesting relationship between these variables. It was studied at the University of Minho (which is a public institution) 1940 first year students enrolled in 2015, GPA at the end of the first year first year was determined as a dependent variable of the university admission score and by means of VCM (Varied Component Models) and RCM (Random Component Models) it was estimated that the relationship between these variables is in promecio 0. 567 per standard deviation and presents a variation depending on the field of study, the courses taken, and whether it was the university of first choice [5]. This points to a strong influence of pre-college requirements and subsequent performance at the university. In addition, the same study points to the importance of admission to the desired school. Since the paper also found that the students who chose the University of Minho as their first choice,and were admitted to it, presented a GPA of 0.141 standard deviations higher compared to their peers who did not have it as their first choice, this at a level of 10% of statistical significance. This relationship shows us that there is an influence on academic performance (measured in this case as GPA at the end of the first year), with acceptance into the first choice university.

Regarding the relationship of satisfaction between education and educational quality, we can highlight a study conducted in Spain, which is based on a European social survey with 2563 individuals in 2008, where there is a focus on the question of how happy you are, on a scale of 1 to 10, where there is an estimate divided into two steps, where the first shows that the average happiness of those who did not finish primary education is 6.91, while those with tertiary education is 8.6. In the second step, happiness is estimated with socioeconomic variables, where they find that age or health has a significant effect on happiness, as well as labor activity (being unemployed has a negative effect on happiness), and the other with income, where it is shown that education directly and positively affects income [1]. This presents relevant evidence that the level of education does affect happiness, through income and job position.

In the context of the influence of education on income, several studies have examined the relationship between education and the economic level of individuals. A study from the University of Berkley shows that it reflects relevant evidence on the influence of education on income. The study explores extensive literature on the topic as well as the US Census Bureau's March Current Population Survey, The US Department of Education, and pooled cross-sectional data from the 2006-2008 American Community Surveys, and finds a strong correlation between education and the economic status of individuals in the United States. The study shows that college graduates earn higher incomes and have lower unemployment rates compared to those without college degrees. Since it could be observed in the same study that during the great recession, adult-age individuals without a degree had an unemployment rate of 11%, 2.8% for individuals with a college degree, and 2% for individuals with degrees such as master's and doctoral degrees, the study shows that college graduates earn higher earnings and lower unemployment rates compared to those without college degrees. These findings support the idea that earning a degree is not only associated with higher earnings, but also with greater long-term job growth.

The literature similarly shows that better educated students tend to have higher incomes. According to Oreopoulos' study exploring the percentiles of the income distribution in 2011 for three educational levels (college, undergraduate, and graduate) of full-time workers aged 30 to 50, college graduates have a lower average salary than people with an undergraduate or gradu-

ate degree. For example, at the 50th percentile the earnings of college graduates alone are about $34,000, compared to 57,000$ for college graduates [9]. This study provides key evidence of the return of education on wage gains in the working world.

Admissions test cuts may not only help define future career success, but also future employment success, and thus future earnings. Research explores the database of the 1976 and 1989 cohorts of the College and Beyond Survey (C B), which contains data from 60 schools, and performs an analysis of the relationship between admissions and SAT scores. The results of this experiment showed that when examining the model data, it shows that there is a long positive correlation between high scores and their long-term wages, with attending a college with a 100-point higher SAT score leading to an increase of approximately 6 percent in earnings for both cohorts. So it is reflected that the quality of education, have a positive influence on salary, which deserves research efforts.

Overall, the studies presented provide strong evidence that college admission cut-off scores have a significant impact on academic performance and other long-term aspects, such as income and satisfaction. Students who are admitted to college with higher cut scores are more likely to perform well academically, graduate, earn higher incomes, and be more satisfied with their careers. It is important to note that these results may vary depending on the context in which they are developed, and it has been empirically demonstrated that the chosen university program and university system also play an important role. So these findings provide valuable guidance for policy makers in making decisions about university admissions practices, taking into account the size of the measured effect which varies from country to country, but overall is shown to be significant. These results could help by providing information on the importance of considering cut scores in the student selection process.

This study proposes to use the scores obtained in the public education entrance test, TRANSFORMAR, as the variable of interest in a regression discontinuity model to examine its relationship with various outcomes at the university level in Ecuador. Specifically, we seek to evaluate the impact of these scores on academic performance, measured through graduation rates, as well as on students' satisfaction with their undergraduate program and future earnings. The main objective of this research is to contribute to the existing empirical literature, because although the effect of admission scores on secondary education in developing economies has been extensively studied, there is a paucity of evidence at the tertiary (university) level in this context. Therefore, this study seeks to fill that gap and provide solid evidence on the effects of cut scores on academic performance, graduation rates, satisfaction, and future earnings in a developing economy such as Ecuador. In addition, the results of this study can be of great use to policy-making institutions in charge of standardized admission mechanisms, providing them with relevant information to improve their selection practices and processes.

3 Experimental design and econometric identification:

Public higher education in Ecuador is characterized by intense competition not only because of the large amount of demand, but also because of the low quality of supply (only 5 of the 30 public universities in Ecuador appear in the QS ranking). Therefore, analyzing the impact of having been admitted to a quality university on academic outcomes such as graduation rates is relevant to justify, for example, public budget increases in this sector. With this in mind, we propose to solve this question by using a Discontinuous Regression Design (DRD) using the data on admission to quality universities provided by the Secretariat of Higher Education, Science, Technology and Innovation (SENESCYT). The data come from the "TRANSFORMAR" test that is

compulsorily taken by high school seniors as a graduation requirement, and on whose result depends the admission of students to any of the 30 public universities in Ecuador.

Here we use a methodology similar to that presented in the paper Effects of School Quality on Student Achievement: Discontinuity Evidence from Kenya. This paper uses regression discontinuity with entrance exam scores as a continuous index to explore the effects of quality education, (provided by national schools presenting a minimum admission score) and graduation rates [8]. The DRD allows us to isolate quite clearly the local average treatment effect (LATE), since by analyzing students just above the admission threshold (Treatment Group) and students just below the admission threshold (Control Group); we are ensuring that, on average, the variables that could affect the probability of any individual being treated are balanced between the two groups. In other words, given the admission characteristic, the only variation between the two groups will be that induced by the treatment, which allows us to exploit this quasi-exogeneity with the use of this model.

3.1 Database construction

First, we define quality public universities based on their rating in the QS World QS Ranking [12] and in the SENESCYT category ranking [11]. These are:

1. Escuela Superior Politécnica del Litoral (ESPOL)
2. Escuela Politécnica Nacional (EPN)
3. Universidad Central del Ecuador (UCE)
4. Universidad de Cuenca (UCUENCA)
5. Universidad de las Fuerzas Armadas (ESPE)

Subsequently, we identified the students whose score in the "TRANSFORM" test allowed them to be admitted to one of these 5 schools. Importantly, we will take only those students who were admitted and actually enrolled in the first option they placed in the application form. Finally, we identify the students whose scores did not allow them to enter any of these 5 universities, but who were admitted and enrolled in the same degree program in one of the 25 remaining public universities of lower quality. Likewise, the students we use for the control group are only those who placed as their first choice in the application ranking the same degree program as the students in the treatment group. The latter ensures that we are analyzing the effect on individuals who are quite similar even in terms of unobserved variables.

Given the immense number of careers offered (1730 according to SENESCYT), we will focus only on the 5 most competitive [3], i.e.:

1. Medicine
2. Nursing
3. Business Administration
4. Law
5. Psychology

Additionally, we will collect demographic and socioeconomic information on the individuals in our sample for further robustness testing. This information is also provided by SENESCYT since students fill out a socio-demographic survey along with the exam.

Similarly, making use of information provided by the Servicio de Rentas Internas (SRI) [**sri_detail_2022**] on reported annual income, we match the control group and the treatment group with their reported annual income 2 years after graduation.

For the analysis of satisfaction with the undergraduate program we decided to use an approach similar to that of the study, making use of the information provided by the opinion pollster

Latinobarómetro on the happiness of Ecuadorians, we matched the control group and the treatment group with this variable one year after graduation. In particular, Latinobarómetro presents a categorical variable to measure happiness in the following form [7] : In general terms, would you say that you are satisfied with your life? Please indicate:

1. Very satisfied.
2. Quite satisfied.
3. Not very satisfied.
4. Not at all satisfied.

3.2 Econometric identification

To describe the relationship between graduation rates from public universities considered to be of high quality vs. those of low quality, and admission to these, we plan to use an OLS model. We will use a regression discontinuity model, based on the analysis in the book Experimental Economics: Method and Applications. [6] :

* Discontinuous regression model.

$$Y_i = \alpha_0 + \beta_T T_i + \beta_1 (x_i - c) + \beta_2 T_i (x_i - c) + \varepsilon_i \quad (1)$$

Where Yi corresponds to the academic outcome of interest (graduation rate, future earnings or satisfaction with the program of choice), Ti is a treatment dummy variable that takes the value of 1 if the individual was admitted and enrolled in his/her preferred career at a quality public university, Xi corresponds to the score obtained by the student in the "TRANSFORM" test and "C" corresponds to the minimum score for admission to the student's preferred career.

The parameter of interest is Bt which will allow us to identify the desired causal effect, while B1 and B2 are only added to control for any variation arising as a consequence of a departure from the cutoff. Finally, $epsilon_i$ is the idiosyncratic error that captures any other explanatory variable of the dependent variable and is assumed to be independent to the Ti treatment given the characteristics of the admission process, as explained above.

3.3 Robustness Tests

Taking advantage of the sociodemographic information provided by SENESCYT, we can test whether the variables are balanced between the two groups. That is, if the hypotheses of the t-tests for differences in means are not significantly rejected (at 5

4 Limitations

This ambitious research project proposes to explore the relationship between achieving enrollment in a quality university with respect to graduation rates, satisfaction and expected income. We have proposed it subject to the current resources to be able to develop it, but it still has limitations. One of the limitations of the study is precisely the Latinobarómetro survey, since not everyone will want to do it, and it would detract from our observations as well as the strength of the effect. Another limitation of the study is with respect to the individual regressions of the Yi, i.e. graduation rates, satisfaction and future income. Since an index could have been made with these variables, which would be easier to report, as well as to revise over time. In addition, our study focuses on the 5 most demanded university careers, so there remains a wide field of research to be explored in the rest of the careers offered in the Ecuadorian higher education system. Therefore, we recommend reviewing these limitations in future studies.

5 Expected Results

Given the existing literature in developing economies and the characteristics of the Ecuadorian higher education system and the labor market, it is expected that the results obtained through the regression discontinuity model will test the hypothesis that there will be a positive effect on graduation rates and on the future income of the students treated. However, caution should be exercised when assimilating these results, since they do not necessarily reflect the causality of educational quality, but rather other variables that we cannot control, such as contacts in the labor market, academic background, personality, among others. It should also be noted that significant results are expected in order to guide public policy makers. If they decide to be more generous in the cut and therefore expand the quotas in the careers of quality universities, there would be a positive return for the state, since there would be an increase in income by having a more educated population, since graduation rates would increase and satisfaction with the program of choice. All of which would create professionals with more tools for the working world, and therefore more sought after, which would generate a higher per capita income, and significant tax revenue for the government. If we obtain significant non-statistical results on passing or failing the quality college entrance exam in terms of graduation rates, satisfaction with the chosen program or future earnings, then we would know that they would be due to the reasons previously discussed. Especially because of the composition of the students who enter universities, since students who come from private schools tend to achieve higher scores on the entrance exams than those from public schools, so that other characteristics such as the academic curriculum, social environment, or personality, can influence graduation rates, satisfaction and salary, even more than the quality of the higher education center attended. So in itself, the difference in the educational quality of higher education institutions would be relevant when analyzing the college success of students as measured by graduation rates. It is highly probable that the academic background of students plays a much more important role in determining their performance in their academic life, their satisfaction and consequently their likelihood of graduating, as well as their future earnings. The pre-existing literature leads to this type of conclusion, but in the context presented in this study, the intuition is very robust given the characteristics of the Ecuadorian higher education system.

Regarding the impact on happiness, we hypothesize that treated students reflect more satisfaction with life. As previous evidence points out, this may arise as a consequence of the self-realization that individuals experience when reaching their goals, especially in ambitious scenarios such as admission to the most selective educational centers in the country.

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