

Degree Project

Level: Master's

Can an intervention increase access to higher education for disadvantaged students?

Quasi-experimental evidence from Peru

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Abstract:

Heterogeneity in the school education quality plays an important role for those who want to pursue a bachelor's degree in Peru since access to higher education is highly correlated with socioeconomic status. In that sense, an intervention for disadvantaged students took place for the first time in 2022 and was constrained to the assessment of a scholarship called “Beca 18”, the biggest scholarship that the public institution called PRONABEC addresses every year since 2012. The intervention included additional tools for a group of applicants: (i) full-time online classes for 2 to 4 months; (ii) an electronic device with an internet connection; and (iii) the admission exam payment fully covered up to 2 times. The objective of this thesis is to evaluate the effectiveness of this intervention in increasing the likelihood of the treated to access higher education through the 2022 “Beca 18” scholarship process. As the treatment was not randomly assigned, a control group was estimated using the Propensity Score Matching methodology based on individual characteristics. Results showed that there is no statistically significant effect of the intervention in the treated applicants and invite to re-evaluate its design and implementation.

Keywords: higher education, access, disadvantaged students, scholarship, Propensity Score Matching, impact evaluation, quasi-experiment.

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1. Introduction

The provision of education is a priority for a country because it develops valuable skills in people who receive it since they construct human capital in the process. Education brings private and societal benefits. First, it expands the possibility to increase individual incomes in the future and secondly, the benefits to society are higher productivity, less poverty, less criminal activity, and economic growth through knowledge production and research. In addition, social cohesion and parenting are also improved (Woessmann, 2016; Barr, 2020).

Furthermore, access and graduation from higher education is a possibility for social mobility toward a better socioeconomic status in society. Nevertheless, Peru is a country with a high level of inequality in terms of instruction in education. There is a considerable correlation between social background and the respective access to higher education because it is constrained to the socioeconomic status of the student's family (Guerrero, 2013); the higher the socioeconomic status, the higher the possibility to access to higher education. In that sense, social mobility becomes a difficult goal to achieve for the disadvantaged population whose odds are highly limited.

Most of the empirical work available has been focused on the academic achievement of Peruvian students. Thus, there is consistent evidence that supports the existence of cognitive gaps between advantaged and disadvantaged persons¹. These gaps appear early in life and can be conditioned by the socioeconomic status of the students during their childhood (Rentería, 2022; Jury et al., 2017). Moreover, the disadvantaged students live in poverty or extreme poverty conditions and face limitations to access higher education because in most cases, they have parents with primary schooling, which can influence them to not continue studying since they do not have access to information about the benefits of pursuing a bachelor's degree, and the high opportunity costs they face of using their time to study instead of working. Therefore, the constraints they experience are cognitive, financial, and informational.

As the value of education is high, and societies cannot afford a waste of talent, the Peruvian government implemented a scholarship called "Beca 18" in 2012, which is run by a public institution called National Programme for Scholarships and Educational Loans (PRONABEC, Spanish acronym). Its objective is to provide financial relief to outstanding

¹ To get an example, see Figure 1 on page 9.

students with disadvantaged backgrounds to access higher education by having full coverage of the fee payments and monthly living expenses.

The disadvantaged students seeking funding through PRONABEC are required to be admitted to the institution -university or institute- they are willing to study in to be ultimately assessed in the last stage of the scholarship process. Since admission to a higher education institution requires obtaining a high score on the entrance exam, it can be interpreted as a barrier to access because the lack of quality education they received during school and the high admission selectivity of some higher education institutions can lead to a regressive pattern in university enrolment in which only the better-off are admitted (Castro et al., 2016).

For that matter and giving the results in education achievement during the COVID-19 pandemic, throughout the 2022 scholarship call for “Beca 18”, PRONABEC implemented an intervention with the purpose of providing additional tools to some applicants to widen their possibilities of being admitted to higher education. The tools provided were (i) full-time online classes for two months but could be extended up to four months; (ii) an electronic device with an internet connection; and (iii) the admission exam payment fully covered up to two times. These benefits were given to the applicants of only two modalities² (out of eight) of the scholarship and were implemented for the second time in the 2023 “Beca 18” call.

The research question developed in this thesis is “Did the intervention for access to higher education through the 2022 “Beca 18” scholarship process increased the likelihood of the treated applicants of being admitted?” The effect expected is that the recipients had improved their probability to get admitted to a higher education institution and being awarded the scholarship (the former is a requirement for the latter). The aim of this thesis is to provide an evaluation of the effectiveness of the intervention in its first year of implementation and possible re-evaluation of the design, if necessary.

Important to highlight that the literature on the topic is focused on the results of academic achievement, attendance, graduation, or dropout rates (Gil and del Canto, 2012; Diagne and Wasmer, 2009; Melguizo et al., 2016; Naylor et al., 2013; Fack and Grenet, 2015). In this study, the data available make it not possible to consider those outcomes, however, there is no

² See Appendix A1 for further details.

previous evidence of an impact evaluation on access to higher education measured by the probability of getting awarded a grant within a scholarship process in the Peruvian context. That is the main contribution of this thesis.

Hence, to evaluate the results of the intervention, the database used is on an individual level and was provided by PRONABEC, the public institution that is in charge of conducting the scholarship process. The procedure to obtain the database is called “Acceso a la información pública” (translated to English: access to public information) which is supported by Law N° 27806 in Peru. The database indicates that in 2022 a total of 15,403 eligible students applied for the scholarship. From them, 1,041 received the treatment and 40% (418) of the treated were awarded one of the 5,000 scholarship grants available.

Of particular importance is that this intervention did not incorporate a control group in the design for logistical and ethical reasons. In that sense, the quasi-experimental methodology of Propensity Score Matching is used to simulate a control group to evaluate the effectiveness of this intervention through the estimation of a probit model. The choice of this methodology is based on the characteristics of the intervention and the variables available in the database.

As a result, we found that the intervention did not have a statistically significant effect on the probabilities of obtaining the scholarship, therefore, in the likelihood of the 1,041 treated applicants to access higher education in the 2022 scholarship process.

This thesis is organized as follows. The second section is a literature review where some results of previous studies are shown and discussed. Later, there is a section about the Peruvian context, where the academic achievement results, enrolment and graduation, and information about the scholarship intervention are presented. A fourth section of the theoretical framework is later introduced, followed by the empirical design where the data is described, the methodology is explained, and the results are presented and discussed. Finally, the last section of conclusions is displayed.

2. Literature review

In this section, we present previous studies about the characteristics of Peruvian students as well as the different interventions that have been implemented around the world to provide

support for access to higher education through financing. The results of evaluations to which they have been subjected are also presented.

There exist several studies that sustain that a rising number of students are not well prepared to start their training in post-secondary education. This is due to factors that are unsatisfactorily developed in the school-university transition. Some of the factors found by Nel et al. (2009) after analysing quantitative and qualitative information on 213 learners of 70 schools in South Africa are the perceived gap between the knowledge acquired in school compared to the required in university; inequalities and inadequacies experienced within the school system; unrealistic expectations of higher education; poor or inadequate academic, social, cultural, and emotional adaptation; and difficult financial circumstances. All these factors may have been intensified due to the effects of the COVID-19 pandemic, especially in Peru where schools were closed down.

In Peru, the circumstances an individual faces during the first year of his or her life are found to be responsible for at least one-third of the total variance in academic achievement by the age of eight years old (Rentería, 2022). This continues to be present during other stages of education. There is consistent evidence that students with low socioeconomic status have fewer possibilities to be successful during their university studies in comparison with students with higher socioeconomic status (Jury et al., 2017). What is more, the socioeconomic status during childhood has a correlation with higher education attendance by the age of 22 (Rentería, 2022).

The heterogeneous provision of school services in Peru leads to the conclusion that students from lower socioeconomic backgrounds have access to less qualified teachers, and poorer infrastructure and equipment (Naylor et al., 2013). Cueto et al. (2014) found that the Peruvian educational system is highly unequal in terms of quality of instruction. The author states that there is a correlation between the socioeconomic status and the opportunities to learn (OTL) in school which means that the quality of education that relatively poor children received reduces their OTL measured as a percentage of correct answers in teacher-provided exercises, curriculum coverage, feedback from teachers, and level of cognitive demand implicit in exercises.

All these out-of-decision circumstances that disadvantaged Peruvian students face during their school years provide them with inadequate and insufficient tools to meet not only the

challenge to get admitted to higher education but also their persistence and graduation probabilities. The intervention designed by PRONABEC had the objective to address this.

On the other hand, referring to the financial constraints encountered by disadvantaged students, the cost of post-secondary education is higher in developing countries than in developed ones. A study by Murakami and Blom (2008) found that the average out-of-pocket³ costs of tertiary education in Latin American countries are 60% of GDP per capita, while in high-income countries is only 19%. This gives additional importance to the scholarships and educational loans that PRONABEC administrates in order to provide access to higher education for Peruvian students whose possibilities to attend a fee-paying university are scarce.

Some interventions have taken place in Latin America and other parts of the world addressing the academic gap in the school-university transition and the financial aid availability. Here is listed a selection of them which have the objective to enhance access to higher education of a specific population and the results obtained by their evaluations.

A model installed in Chile by UNESCO is the propaedeutics. They have two stages. During the first stage, selected students are allowed to take courses in universities participating in the programme while still attending high school. They receive classes for at least 16 weeks and, as part of the second stage, have the opportunity to access directly to higher education institutions with a full scholarship if they obtain outstanding scores that place them in the top 5% of students upon graduation (UNESCO and Fundación Equitas, 2015). The first propaedeutic in Chile took place in 2007 and is composed of three components. The first one is academic, which has the objective to improve their academic skills to get admitted to a higher education institution. The second one is personal management, which allows them to work on motivation, leadership, and self-trust to reduce drop-off risk. Finally, the third component is related to their vulnerability as it articulates their families with the social protection system in coordination with the municipalities. In this way, they are granted an amount of allowance while studying.

³ “Out-of-pocket costs refer to the total education costs (education and living costs) net of student assistance (grants and student loans). The out-of-pocket costs represent what the family has to pay during the studies” (Murakami and Blom, 2008, pp. 18).

The second stage of the implementation of propaedeutics on the 2007 entry cohort in the Universidad de Santiago de Chile was evaluated by Gil and del Canto (2012) getting as a result that even though during the first year of their studies the participants got statistically significant lower results than their peers, during their second year they got graduated in 52% of the cases and the academic gaps were reduced. Results in the first year show the knowledge gaps they bring from school; however, the second-year results demonstrate the intellectual capacity of these students to catch up.

In Chile, the Ministry of Education (MINEDUC) designed, funds, and conducts a programme called Access to Higher Education Programme (PACE, Spanish acronym) that allows high school students from disadvantaged backgrounds with outstanding grades to get permanent support and preparation to be enrolled in one of the 29 Chilean higher education institutions participating in the programme. PACE, in coordination with the latter, ensures a set number of vacant places for these selected students. In this way, it guarantees not only access but also academic and psycho-educational support with the objective to reduce the academic and non-academic skill gaps. Since its first implementation in 2014, their participating students got access to higher education, on average, in 81.8% of the cases (Ministerio de Educación, 2022).

A study made by Cooper et al. (2022) on the effect of PACE analyses an unstratified randomized experiment for the 2010 cohort that selected 64 schools (4,953 students) out of 220 (14,936 students) as a treated group. Their findings showed that PACE had a positive effect on university enrolment and did not increase their dropout rate.

In France, Sciences Po University signed a special agreement in 2001 called *Conventions Education Prioritaire* (CEP) with schools from disadvantaged neighbourhoods. CEP is geographically targeted and has the aim to admit its outstanding students through a special process. The selected students receive academic support (integration camp and a tutor) and financial support (fellowship, housing, and books were covered). In addition to that, partner firms participate in recruiting them after graduation. Even though the academic performance of CEP students is not highly successful during the first semesters, they end up with a similar achievement to the other students once they graduate. Using data from the French Ministry of Education, Diagne and Wasmer (2009) evaluated the effects of the programme on academic

achievement from 2001 to 2006 finding that the most beneficiated schools were the ones with the highest proportion of deprived students.

In Colombia, a national-level subsidized loan program called ACCES (Spanish acronym for Access with Quality to Higher Education) has the objective to tackle the disparities in access to post-secondary education for low-income students. ACCES has the main purpose to reverse that the access to higher education favoured the highest income quintile in Colombia. A study by Melguizo et al. (2016) uses individual-level data from 2002 to 2012 to evaluate the programme and found that it increased in 20% the probability of a beneficiary student to be enrolled in college. Also, ACCESS reduced the dropout rates by 7% approximately.

In Canada, there is a randomly assigned merit-scholarship in a Canadian University as part of the Student Achievement and Retention Project (Project STAR) whose early impact was evaluated by Angrist et al. (2009) finding a positive influence in enrolment and persistence of studies particularly for disadvantaged female students (Melgrizo et al., 2016).

In the USA, another study done by Singell (2004) based on data from freshmen in 1997 and 1998 from the University of Oregon found that if need-based and merit-based grants and student loans had an increase of \$1,000, the impact would be an increase in the retention rate of 1.4% and 4.3%, respectively. There is more evidence in states in the USA where is developed bridging programmes with the aim of increasing academic achievement. Given that there is a gap in the academic preparation of underrepresented students, these types of programmes have high effectiveness (Naylor et al., 2013).

In France, need-based grant programs were evaluated on their impact on low-income student's college enrolment by Fack and Grenet (2015) who used individual-level administrative data to track enrolment and academic progress from 2008 to 2010 and found that grant beneficiaries have higher persistence and completion rates. Another finding was that a grant of 1,500 euros generated an increase in the enrolment rate of potential beneficiaries between 5% and 7% (Melgrizo et al., 2016).

There is strong evidence from Australia, the UK, and the USA on the impact of scholarships to increase access for disadvantaged students and their aspirations to attend university. It is more likely to beneficiate low-income students when the scholarships are need-

based rather than merit-based. The latter perpetuates access to higher education for whom will pursue a bachelor's degree in any case, with or without a scholarship. It is important to highlight that need-based scholarships assume that the major impediment for low socioeconomic students to attend higher education is its costs (Naylor et al., 2013). This measure may improve access but neglects other barriers that are also important to address.

As shown, there is a wide range of interventions worldwide to address the academic preparation gaps existing in the transition from school to higher education for disadvantaged students. From the propaedeutics and PACE in Chile and ACCES in Colombia, which are conducted by the state with close coordination with higher education institutions, to CEP in France which has a lower scale since is an initiative conducted by one university, it is found that these interventions had a positive effect on academic achievement, enrolment, and dropout rates within the treated students. The objective of this thesis is to provide information on the effect on the beneficiaries of a medium-scale intervention in Peru for its first implementation in 2022.

3. The Peruvian context

Naylor et al. (2013) stated that there are three factors that prevent disadvantaged students from attempting to access higher education. First, most of them do not complete high school education; second, the low achievements reached during school; and finally, having alternative aspirations which rely on the lack of information about the benefits of studying for a degree. In this section, the educational context of the Peruvian students is described with a focus on the first two factors indicated beforehand.

3.1 Academic achievement

The academic accomplishment of Peruvian students is measured through the Student Assessment Census (ECE, Spanish acronym) which is a Peruvian standardized test that has been used annually since 2015⁴ by the Ministry of Education to evaluate the academic performance of 2nd-grade high school students in the areas of mathematics, reading, social

⁴ Due to the COVID-19 pandemic, during 2020 and 2021 ECE was suspended and not carried out. In 2022 has been resumed.

science, and natural science, and 4th-grade primary students in the areas of mathematics and reading. Results show four different statuses: pre-starting, starting, in process, and satisfactory.

According to the 2022 ECE, the general results for 2nd-grade high school students are that only 12.7% of them obtained a satisfactory achievement in mathematics and 19.1% in reading. Despite showing a low accomplishment, when these results are disaggregated by socio-economic status⁵ (SES), the gap is bigger as Figure 1 displays for mathematics results.

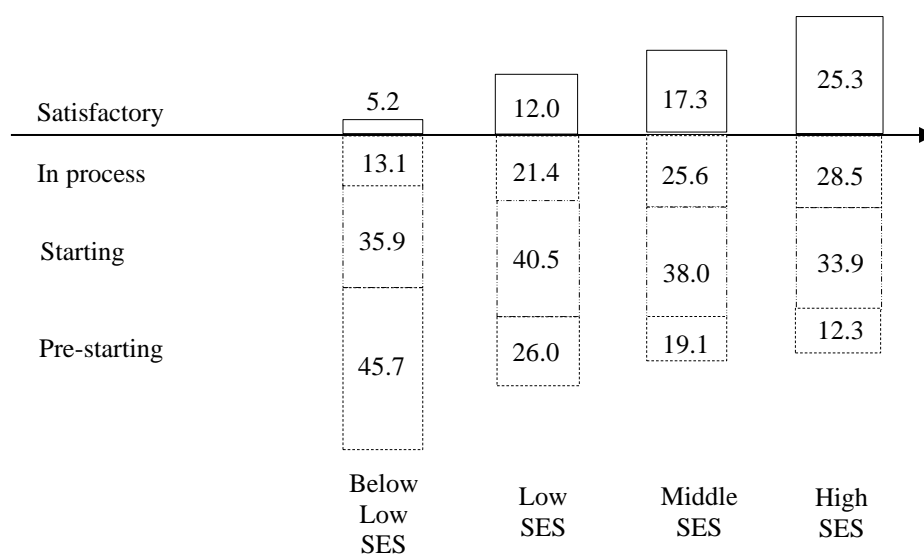


Figure 1 – ECE 2022 math results, 2nd grade of high school.
Source: MINEDU (2022)

A tendency found in the 2022 ECE results is that the lower the SES, the worse the results obtained. Those students with a Below Low SES reached mostly pre-starting results, which were obtained in 45.7% of the cases. Additionally, Low SES students got pre-starting (26%) and starting (40.5%) results mostly. Furthermore, only 5.2% of those with Below Low SES students obtained a satisfactory result compared to 25.3% of those with High SES.

Unequal outcomes confirm that students with higher SES get better results since they accessed high-quality teachers and infrastructure that lead them to have better academic preparation while taking school classes (Naylor et al., 2013). It also highlights the gaps between urban-rural and private-public (Beltrán and Seinfeld, 2012), as students with high SES attend

⁵ The Ministry of Development and Social Inclusion (MIDIS) administrates the Household Targeting System (SISFOH, for its capitals in Spanish) which assesses the socioeconomic status of the Peruvian population in order to identify who would be the beneficiaries of social programmes and state subsidies.

urban and private schools. These conditions place them in an advantageous situation with better academic performance and skills by the time they decide to apply for higher education.

3.2 Enrolment and graduation

Peru has made significant progress in school attendance compliance with good results in terms of coverage. However, less improvement has been done in terms of access and graduation in higher education, which place them at a disadvantage position compared with developed economies.

In Latin America and the Caribbean, the gross enrolment rate in tertiary education has increased over the last 20 years, reaching 55% in 2020. Nevertheless, it is still far below regions like Central and Eastern Europe (87%) and North America and Western Europe (81%) which are the ones with the highest participation ratios (UNESCO, 2022).

At the national level, the access to higher education rate has had a significant improvement over the years, however, due to the COVID-19 pandemic, the ratio decreased from 32.9% in 2019 to 28.5% in 2020 (SUNEDU, 2021). In terms of graduation of higher education among the 20-24 years-old population, it raised from 12.3% in 2008 to 16% in 2020 (PRONABEC, 2021).

In addition to reduced access and graduation rates, an important feature is that they are also highly unequal. Gaps between students with different SES widen as they progress through the education system and levels (see Figure 2). Thus, secondary graduation in 2020 was 85.5% for non-poor students while 64.9% for those extremely poor, which represents a difference of 20.6 percentage points (pp). Moreover, tertiary enrolment was 39.6% for non-poor students and 13.1% for the extremely poor. This difference is even wider, it represents 26.5 pp. Finally, tertiary graduation only reached 18.0% for non-poor students and 8.9% for the extremely poor (PRONABEC, 2021).

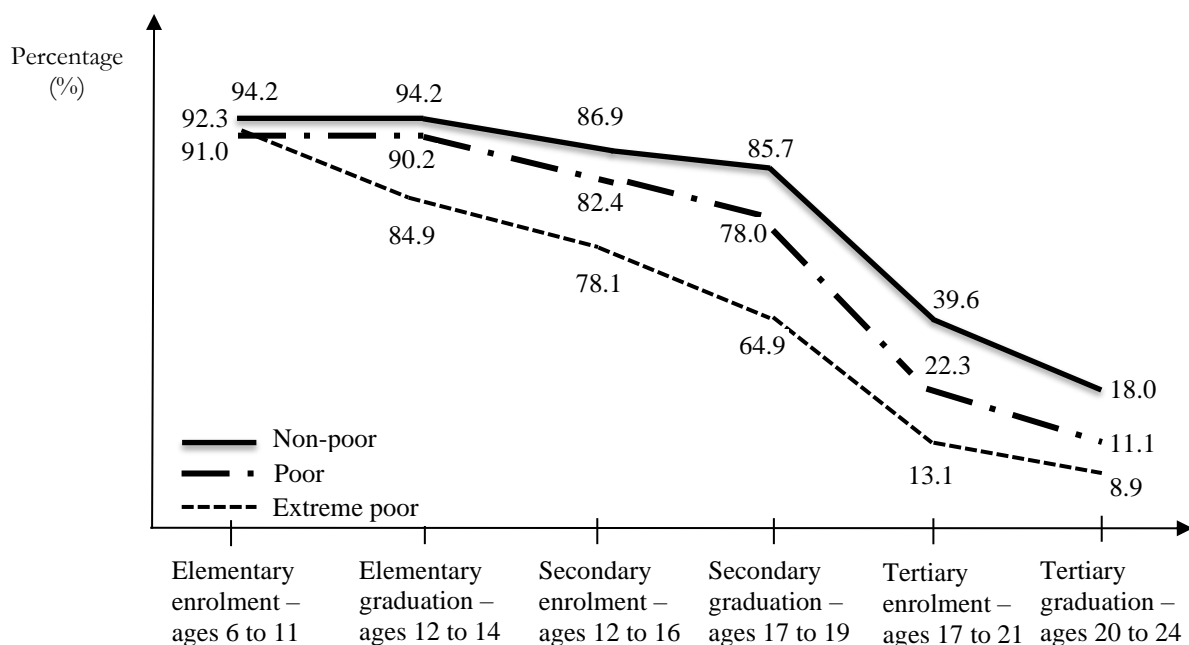


Figure 2 – Net enrolment and graduation in all education levels, according to age, 2020.
Source: PRONABEC (2021)

According to the literature on the topic, it is established that poverty status, parental education, ethnic origins, and rural residence are variables correlated with educational inputs - such as school characteristics and quality of teaching- and outcomes, such as graduation and academic achievement (Rentería, 2022). In the Peruvian case, two of them have a significant effect on the probability to access to higher education: socioeconomic status and parental education (Benavides et al., 2015). Having educated parents increases the probability of enrolment through imitation, for being inducted into it due to its social and economic value, or for the more access and use of information available regarding the quality education during the school years (Castro et al., 2016). In addition, aspirations are developed in close relation to family and community attitudes (Naylor et al., 2013).

3.3 The treatment

PRONABEC conducts several scholarships and educational loans processes every year. The biggest scholarship run by them is “Beca 18” which grants 5,000 scholarships every year within its eight modalities for each disadvantaged condition (see Appendix A1). During the 2022 call, PRONABEC received 15,403 applications from eligible students for the scholarship.

Given the results in education achievement during the COVID-19 pandemic, during the 2022 scholarship call for “Beca 18”, PRONABEC designed and implemented an intervention with the purpose of providing additional tools to applicants to widen their possibilities of being admitted to higher education. The tools provided were (i) full-time online classes for two months but could be extended up to four months; (ii) an electronic device with an internet connection; and (iii) the admission exam payment fully covered up to two times. These benefits were given to 1,041 applicants who applied under two modalities of the scholarship: Afro-Peruvian and Amazonian native communities and Intercultural Bilingual Education.

Important to mention that this treatment does not have an ethical issue as the places available for grants are divided by the modalities of the scholarship. In that sense, applicants to the two categories that were given the treatment were not prioritized or privileged over the other applicants since they compete within their correspondent modality.

The treatment had the aim to address not only the financial support that the applicants to the scholarship need for pursuing further studies but also a remedial stage in which some of the missed academic knowledge is provided to smooth their transition and reduce their dropout risk. Even though a two-month training will not remedy the shortcomings accumulated by years, will certainly provide them with valuable insights that go beyond access by allowing them to remain in their post-secondary pathway (Bouillon and Tejerina, 2007; Gil and Del Canto, 2012).

4. Theoretical framework

This thesis bases its assumption on the Human Capital Theory which is the foundation of the economics of education literature. The theory was first introduced by Becker (1962) and Rosen (1976) as cited in Xu and Fletcher (2017) stating that individuals have a set of skills and abilities as personal assets which can be improved or accumulated through education. The aim for a person improving their abilities and skills is to increase their market value in proportion to the number of years or credits of education received. The accumulation of human capital is translated into more expertise and effectiveness while working.

Education is understood as an important input in the construction of human capital for the citizens of a country. It is an investment decision that will provide a return of higher lifetime

earnings as human abilities are means to wealth (Brewer et al., 2010). An individual involved in an educational process gains increased productivity through the acquisition of knowledge and skills, and the costs are in the form of foregone earnings, out-of-pocket expenses, and psychic costs related to stressful situations when studying and facing examinations. (Brewer et al., 2010). The formal education received becomes a “signal” of future productivity in the labour market. (Xu and Fletcher, 2017).

To obtain the signal, there is a trade-off made by the individual when he or she decides to study post-secondary education. They sacrifice early earnings and gain training. After the training period is over, they earn more than their untrained peers. That is the basic trade-off in the Human Capital Theory. What is more, a new growth theory treats education as an endogenous variable that uses resources as inputs and produces outputs measured as increased productivity of labour. Under this theory, education can have increasing returns (Psacharopoulos, 2006).

The outputs of receiving education benefit the individual through a higher standard of living and higher incomes that will be sustained throughout their lifetime, and society through externalities or indirect effects in extended life expectancy, reduced infant mortality, decreased poverty and inequality, better democratization, and environmental consciousness. Measuring these effects allows us to evaluate the use of resources invested in education. Moreover, when the government is the main financer, issues of equity arise as well (Psacharopoulos, 2006).

Equity refers to a distributional aspect since it addresses relieving poverty, reducing inequality and social exclusion (Barr, 2020). In that sense, this thesis evaluates a Positive Action treatment. Positive Action can be defined as positive discrimination towards those who are racially discriminated against or excluded historically. This type of action gives special treatment to socially disadvantaged persons in order to reduce inequality of opportunities and human capital accumulation (Villalobos et al., 2017).

The intervention evaluated in this thesis allows treated applicants to receive academic training (through the provision of full-time online classes) to develop skills and abilities to increase expertise and effectiveness in their admission process to higher education institutions. According to this, the expectation of the effect on its beneficiaries should be positive.

5. Empirical design

This thesis conducts an impact evaluation whose main aim is to measure the causality of a treatment on a certain and expected outcome. In other words, the changes in the outcome can be attributed to the intervention, aside from other factors or variables that also affect the outcome at the same time (Bouillon and Tejerina, 2007).

To find the impact that an intervention -or treatment- had on the participants of it, it is needed to have two different scenarios in which a person goes through the intervention and has a certain outcome, and another scenario in which the same person does not receive the intervention and gets a different outcome. The difference between both outcomes (with and without intervention) is attributed to the intervention. Nevertheless, this is impossible to do. For that matter, the solution is to find an adequate comparison group -called control group- which will be the non-treated persons (without intervention). Finding a suitable control group becomes the most important task since it has to be as close as possible to the observable and unobservable characteristics of the treated group (Bouillon and Tejerina, 2007).

According to Bouillon and Tejerina (2007), within the methodologies to measure the impact of a treatment on a certain outcome, there are randomized control trials (RCT), which are the ideal type of methodology. Nevertheless, for this study was not possible to apply this kind of experimental design since the assignment was not done randomly. For that matter, the control group must be assigned through some quasi-experimental design like the difference in differences (DiD) estimator. However, it is also not a possible method to apply to this study due to its assumption of parallel slopes for both groups, treated and control units, which is not reasonable in this case, in addition to a lack of availability of important variables to test.

Regression Discontinuity Design (RDD), another quasi-experimental design, requires a cut-off point within a continuous sequence of numbers. This is not the case in this study as the result or dependent variable is dichotomic: 1 for being awarded the scholarship and 0 for not being awarded the scholarship. What is more, the treatment was assigned to all the applicants participating in two modalities, no ranking was required.

Propensity score matching (PSM) is a methodology that uses statistical procedures to build a control group by matching treated individuals with their counterparts in the constructed

control group based on observed characteristics. Using the latter, is constructed a score that provides information on which probability a certain individual must have to be a participant in the treatment. One important assumption of this method is that the unobserved characteristics are not systematic. Another requirement is that the data should be pre-intervention which will be used as baseline data (Bouillon and Tejerina, 2007; World Bank Dimewiki). This is the chosen method to be used since it suits better to the data availability and features of the treatment's first implementation in 2022.

5.1 Data and descriptives

Due to the context of the scholarship, which is need-based, the student population analysed here comes from disadvantaged backgrounds with high academic performance within their respective schools. In that sense, during the scholarship registration process PRONABEC collects relevant information about the characteristics of the applicants such as age; sex; mother tongue (*tongue*); region, province, and district of residence; SES (*sisfoh*)⁶; grades on 4th and 5th grade of secondary school education; preferences on career and higher education institution chosen; and the level of parental education achieved (*edu_father* and *edu_mother*).

In addition to that information, the database was completed with a *proxy* of the applicants' social conditions using the Human Development Index (*hdi*)⁷ based on the district of residence. Additionally, we applied a simple average equation to calculate the average grades (*ave_grades*) of every applicant using their 4th and 5th grades registered.

On the other hand, based on the scoring system of the scholarship process (see Appendix A1), we use the information on the preferences on a career chosen by the applicant to control a possible effect on this selection on their possibilities to be awarded the scholarship. We differentiate those who selected an engineering major (*engineering*) since it mostly gives

⁶ The Ministry of Development and Social Inclusion (MIDIS) administrates the Household Targeting System (SISFOH, for its capitals in Spanish) which assesses the socioeconomic status of the Peruvian population in order to identify who would be the beneficiaries of social programmes and state subsidies. The process takes place every 3 years with the aim to maintain an updated database. However, it is important to mention, that for this thesis, some applicants with an "expired" status were classified in their respective categories (i.e. "expired poor" was classified as "poor") since we are assuming that the COVID-19 pandemic has reduced the possibilities of these families to change status within the 3 years of reassessment initially planned considering that the application process initiated in late 2021. Therefore, there is a high probability that their "expired" status will still be their current socioeconomic status.

⁷ This variable is calculated by the public institution called CEPLAN (National Strategic Planning Centre).

high returns on education, and they are a prioritized major. This combination leads to additional points in the scholarship assessment. Finally, when the higher education institution is public, the applicant receives additional points in their score, therefore, we differentiate this choice in a variable called *hei*.

The database comprises a total sample of 15,403 eligible applicants for the 2022 “Beca 18” scholarship call. The descriptive statistics of the variables are described in Table 1.

Table 1. Descriptive statistics of the variables

Variable	N	Mean	Std. Dev.	Median	Min	Max
final_state	15,403	0.32	0.47	0	0	1
age	15,403	18.93	2.76	18	15	53
sex	15,403	0.35	0.48	0	0	1
tongue	2,121	0.80	0.40	1	0	1
hdi	15,403	0.50	0.17	0.51	0.09	0.85
sisfoh	15,403	1.51	0.63	2	0	3
ave_grades	15,403	16.11	3.45	16.92	0	20
engineering	15,403	0.31	0.46	0	0	1
hei	15,403	0.81	0.39	1	0	1
edu_father	13,865	3.30	1.95	4	0	9
edu_mother	14,640	3.02	1.83	3	0	9
access	15,403	0.07	0.25	0	0	1

The descriptive statistics of every variable are presented and described as follows:

- *final_state* is the dependent variable that indicates if the applicant was awarded the scholarship: non-scholarship holder (0) or scholarship holder (1). Its median value shown in Table 1 corresponds to the non-scholarship holder which supports the high competitiveness of the scholarship.
- *age* is the age of the applicant at the moment they applied for the scholarship. Important to mention that some of the scholarship modalities⁸ have restrictions on age and some others do not, that explains the wide variation indicated in Table 1. Nevertheless, 86% of the applicants are between 17-20 years old (see Appendix A2). Also, it is shown that the median age of the applicants is 18, which may be indicating that after graduating

⁸ The scholarship has eight modalities: Ordinary, “VRAEM” Area residents, Armed Forces, Shelters, Civil Redress, “Huallaga” Area residents, Intercultural Bilingual Education, and Afro-Peruvian and Amazonian native communities. Further details in Appendix A1.

from school (16-year-old approximately) they needed some time to decide to apply for higher education and/or to be academically prepared to get admitted to an institution.

- *sex* refers to the sex of the applicant. Takes the value of 0 for female and 1 for male. Table 1 shows that, in the median, the applicants are female. Also, the mean value is closer to 0 than to 1, which supports the same conclusion. In detail, 64.5% of applicants are females and 35.5% are males.
- *tongue* is a dichotomic variable that indicates whether the mother tongue of the applicant is Spanish (1) or a native language (0). Table 1 indicates that this variable was not registered for all the applicants, only 2,121 reported it. From those, 80% of the applicants declared speaking Spanish as their first language.
- *hdi* is the Human Development Index calculated at a district level according to the place of residence of the applicant. The closer to one, the better the social conditions measured by the index in three dimensions: life expectancy at birth, education index (expected and mean years of schooling), and GDP per capita (PPP \$). There are 1,317 districts in this sample. For further details, see Appendix A3 and A4.
- *sisfoh* is a categorical variable that indicates the socioeconomic status of the applicant. It is classified as follows: “non-poor” (0), “poor” (1), and “extremely poor” (2) and “no category”⁹ (3). In Table 1 is stated that, in the median, the SES of the applicants is extremely poor. In detail, 92% of applicants are poor and extremely poor.
- *ave_grades* is the average of the grades obtained in 4th and 5th grades of secondary school education. It is important to note that 5th grade is the last year of formal school education in Peru, and the grading scale system goes from 0 to 20. In Table 1, it is shown that the applicants obtained an academic achievement corresponding to the highest quintile, which demonstrates their top performance. For further details, see Appendix A5 and A6.

⁹ As the assessment made by the Ministry of Development and Social Inclusion (MIDIS) is required by the individual, some applicants did not have a classification assessed by the MIDIS.

- *engineering* is a dichotomic variable that indicates whether the applicant chose an engineering major to study. Takes a value of 1 if yes, and 0 if no. Data shown in Table 1 indicates that most applicants chose majors other than engineering.
- *hei* is a dichotomic variable that indicates a characteristic of the higher education institution chosen by the applicant. Takes the value of 1 if the institution is private and 0 if is public. Data indicates that most applicants chose private higher education institutions to study (81%). Such institutions are less competitive than public institutions, but significantly more expensive than the latter, indicating the need to be awarded the scholarship in order to attend higher education.
- *edu_father* is the highest education level attained by the father. It has 10 categories: no studies (0), incomplete primary (1), complete primary (2), incomplete secondary (3), complete secondary (4), incomplete non-university studies (5), complete non-university studies (6), incomplete university studies (7), complete university studies (8), and postgraduate studies (9). In Table 1 is showed that the average education level of the father is incomplete secondary, while the median indicates complete secondary. A tabulation of this variable reveals that 48% of fathers did not finish school. For further details, see Appendix A7.
- *edu_mother* is the highest education level attained by the mother. It has the same categories as *edu_father*. In Table 1 is shown that the average and median education level attained by the mother is incomplete secondary. A tabulation of this variable reveals that 56% of mothers did not finish school. For further details, see Appendix A8.
- *access* is a dichotomic variable that indicates which applicants received the treatment. Takes the value of 0 for non-treated applicants and 1 for treated applicants. Table 1 indicates that a major number of applicants did not receive the treatment, only 1,041 (6.8%) did.

5.2 Methodology and empirical model

The empirical strategy applied is the PSM method which uses individual characteristics to build a control group based on a constructed score that is employed to match treated units to

control units and estimate the probability of receiving the treatment. The method uses a probit model with *access* as the dependent variable and the individual pre-treatment characteristics (*age*, *sex*, *hdi*, *ave_grades*, *engineering*, and *hei*) as the covariates to estimate the probability of receiving treatment.

The covariates selected are variables that attribute scores on the scholarship process to control their effect on the applicant's possibility to be awarded the scholarship. Such variables are: *tongue*, *sisfoh*, *ave_grades*, *engineering*, *hei* (see Appendix A1). This relies on the assumption that the relevant differences are being captured by these observable variables which ensure an unbiased treatment impact estimate (Dehejia and Wahba, 2002).

However, as Table 1 showed, *tongue* was reported only for 2,121 applicants out of a total of 15,403. This difference makes a total of 13,282 missing values for the rest of the applicants. When this variable was included in the model, valuable information was lost for 13,282 applicants. Therefore, while the literature review (Rentería, 2022) indicates that the mother tongue variable is relevant for access to higher education, *tongue* was not included for its high number of missing values and lack of information for the total population evaluated in this thesis.

On the other hand, as *sisfoh* and *hdi* are both variables that give the same information: the applicant's socio-economic conditions, it is important to keep one of them since the treatment was given to applicants whose possibilities to access the tools provided were close to zero if they did not receive them from PRONABEC. Therefore, since *sisfoh* has a "no category" value that could be affecting the dependent variable as an omitted value, we use *hdi* in the estimation. Finally, we removed *edu_mother* and *edu_father* to avoid multicollinearity as they are moderately correlated with *hdi*, 0.32 and 0.23, respectively, at a 95% of confidence level.

For measuring the treatment effect, it is used a model in which the dependent variable denotes two categories of final results: non-scholarship holder and scholarship holder. The vector of explanatory variables X is containing individual and socio-economic characteristics of the applicants including a distinction if they received the treatment or not.

The model tested is:

$$\begin{aligned} final_state_i = & \beta_1 + \beta_2 age_i + \beta_3 sex_i + \beta_4 hdi_i + \beta_5 ave_grades_i \\ & + \beta_6 engineering_i + \beta_7 hei_i + \beta_8 access_i + \varepsilon_i \end{aligned} \quad (1)$$

Where β_2 to β_4 measures the effect of disadvantaged characteristics of the applicant on their final state; β_5 measures the effect of their academic achievement on the scholarship results; β_6 and β_7 are choices made by the applicants in their application stage; and β_8 is denoting the impact of the treatment on the results. The latter is the coefficient of interest in this thesis.

5.3 Results

For the matching process, we decided to use a no-replacement feature. This improves the precision of the estimates, nevertheless, some of its drawbacks are that it increases bias when there are few control units and they have different estimated propensity scores than their matched treated units. Also, results are potentially sensitive to the matching order of the treated units (Dehejia and Wahba, 2002). We will address these drawbacks using statistical tests to prove the suitability of the feature for this particular dataset.

First, as it is shown in Table 2, there is no statistically significant difference between the treated and control units' means. Therefore, the matching process generated a proper assignation of a control group since the mean values of the treated and control units are statistically similar to each other, according to the difference in means (%bias) and the p-values for every covariate used in the matching. Also, Table 2 reveals the availability of several controls (14,362) per treated units (1,041).

Table 2. Covariates' mean values of the treated and control groups, using no-replacement

	Treated	Control	%bias	t-test	
	Mean values	Mean values		t	p-value
age	18.56	18.62	-2.3	-0.63	0.531
sex	0.43	0.42	2.6	0.58	0.564
hdi	0.39	0.39	2.2	0.54	0.593
ave_grades	15.52	15.46	1.8	0.36	0.716
engineering	0.22	0.23	-2.4	-0.58	0.560
hei	0.64	0.63	0.4	0.09	0.927
<i>N</i>	1,041	14,362			

For addressing the similarity of the propensity scores estimated for control units and treated units, in Figure 3 we illustrate how the matched units are distributed according to the propensity score estimated. It is seen that the amount of control (untreated) units is bigger than the treated units for low propensity scores, which is visualized in the first bin. Later, as the propensity score increases, the number of treated units outnumbers the controls. However, it appears to be balanced for the whole matching process.

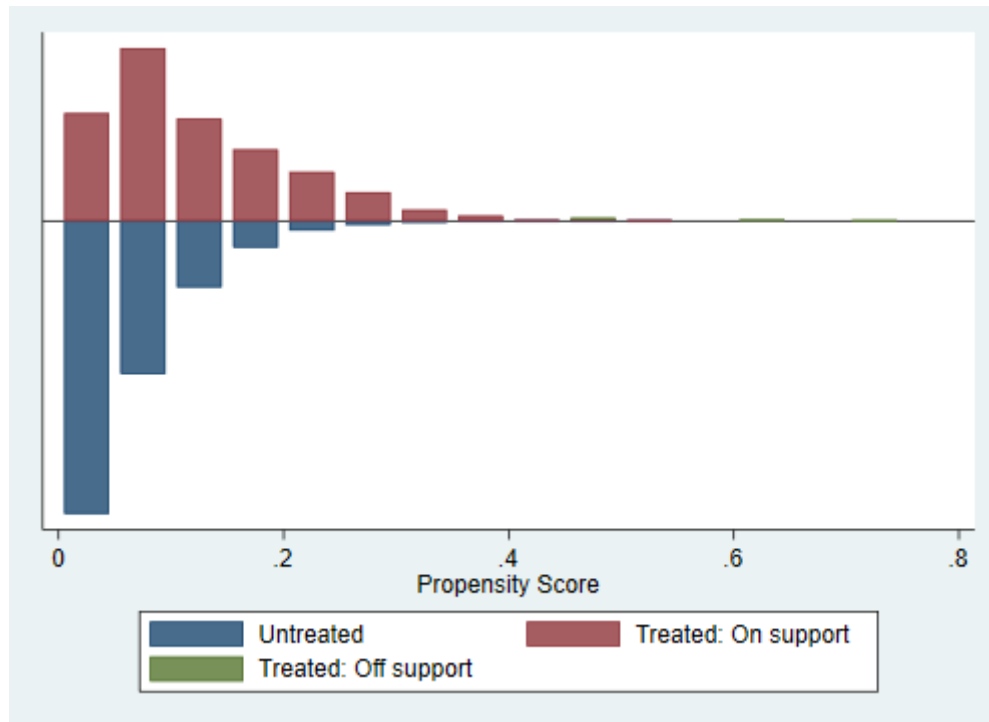


Figure 3 – Propensity Scores for treated and untreated (control) units.

Based on the estimated propensity scores, radius matching with a caliper of 0.03 was used to define the control units. This procedure was chosen to allow the matching to be as efficient as possible because, despite the high or low number of control units with a propensity score close enough to a treated unit, it matches it (Dehejia and Wahba, 2002).

Finally, the estimates of the average treatment effect on the treated (ATT) were calculated through the model specified in Equation (1). Results are shown in Table 3, where *access* was not found statistically significant. This indicates that the intervention had no effect on the probability to access higher education for the 1,041 treated applicants in the 2022 scholarship process.

Table 3. Results of the average treatment effect on the treated (ATT)

	estimate	p-value
access	-0.01	(-0.53)
age	-0.01	(-1.40)
male	0.03	(1.20)
hdi	0.07	(0.98)
average grades	0.01**	(2.24)
engineering major	-0.04*	(-1.69)
private hei	-0.31***	(-14.16)
cons	0.61***	(3.94)
<i>N</i>	2,072	
<i>R</i> ²	0.102	
adj. <i>R</i> ²	0.099	

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The results are aligned with the literature review presented (Bouillon and Tejerina, 2007; Gil and Del Canto, 2012; Naylor et al., 2013; Rentería, 2022) where the educational conditions -less qualified teachers, poor infrastructure, out-dated equipment, etc.- in which these students studied generated a gap that increases as they get closer to high school graduation. These circumstances provide them with inadequate and insufficient tools to manage a successful transition to higher education.

The intervention designed by PRONABEC had the objective to address this problem in the disadvantaged student population in Peru. Nevertheless, the null impact found in the results may be related to at least two factors identified. First, the time the intervention took place. Some other experiences in Chile, presented in the literature review section, showed positive results to similar interventions applied in early stages during school years. This is a difference from the treatment applied by PRONABEC since the treated were already graduated from school. Secondly, the duration of the intervention may be another determinant factor for its effect. While other experiences have an implementation frame of years, the intervention evaluated in this thesis was up to 4 months.

Therefore, we conclude that, to prevent a bigger gap during school, any intervention that aims to reduce it should take place early during school studies and have a wider timeframe of implementation.

Finally, it is important to highlight that results can vary if is applied another statistical method since one strong assumption of the PSM is that the unobservable characteristics of the individuals under analysis are not systematic, hence, they cannot impact the outcome in any way. For the development of this thesis, we assume that every measurable and observed characteristic of the applicant that can affect their access to higher education has been collected and used. Other unmeasured characteristics such as motivation, perseverance, support at home or drive are not considered to be systematically different among the applicants.

6. Conclusions

Finally, in this section we present the conclusions of the study. As Naylor et al. (2013) stated, the most intuitive action to increase access to higher education for students coming from disadvantaged backgrounds is to provide financial support. This is the premise for the existence of need-based scholarships funded by the state such as “Beca 18” in Peru which is implemented every year since 2012 by PRONABEC. The aim of this institution is to dissolve the economic barriers for those who already decided to pursue a bachelor’s degree.

Nevertheless, an external shock exacerbated social inequalities in Peru. The COVID-19 pandemic that took place during 2020 and 2022 led to a deterioration in national educational achievements, especially for students in poverty, as Figure 1 shows. This scenario predicted high dropout rates during the first semesters of higher education. For that reason, PRONABEC designed an intervention with the aim to provide extra academic resources for the applicants to the scholarship “Beca 18” in order to fill in the increased academic gaps attributed to the pandemic and the closedown of schools in the country.

The tools provided were (i) full-time online classes for two months but could be extended up to four months; (ii) an electronic device with an internet connection; and (iii) the admission exam payment fully covered up to two times. These benefits were given to 1,041 applicants who applied under two modalities of the scholarship: Intercultural Bilingual Education, and Afro-Peruvian and Amazonian native communities. This intervention had its first implementation in the 2022 “Beca 18” scholarship call.

This thesis evaluated its effect on the probabilities of being awarded the scholarship for the treated applicants. Since as part of the final stage of the scholarship process, the applicant

is required to be admitted to a higher education institution to be finally assessed, the intervention can be interpreted as a facilitator of access to higher education through the scholarship.

The research question developed in this thesis was “Did the intervention for access to higher education through the 2022 “Beca 18” scholarship process increased the likelihood of the treated applicants to being admitted?” The evaluation was measured by a Propensity Score Matching method where individual characteristics, such as age, sex, socio-economic conditions of living, average grades during the last two years of secondary school, and choices on major and higher education institution were used as covariates to build a control group based on a constructed propensity score.

As a result of the average treatment effect on the treated, we find no statistically significant effect on having received the treatment. The intervention did not affect the probabilities to get awarded the scholarship, therefore, access to higher education for the 1,041 treated applicants in the 2022 scholarship process.

The result does not match what the Human Capital Theory predicted, nevertheless, is aligned with the literature review presented (Bouillon and Tejerina, 2007; Gil and Del Canto, 2012; Naylor et al., 2013; Rentería, 2022) in which it is stated that the gaps gained during formal education years provide disadvantaged students with insufficient tools to manage a successful transition to higher education. This suggests that any intent to remedy these shortcomings should be addressed in the early stages of school years (Barr, 2020).

Another important feature of the intervention that might have affected the results is its duration. While some successful experiences in other parts of the world have a yearly frame of implementation, the intervention of PRONABEC was only up to 4 months because it is constrained to the duration of the scholarship assessment. For that reason, it is crucial that the intervention becomes a part of a larger multi-sectoral and multi-institutional strategy to address the potential academic gaps of disadvantaged students with high potential to not only overcome poverty but also to contribute to the Peruvian society in some of the different aspects that education has as positive externalities.

These results do not necessarily discourage the continuity of this intervention on future scholarship calls but invite to evaluate its features and possibilities of extension to other institutions to overcome the timeframe in which is implemented which is relatively late and short for a student with their socio-economic characteristics.

As future research, will be important to review how well the treated and scholarship holders were doing during the semesters in their higher education and contrast it with other interventions in Latin America such as in Chile or Colombia. Furthermore, another important topic to address will be the reduction in their poverty conditions after graduation or first years of working in the labour market.

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Appendix

Appendix A1: Characteristic of the 8 different modalities in 2022 “Beca 18” scholarship call.

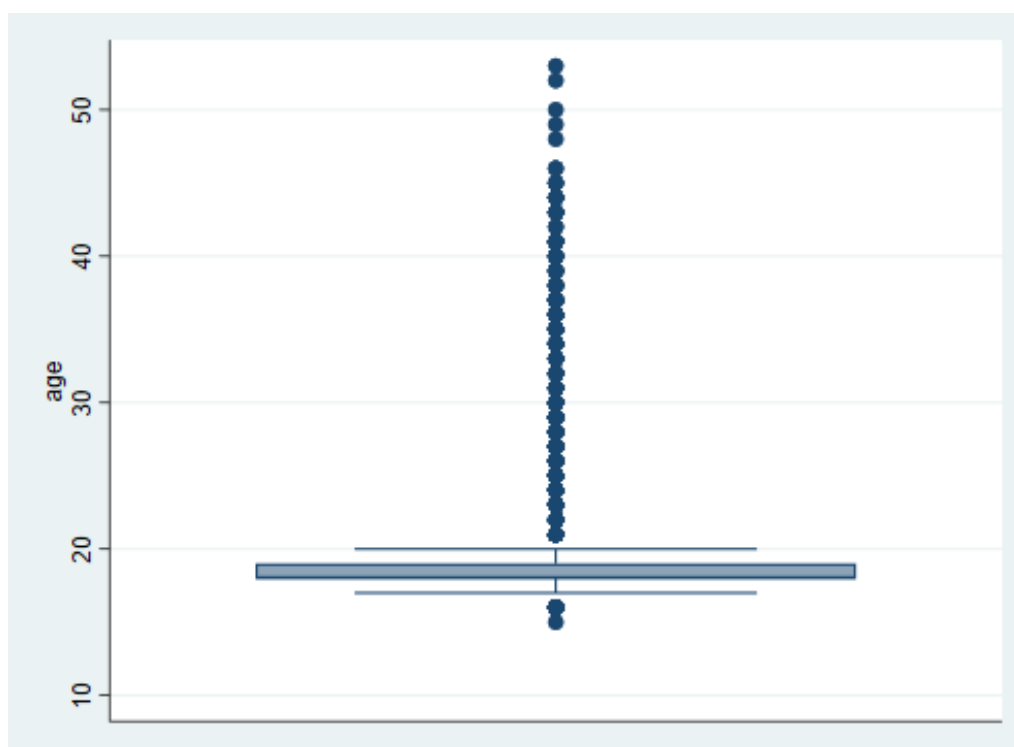
Modality	Target population	Requirements	Score system
Ordinary	Secondary school graduates with high academic performance and scarce economic resources according to the Household Targeting System (SISFOH) categories.	<ul style="list-style-type: none"> - Be under 22 years old. - Have been classified under the SISFOH category of poor or extremely poor. - Be ranked in the top third during the 4th and 5th grades of secondary school. 	<ul style="list-style-type: none"> - Grades, differentiated scores according to the percentile position ⁽¹⁾ - Have a poverty classification ⁽¹⁾ - Have an extreme poverty classification ⁽¹⁾
“VRAEM” Area residents	Secondary school graduates, residents of the Apurímac, Ene, and Mantaro River Valley (VRAEM, Spanish acronym).	<ul style="list-style-type: none"> - Be under 22 years old. - Be a resident in the VRAEM’s focal or influence Area. - Be ranked in the top third during the 4th and 5th grades of secondary school. 	<ul style="list-style-type: none"> - Have a disability condition. - Belong to the firefighters’ force or be the child of one. - Be in the volunteers’ state registry.
Armed Forces	Secondary school graduates from voluntary military service.	<ul style="list-style-type: none"> - Be up to 30 years old. - Have served or been active in the armed forces for at least 12 months. - Be ranked in the upper half during the 4th and 5th grades of secondary school. 	<ul style="list-style-type: none"> - Belonging to an Afro-Peruvian or peasant or Amazonian native community. - Be a high-performance athlete. - Proficiency in a
Shelters	Secondary school graduates, adolescents in a situation of abandonment or under state tutelage.	<ul style="list-style-type: none"> - Be under 22 years old. - Belong or come from a shelter, refuge, or guardianship center recognised by the authority or court during adolescence. - Be ranked in the upper half during the 4th and 5th grades of secondary school. 	<ul style="list-style-type: none"> - Prioritize native language ⁽¹⁾ - Ranking of the higher education institution chosen by the applicant, differentiated scores according to the ranking position. - Public higher education institution chosen by the applicant ⁽¹⁾
Civil Redress	Secondary school graduates, victims of the violence that occurred in the country during the decade of 1980, and a direct relative (child or grandchild) subject to transfer of educational benefits.	<ul style="list-style-type: none"> - No age restrictions. - Be registered as a beneficiary or victim in the special state registry. - Have at least a grade of 12 during the 4th and 5th grades of secondary school. 	<ul style="list-style-type: none"> - Private non-profit associative higher education institution chosen by the applicant. - Estimated return according to the major selected by the applicant.
“Huallaga” Area residents	Secondary school graduates, residents living in the Huallaga Area.	<ul style="list-style-type: none"> - Be under 22 years old. - Be a resident in the Huallaga’s focal or influence Area. 	<ul style="list-style-type: none"> - Have chosen a prioritized major ⁽¹⁾

Modality	Target population	Requirements	Score system
		<ul style="list-style-type: none"> - Be ranked in the top third during the 4th and 5th grades of secondary school. 	
Intercultural Bilingual Education	Secondary school graduates who are interested in pursuing a career in Intercultural Bilingual Education.	<ul style="list-style-type: none"> - No age restrictions. - Proficiency in a native language. - Be ranked in the upper half during the 4th and 5th grades of secondary school. 	
Afro-Peruvian and Amazonian native communities	Secondary school graduates that belong to an Afro-Peruvian or Amazonian native community.	<ul style="list-style-type: none"> - No age restrictions. - Belong to an Afro-Peruvian or Amazonian native community. - Be ranked in the upper half during the 4th and 5th grades of secondary school. 	

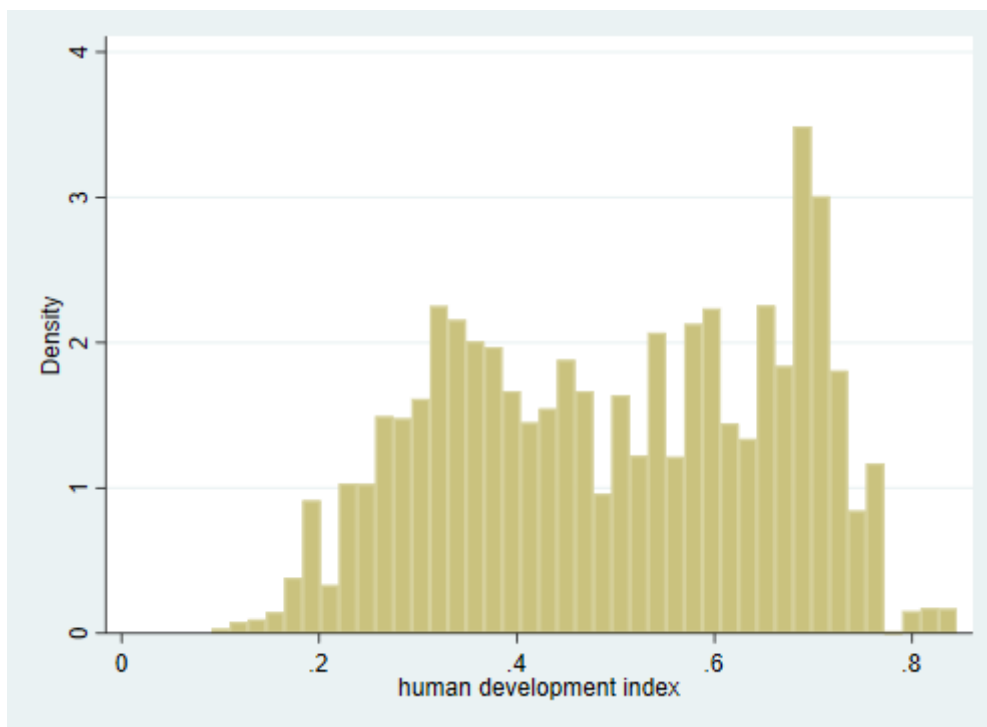
(1) The database used in this thesis is comprised of these variables.

Source: PRONABEC (2021)

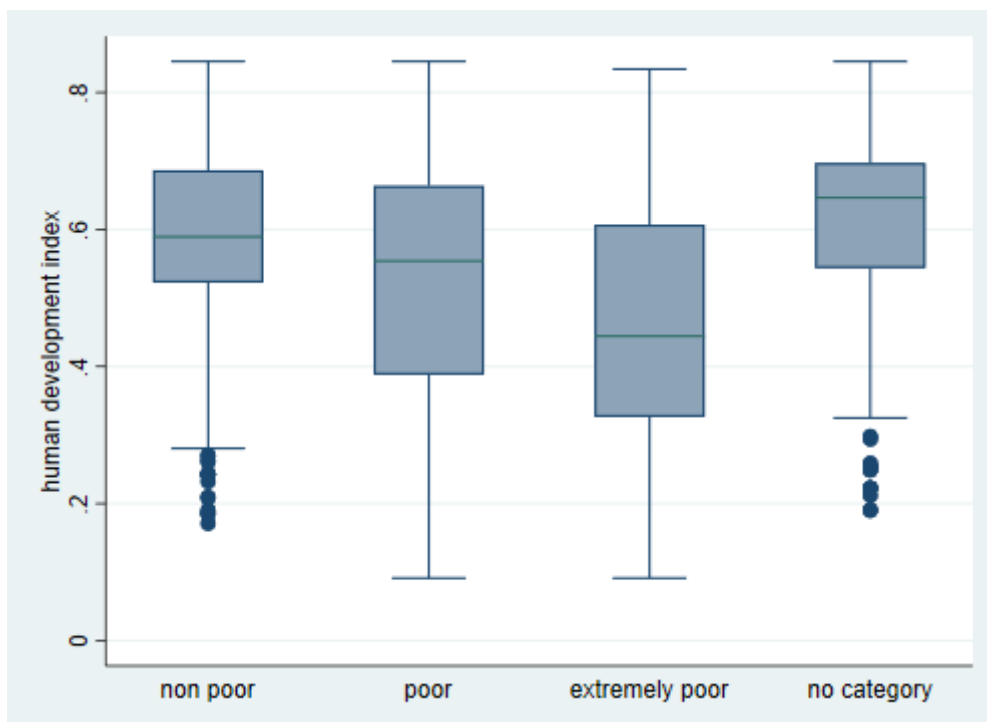
Appendix A2: Box graph of the distribution of variable “age”.



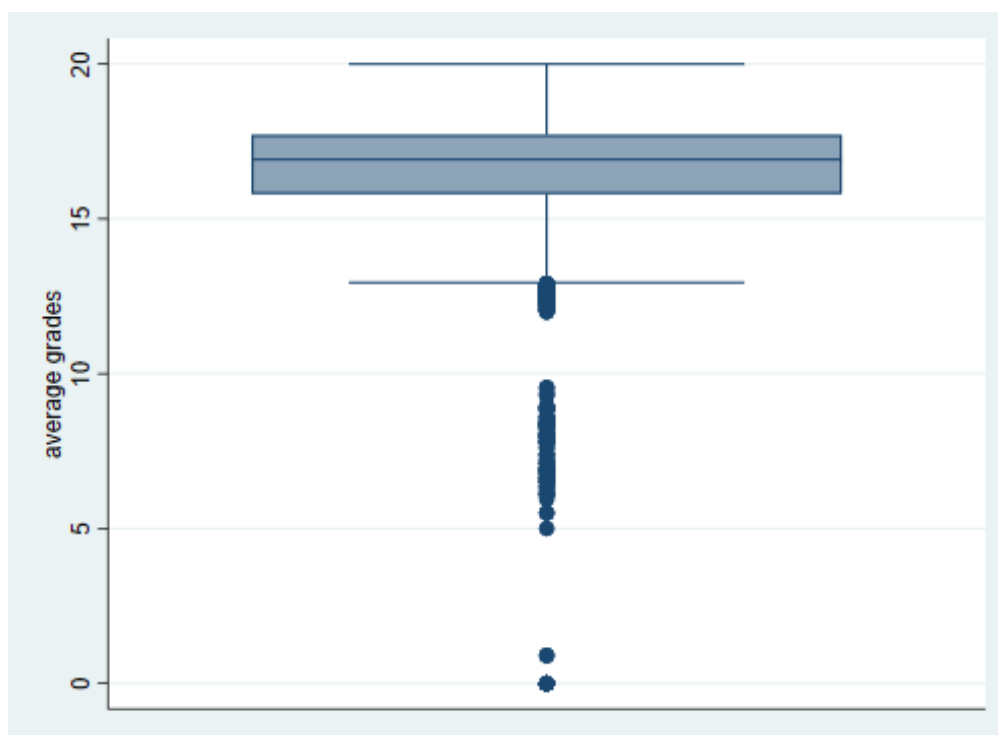
Appendix A3: Histogram of the distribution of variable “Human Development Index”.



Appendix A4: Box graphs of the distribution of variable “Human Development Index” per SES.

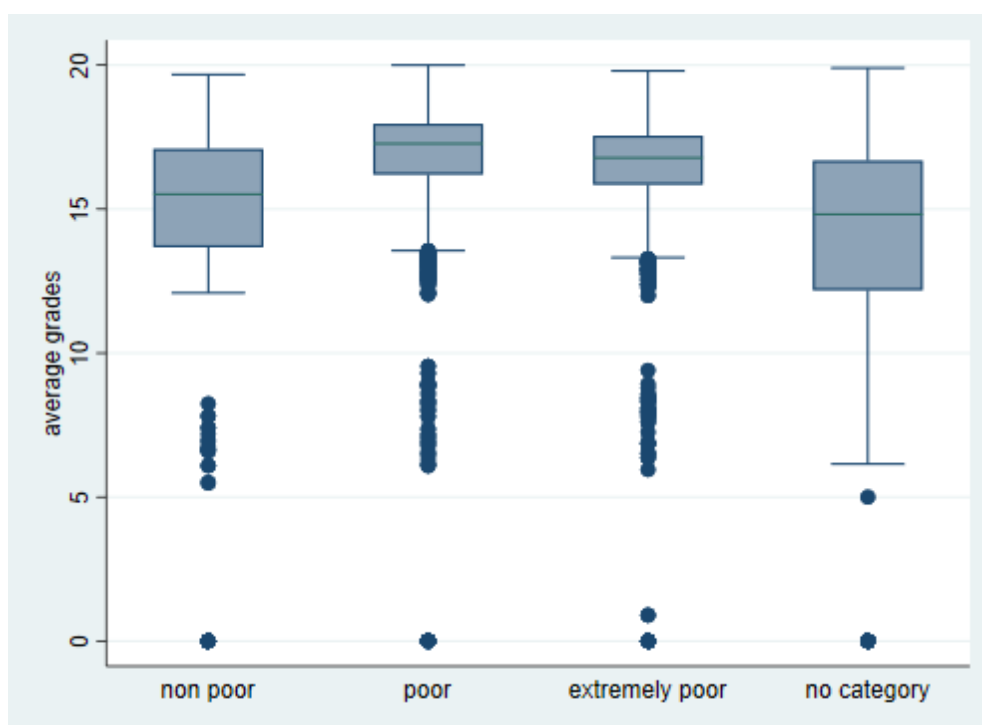


Appendix A5: Box graph of the distribution of variable “average grades”.



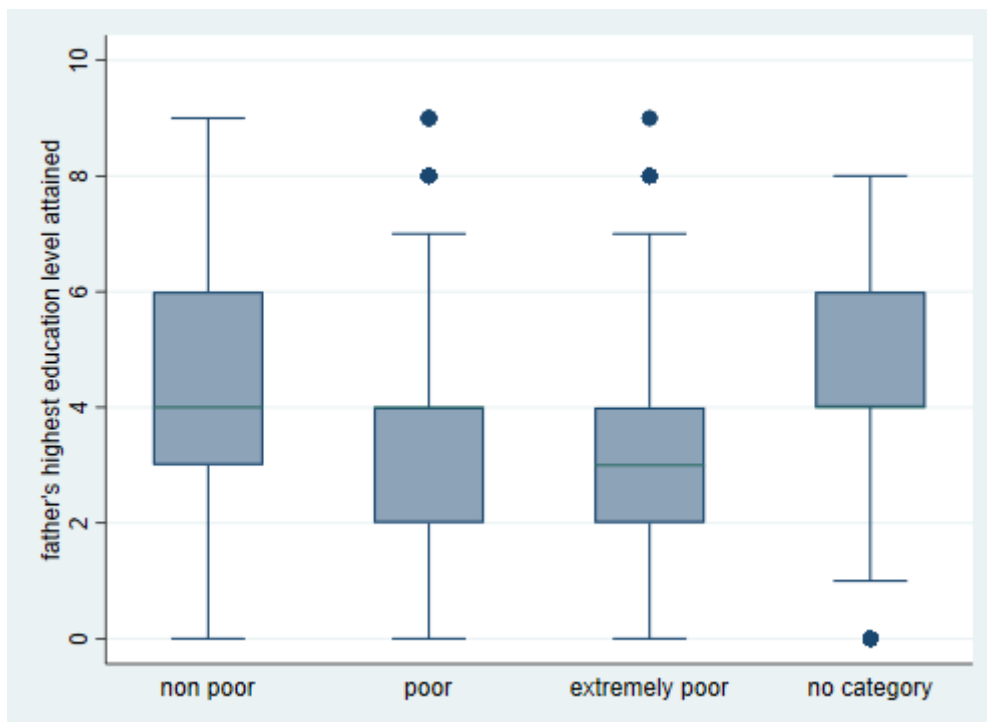
Note: Official Peruvian grade system goes from 0 to 20.

Appendix A6: Box graphs of the distribution of variable “average grades” per SES.



Note: Official Peruvian grade system goes from 0 to 20.

Appendix A7: Box graphs of the distribution of variable “father’s highest level of education” per SES.



Note: It has 10 categories: no studies (0), incomplete primary (1), complete primary (2), incomplete secondary (3), complete secondary (4), incomplete non-university studies (5), complete non-university studies (6), incomplete university studies (7), complete university studies (8), and postgraduate studies (9). Same for Appendix A8.

Appendix A8: Box graphs of the distribution of variable “mother’s highest level of education” per SES.

