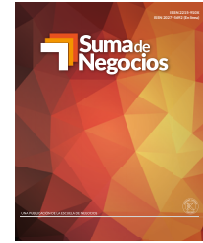







## SUMA DE NEGOCIOS



## Research Article

# Employment and salaries of university graduates: impact evaluation of a financial aid programme by means of propensity score matching

Patricia Hernández-Medina<sup>1</sup> , Daniel Goncalves Hernández<sup>2</sup>  y Luis Morales La Paz<sup>3</sup> 

<sup>1</sup> PhD in Sustainable Territorial Development. PhD in Economic Sciences. Professor-Researcher, Universidad Nacional del Chimborazo, Riobamba, Ecuador and Universidad Católica Andrés Bello, Caracas, Venezuela (corresponding author). Email: [patricia.hernandez@unach.edu.ec](mailto:patricia.hernandez@unach.edu.ec)

<sup>2</sup> Data Science Engineering. Student, Universidad Carlos III Madrid, España. Email: [100479161@alumnos.uc3m.es](mailto:100479161@alumnos.uc3m.es)

<sup>3</sup> PhD in Economics and Management Sciences. Professor-Researcher. Universidad Católica Andrés Bello, Caracas, Venezuela. Email: [lmorales@ucab.edu.ve](mailto:lmorales@ucab.edu.ve)

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## ABSTRACT

**Introduction / Objective:** Educational funding in Venezuela is limited, especially in private higher education institutions, due to existing budget constraints. Despite these limitations, some grant programmes manage to serve a significant proportion of students. The purpose of this research was to evaluate the impact of a financial aid programme at a Latin American university by analysing the probability of employment and remuneration at three key points in time: during the degree programme, upon graduation, and three years after graduation.

**Methodology:** A sample of graduates from various programmes was used, and information about their career paths was collected by means of a follow-up survey. The analysis was conducted using propensity score matching through the Average Treatment Effect on the Treated (ATT) estimator, employing both parametric and non-parametric methods.

**Results:** The results indicate an inverse relationship between the financial aid received and the salary earned during the evaluation periods, alongside a positive relationship with the probability of being employed. However, none of the estimated coefficients were significant, whether for the nearest neighbour, the 5 or 10 nearest neighbours, the Kernel estimation, or the local linear estimation, taking into account the common support and the 20% trimming.

**Conclusions:** It cannot be concluded that the grant received during the degree programme significantly improves employment and remuneration outcomes. This suggests the need for a comprehensive programme that includes support in job placement processes in order to enhance these outcomes.

**Empleo y salarios de los graduados universitarios: evaluación del impacto de un programa de ayuda financiera mediante propensity score matching**

## RESUMEN

**Introducción / objetivo:** el financiamiento educativo en Venezuela es limitado, especialmente en instituciones de educación superior privadas, debido a restricciones presupues-

tarias. A pesar de estas limitaciones, algunos programas de subvenciones logran atender a una proporción significativa de estudiantes. El propósito de esta investigación fue evaluar el impacto de un programa de ayuda financiera en una universidad latinoamericana, analizando la probabilidad de empleo y la remuneración en tres momentos clave: durante la carrera, al graduarse y tres años después de egresar.

**Metodología:** se utilizó una muestra de graduados de diversos programas, recolectando información sobre su trayectoria laboral mediante una encuesta de seguimiento. El análisis se realizó utilizando la metodología de *propensity score matching* mediante el estimador del efecto medio del tratamiento (ATT), empleando tanto metodologías paramétricas como no paramétricas.

**Resultados:** los resultados muestran una relación inversa entre el tratamiento y el salario percibido en los períodos de evaluación, y una relación positiva con la probabilidad de empleo. Sin embargo, en ningún caso los coeficientes estimados fueron significativos, tanto para el vecino más próximo, como para los cinco o diez vecinos más próximos, la estimación Kernel y la estimación lineal local, considerando el soporte común y el recorte del 20%.

**Conclusiones:** no se puede afirmar que la subvención recibida durante la carrera mejore de manera significativa las variables de inserción laboral y remuneración. Esto sugiere la necesidad de un programa integral que incluya apoyo en los procesos de inserción laboral para mejorar estos resultados.

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## Introduction

Education is a determining factor in labour market insertion and the salaries of individuals, which is corroborated by numerous studies and economic theories, among which the theory of human capital, developed by Becker (1964), stands out. Investment in education increases the productivity of individuals, which in turn translates into higher wages and better employment opportunities. According to this theory, additional years of education and skills acquired during academic training significantly improve job prospects.

In this context, Mincer (1974) showed that individuals with higher education degrees, such as bachelor's and post-graduate degrees, tend to have higher salaries than those with less education. This is because higher education provides specialised skills and knowledge that are highly valued in the labour market (Chiswick, 2024).

Research has attempted to corroborate this positive relationship between educational attainment and salaries (Azad & Hari, 2024; Dolgikh & Potanin, 2024; Gross et al., 2023; Lee & Choi, 2024; Tran & Paweenawat, 2023) and labour market insertion (Assaad et al., 2023; Czarnecki & Litwiński, 2024; Peng et al., 2024), although the results depend on the sector in which the analysis is conducted and the structure of the labour market (Chassamboulli & Gomes, 2023).

As part of affirmative action policies to widen access and retention possibilities, funding or grants in the university system are mentioned. The literature presents evidence of the effects of different modalities of financial support, be they discounts, subsidised or unsubsidised loans, or partial or full scholarships, mainly on the variables of access, retention (Herzog, 2018; Von Hippel & Hofflinger, 2020) and graduation.

The impact was measured using different methodologies, either propensity score matching or a regression discontinuity design.

Despite the work developed in impact evaluation for this type of programme, little has been explored by considering other outcome variables associated in the long term, such as, for example, the probability of employment once graduated, or the salary obtained in that job. In the cases in which there is research, the impacts do not seem to be clear, since the results in the labour market depend on many factors in addition to the quality and reputation of the university that grants the degree, an aspect explored in the signalling theory.

Moreover, the quality and quantity of relationships, as well as access to resources and the appropriation of their benefits, have an impact on obtaining higher employment and wages. Studies of this relationship between social capital and the labour market include Granovetter (1985) and Coleman (1990), who establish that “weak” social connections (acquaintances, casual contacts) are often more useful than “strong” relationships (family, close friends) in accessing job opportunities. This suggests that a wide network of contacts may be crucial for influencing education (human capital) and finding better paid jobs.

These authors also recognise the difference in social capital and human capital between socio-economic status (different socioeconomic levels or classes within a society, characterised by varying income, wealth, and social status), with individuals from higher social classes tending to have more social capital, which allows them access to greater opportunities and resources. This disparity contributes to the reproduction of social and economic inequalities (Li et al., 2024). Thus, social capital is fundamental in the creation of

human capital, especially in educational contexts. Coleman (1990) observes that families and communities in higher socio-economic classes tend to have more robust and effective social networks, which facilitate the transmission of values and expectations, as well as access to educational resources and employment opportunities.

Research has explored these variables that may impact on graduates' market behaviour, although to a lesser extent considering the effect of financial aid programmes. Although the empirical evidence regarding the impact of these programmes on the employment trajectory of graduates is scarce, it can be analysed according to the type of aid, with most studies focusing on the impact of educational credits, while very little research analyses the effect of scholarships or grants on graduate employment or salaries.

Amongst the studies that seek to assess the impact of educational credits on post-graduation variables, research regarding the United States and Chile stands out for their experience in higher education financing programmes. The first group includes studies by Baker et al. (2017) and Bettinger et al. (2019), while the second includes those by Beyer et al. (2015) and Bucarey et al. (2018).

Studies such as that by Baker et al. (2017) also address the problem within the United States subsequent to graduation from university. Because the most vulnerable students are those who have acquired larger loans, the balance will be positive to the extent that training results in the reduction of inequalities through better jobs and higher salaries. In this context, a vulnerable student is one who faces conditions that put their well-being and ability to succeed in the educational environment at risk. These conditions may be socio-economic, familial, emotional, physical or academic in nature, often requiring additional support in order to overcome barriers that may impede their academic and personal success.

Meanwhile, there is research that presents empirical evidence showing a positive impact on labour income in graduates who have received educational funding during their degree courses, such as Vélez et al. (2018), Scott-Clayton and Zafar (2019), Daniels and Smythe (2019) and Froidevaux et al. (2020). On the other hand, there are authors who did not discover a positive impact, among which we find Yang (2011), Mayer et al. (2016), Gurantz (2019), Bettinger et al. (2019), Bernasek and Long (2021), Angrist et al. (2022) and Rattini (2023) in their long-term study.

Bettinger et al. (2019), in their research on California, considered the long-term effects of funding by studying the outcomes of the educational process over 14 years. They find that the effects of the university degree are significant seven years after graduation, although they could not corroborate a relationship between financial aid and long-term earnings growth. Neither could Gurantz (2019) find an impact on the employment and wages of non-traditional graduates in California who received financial aid relative to those who did not receive loans, an analysis that was conducted using a regression discontinuity design.

Scott-Clayton and Zafar (2019), through the design of regression discontinuities, also assessed the long-term effects of educational loans, but found that there appears

to be a positive impact on the labour income of this group of graduates.

Similarly, Daniels and Smythe (2019) reported a positive relationship between graduates with student loans and labour income, identifying a difference of up to 8% between treated and untreated earnings. Vélez et al. (2018) obtained equivalent results in the sense that they identified a positive impact of educational credit on graduates' labour market earnings, but the authors argued that this may be due to the need to repay the debt and not by choice based on the graduate's professional growth or expectations.

In Latin America, Beyer et al. (2015) analysed the relationship between students in Chile with financing and the income generated in the labour market; in their conclusions, they established that the highest income is generated by graduates of traditional degrees such as science, health and business, who are also the ones who have obtained the largest loans; thus, they found that the loan did not influence income, rather the type of degree did.

This impact is studied by Bucarey et al. (2018), who, through a regression discontinuity design, did not identify differences between Chilean students who are beneficiaries or not of a funding programme in variables such as salary, employment, or type of contract. These results are associated with the signalling theory, in the sense that it is the university that determines labour market insertion and the remuneration received.

These students who received educational credits tended to enrol in low-status universities, which may have improved their chances of graduation. This choice punished them later in the labour market in terms of lower salaries and worse jobs. Therefore, the social background that determines the socio-economic status of students, and hence the need for financial aid and the institution where they study, can indirectly affect the income obtained from the labour market upon graduation (Gurantz & Odle, 2022; Oh, 2022).

For Colombia, Forero and Ramírez (2008) obtained equivalent results in the sense that "in the labour market, not only the degree obtained by the worker is remunerated, but also his or her accumulated human capital and possible network effects that facilitate the attainment of better paid jobs" (p. 87). These findings are corroborated by Rangel (2016), whose study also took place in Colombia and found that children of parents with a higher level of education are more likely to gain employment due to the social capital that those parents can offer their children.

This cultural capital, and more precisely social capital, understood as the relationships with the family and the environment, was analysed by Cuervo et al. (2019) for Australia, who identified a relationship between social capital and educational and employment aspirations. Indeed, students whose relational capital is low will have barriers to enter into higher-level universities and thus to better job opportunities.

According to Wang et al. (2022), from a labour market perspective, employers increasingly demand applicants with significant endowments of human capital and social capital, which is a disadvantage for low-income students. Similar conclusions were reached by authors such as Van

Belle et al. (2019), who in their study corroborated the importance of these pre-graduation internships and relate it to greater social networks, experience, and a higher endowment of social capital.

This inequality of opportunities derived from the different endowments of social and cultural capital that are reinforced by the labour market, prevails even more so in non-traditional students. The results found for Portugal and Ireland suggest that the upward mobility of non-traditional students upon obtaining a degree may not be as credible in highly competitive markets, where experience and post-university training are crucial, as well as intellectual development (Finnegan et al., 2019).

It is noteworthy that this upward mobility that the massification of education aims to achieve is also questioned by Ho Mok, (2016) for the case of East Asia, such that “when analysing the relationships between education and social mobility, we cannot rest upon the conventional notion that education promotes social equality and social justice, because gentrification in most global cities surely raises the issue of class and class inequalities” (p. 67).

Specifically, when analysing scholarship programmes (based on economic status or merit) and not on educational funding, the most empirical evidence relates to the impact on variables related to continuation, passing grades and permanence in the higher education system, including graduation (Hernández-Medina & Ramírez-Torres, 2022, 2023; Welch, 2014).

With regard to research on the effect of scholarships or grants on post-graduation variables, the evidence is scarce; some studies fail to identify effects, such as that of Welch (2014), who draws attention to the type of financial support received, indicating that scholarships and grants do not seem to condition the selection of the profession, towards those with higher remuneration, while educational funding does bias that decision, so that, in the first case, there is no evidence of significant differences in salaries among graduates.

Among the studies whose findings indicate positive impacts are those of Iriondo (2020), who, in the case of the Erasmus programme, concludes that there is a positive effect on the salaries of participants with respect to their peers; as well as that of Denning et al. (2019), who evaluate the impact of the Pell Grant programme on academic performance and income variables after graduation, obtaining that the beneficiary students not only complete their training in less time, but also graduate more and receive higher incomes.

Given the scarce empirical evidence and the results found so far that posit first the absence of a positive impact of loans or financial support for higher education on post-graduation variables and second, the need to consider multiple additional factors when studying the insertion of undergraduates in the labour market, this research aimed to evaluate the impact on post-graduation variables such as employment and salary (measured as the number of times the salary exceeds the minimum wage) of the educational scholarship programme of the Universidad Católica Andrés Bello (UCAB), whose allocation depends on the socioeconomic level of the student.

This Venezuelan university is a private, non-profit institution that belongs to the network of universities entrusted to the Society of Jesus, which facilitates access to higher education through the financial aid programme, in which percentages of tuition discounts (between 25% and 50%) are granted to students of lower socioeconomic levels.

With respect to Venezuelan universities, this is the only private institution that for more than three decades has focused its policy on facilitating access and retention for students from low socio-economic backgrounds. Meanwhile, the remainder of the education system has focused on expanding programme offerings and providing academic support, but not financial support. At the public level in the last decade, the Alma Mater Programmes, the Sucre Mission and the creation of the Bolivarian University of Venezuela stand out. The first was designed to provide financial support to the most disadvantaged students who were selected for public universities; and the second was designed to help students who could not access public universities by means of remedial courses and vocational support, enabling them to enrol in universities belonging to the programme.

In the particular case of UCAB, given the characteristics of the programme, its particularity in the context of higher education in Venezuela and the resources allocated to its implementation, previous studies have been carried out analysing the impact of the financial aid programme on dropout, continuation and graduation. Using the propensity matching score and regression discontinuity design, it was possible to identify at least a positive and significant impact on dropout, finding different results according to the methodology in terms of continuation and graduation (Hernández-Medina & Ramírez-Torres, 2022, 2023).

It is worth asking, then, whether the programme allows the graduate to enter the labour market in such a way that his or her salary is equal to or higher than that of a non-beneficiary of the programme, since the market could value the student's effort to overcome his or her economic deficiencies or, on the contrary, the variables associated with the productive environment and particularly with social and human capital act in the opposite direction, limiting the possibilities of professional performance with lower salaries.

For this purpose, the cohorts of students admitted to all UCAB degree courses for the period 2013-2014 were analysed using socioeconomic and academic information available at the institution, as well as data on labour market insertion obtained from a follow-up survey of graduates.

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## Methodology

### Data

To obtain employment information from the graduates, a follow-up survey was used, defined by Baldussi and Di Fonzo (2002) as “a research instrument or technique (...) that forms part of the so-called methods of observation of those individuals whose characteristics, behaviours or attitudes are relevant to the research objectives” (p. 32).

This technique presents a series of advantages that facilitate data collection and allow the design of an instrument that contains, amongst others, at least several graduate follow-up manuals, as well as questions associated with three basic aspects: graduate profile, relationship with the labour market and relationship with the institution.

#### *Type, scope, and design*

The research developed has been quantitative, explanatory and quasi-experimental, using analysis methods that simulate, based on the simulation of probabilities of participation in the programme, whether they would receive the treatment.

#### *Procedure*

Based on these groups of variables, the questionnaire was well-designed as a series of closed multiple-choice questions, and the instrument was applied through e-mail to graduates from different degree programmes at the university. The instrument consisted of six sections related to academic information, work experience during studies, first job, current job, further studies, and evaluation of experience at the university.

These questions are not related to the socio-economic evaluation of the family group that is carried out to grant the subsidy, as in this case the analysis was carried out throughout the studies and corresponds to the family nucleus. The aim of the graduate follow-up survey is to monitor the employment conditions of the graduate.

Based on these groups of variables, the questions in the questionnaire were designed as closed, multiple-choice questions and applied for validation. They were structured as follows: 1) academic information: knowledge of a foreign language, computer science, other undergraduate degrees obtained; 2) work experience during the degree programme: job, relationship with the degree, salary, dedication, duration; 3) first job: relationship between job and profession, salary, economic activity, dedication, duration, aspects valued by the employer; 4) current job: experience, salary, type of employment relationship, training for the job, type of position; 5) time spent unemployed, reasons for unemployment; 6) self-employment: economic activity, entrepreneurial nature of the activity, training to become an entrepreneur; 7) further studies: studies completed, place of study, relationship with the profession; 8) assessment of their undergraduate studies: whether they would study the same, at another university or abroad.

#### *Data analysis*

This study employs a quantitative approach using the matching method. This technique involves comparing individuals with similar observable characteristics without utilising an assignment index to divide them into treated and untreated groups. This approach was chosen to address the

research objectives. The estimations have been carried out using STATA 16 software.

This method has advantages in terms of not requiring a treatment assignment index or “variable, which in some cases does not exist or is unfeasible to construct. If the existence of similar characteristics is not guaranteed, it would prevent finding the causal relationship between the programme and the outcome variables” (Hernández-Medina & Ramírez-Torres, 2023, p. 232).

Instead of comparing “individuals with similar characteristics, propensity score matching compares individuals with the same estimated probability of participating in the programme for the common support” (Hernández-Medina & Ramírez-Torres, 2023, p. 233). Since this probability is estimated as a function of the characteristics of the individuals, this should ensure that they are alike.

The initial starting point for this estimation is to find the probability of participation using a probit model including variables that determine this probability and are independent of the treatment. In this case, the personal and socioeconomic characteristics of the individuals are used, for example: gender, age, nationality, marital status, parents’ educational levels, income level, family burden, type of housing, housing conditions and type of school.

Once this probability has been estimated, it is necessary to satisfy the assumption of common support, which implies finding individuals as similar as possible so that both groups have a positive probability. Graphical analysis was used to find the common support.

After establishing the common support, the impact of the programme was estimated parametrically and nonparametrically, which should generate similar results at least in large samples. This estimation was performed using nearest neighbour, Kernel and local linear regression, expressed as the treatment estimator:

$$\hat{\delta}_{ATT}^{PSM} = E_{p(x)|D=1} \left\{ E(Y(1)|D=1, P(X)) - E(Y(0)|D=0, P(X)) \right\} \quad (1)$$

According to Bernal and Peña (2011), Equation 1 represents the treatment estimator and indicates the “mean difference in outcome variables between the treatment group and the control group in the common support, weighted by the probability distribution of participation” (p. 105).

The parametric estimation is associated with a control group that is given by the nearest neighbour in terms of the probability of being treated,  $P(X)$ . The other two nonparametric methodologies (Kernel and local linear regression) consider higher weights for the most similar individuals in terms of the probability of being treated or an independent term in the local linear estimation that is a function of the probability found.

Finally, the quality of the matching was checked by estimating the probit model of participation with the selected observable variables and the predicted probability, in the hope that the latter is significant, and the observed variables are not, thus guaranteeing the comparison of similar groups.

### Ethical considerations

With regard to ethical considerations, in order to carry out the survey, each of the graduates had to complete a written consent form in which they agreed to provide the information requested; this consent indicated the guarantee of privacy and safeguarding of the data provided, so that it would remain confidential.

## Results

### Characterisation of the educational scholarship programme

The programme is aimed at all students with financial difficulties who are unable to pay their tuition fees. To be eligible for the programme, the student must have been admitted to the University for undergraduate studies, be under 31 years of age and complete the application process at the Office of Economic Cooperation, which oversees the programme, attached to the Dean's Office for Student Development. The modality analysed consists of granting a tuition discount, depending on the socio-economic evaluation, with variable exemption percentages depending on the conditions of the student and the number of resources available to the university for each academic period. It is not considered an educational credit and therefore the student is not legally obliged to repay it, although it is hoped that in some way the graduate beneficiary of this programme will contribute to other students once they have achieved economic stability.

The information provided by each student who applies for aid is analysed through the "Matrix of Evaluation of the Socio-economic Situation of the Applicant's Family Group" which allows a score to be obtained compared with pre-established criteria to determine whether he/she receives aid and the percentage of aid. The Evaluation Matrix has a maximum score of 600 points, distributed in five factors: income and expenses expressed in number of minimum wages, which represents 45%; the type of housing and its ownership with 20%; housing services with 5%; family burdens with 15%; average educational level of the family group with 10% and means of transport used with 5%.

Based on each student's information, a treatment assignment index is constructed. Thus, the allocation criterion is based on the construction of a financial aid index (following the methodology of Brito & Zambrano, 2005), calculated according to the socio-economic variables of the student (average monthly family income, type of housing, housing conditions, family burden and the student's residence), as the allocation criterion is economic and not linked to academic merit.

In each cohort, students who apply for the programme according to the allocation variable will receive treatment if they have an index equal to or higher than one hundred points, in which case the higher the need, the higher the percentage of discount or loan will be. If it is between 100 and 199 points it is 25%, between 200 and 299 it will be 30%, between 300 and 399 it will be 45% and above four hundred

it will be 50%. In this way, the index has four cohort points, which generates a multiple treatment. This treatment assignment index does not necessarily determine whether, and at what level, but rather the likelihood of receiving treatment, as it is the case analyst, considering the index and an interview with the person concerned, who makes the final decision.

### Characteristics of graduates based on the application of the questionnaire

The initial study population consisted of 4,677 untreated and 936 treated students. Of these, 50.64% of the treated and 53.80% of the untreated had dropped out at the time of the study, with only 2,292 graduating, which represented 40% of the initial population. Also, upon analysing the financial aid programme, 1,897 of the total number of graduates in both cohorts did not benefit from the financial aid programme (not treated) and 395 were beneficiaries.

The students who received treatment represent 16.7% of the total enrolled in both cohorts, a proportion that, although it rose to 17.2% of the total number of graduates, registered a loss of 541 who benefited from the programme and did not graduate, at least at the time of this study, hence of the 936 initial beneficiaries, only 395 graduated. Despite this, the graduation rate of the beneficiaries was higher than that of the non-beneficiaries: 42% in the first case and 40% in the second.

After applying the questionnaire to the 2,292 graduates, a response rate of 41.8% was obtained, higher than the range of 25 to 30% established in the literature on graduate follow-up, which is considered an acceptable rate for this type of instrument applied by e-mail.

Of the total number of completed questionnaires (958), 73.3% did not receive treatment (703 leavers) and 27.7% benefitted from treatment (255). The general results of the questionnaire about personal and family characteristics indicate that the majority (89%) are single, with an average age of 25 years.

Given that among the family variables, the literature indicates that the mother's level of studies represents one of the most important factors in terms of the influence it has on academic performance and continuation, we consulted on this aspect, obtaining that 37% had completed higher education and 18% had a postgraduate degree, which means that more than half of the graduates come from a household with a mother who has at least third-level studies.

A second aspect associated with additional studies and knowledge of a second language and computer skills was answered by the graduates, whereupon it was found that more than 65% have at least a good command of speaking, reading, and writing English and 96% have a good command of computer tools.

After graduating, a slim majority (51.9%) continued their education, of which only 26.22% did so at UCAB and 73.8% at other universities (37.7% abroad). Of the total who indicated that they continued their studies, only 31.6% took master's degrees and the rest took courses, in English. Despite this, 71.3% consider their education to be related to the undergraduate degree they obtained.

The third aspect consulted is associated with insertion into the labour market during the degree, upon graduation and at the time the instrument was applied (3 years after the theoretical date of graduation). During the first stage (Moment 1), 48.9% report having worked during their studies, of which 79.6% did so in some activity related to their studies, receiving an average monthly income of 1.95 times the average minimum salary and with a length of service of 26.4 months, as shown on Table 1.

During Moment 2 (upon graduation), the average time spent waiting for a job was 2.21 months and the average monthly income was 2.15 times the average minimum salary, with an average of 15.84 months of employment. At Moment 3 (recorded at the time of the survey), 82% were employed, with an average monthly income of 2.57 times the minimum salary.

Therefore, on average, gains were recorded when comparing employment during the course and graduation, and between graduation and the time of applying the survey (3 years after graduation). The courses that registered losses with respect to the time of the survey are Literature and Education, which tends to be the trend in the Venezuelan labour market, showing differences in remuneration by course.

If we specifically analyse the outcome variables on which we wish to measure impact, considering treated and untreated, we can identify the significant variables in remuneration and the proportion of employees in the three moments consulted. With respect to salary, the differences are significant in the three moments, as they are always higher in the untreated individuals, while the proportion of employees is higher for the treated and the difference is significant.

With respect to the additional knowledge or tools that both groups have and that could have an impact on both job search and perceived remuneration, the command of another language (English) and computer skills stand out. In the first case, the students report a lower command of the English language in terms of writing, reading, and speaking skills. On the other hand, the reported knowledge of computer tools is similar between beneficiaries and non-beneficiaries of the programme.

The results can also be analysed according to participation or not in the financial assistance programme, distinguishing between treated and untreated. In this case, we find significant differences in the main variables associated with the labour market (Table 2).

**Table 1. Income expressed as number of times greater than the minimum salary at the three time points consulted**

Degree	Moment 1	Moment 2	Moment 3	Earnings (Moment 1 and 2)	Earnings (Moment 2 and 3)
Economy	1.87	2.29	3.13	0.42	0.84
Law	2.05	2.14	2.82	0.09	0.68
Computer Engineering	1.64	2.19	2.81	0.55	0.62
Telecommunications Engineering	1.84	2.06	2.80	0.22	0.73
Industrial Engineering	1.69	2.11	2.79	0.42	0.68
Administration and Accounting	1.97	2.14	2.75	0.17	0.62
Social Sciences	2.08	2.07	2.73	-0.01	0.66
Psychology	2.11	2.27	2.42	0.15	0.15
Civil Engineering	2.50	2.15	2.41	-0.35	0.25
Social Communication	1.77	2.15	2.33	0.38	0.18
Literature	2.16	1.94	1.92	-0.22	-0.02
Education	1.80	2.26	1.91	0.46	-0.36
Average	1.96	2.15	2.57	0.19	0.42

Note. Moment 1 represents the average income during the degree course (N° minimum salaries), Moment 2 represents the average income upon graduation (N° minimum salaries) and Moment 3 represents the current average income (N° minimum salaries).

Source: own elaboration

**Table 2. Comparison of outcome variables between treated and untreated**

Variable	Untreated	Treated	Difference	
N				
Worked during career (proportion)	0.4765 (0.0188)	0.5373 (0.0312)	-0.0608 (0.0365)	*
Income during studies (number of minimum salaries)	2.0098 (0.0935)	1.6627 (0.0873)	0.3470 (0.1566)	**
Income after graduation (number of minimum salaries)	2.5697 (0.0532)	2.2541 (0.0676)	0.3155 (0.0953)	***

(Continued)

Variable	Untreated	Treated	Difference	
Current job (proportion)	0.8151 (0.0146)	0.8667 (0.0213)	-0.0516 (0.0258)	*
Current income (number of minimum salaries)	2.8153 (0.0730)	2.1422 (0.0668)	0.6730 (0.1248)	***
Self-employment (proportion)	0.0610 (0.0091)	0.0632 (0.0153)	-0.0022 (0,0178)	
Self-employment income (number of minimum salaries)	4.2058 (0.7024)	2.1422 (0.1642)	2.0635 (1.1571)	*
Current unemployment (ratio)	0.1821 (0.0146)	0.1333 (0.0213)	0.0487 (0.0258)	*

Note. Values in parentheses represent standard errors. Significant minus 1% (\*\*\*), between 1% and 5% (\*\*), between 5% and 10% (\*).

Source: own elaboration

A higher proportion of beneficiaries of the programme worked during their studies (53.7%), earning a lower average monthly income than the untreated (1.66 minimum salaries as opposed to 2 minimum salaries). After graduation and at the time of the survey, the trend seems to be the same, with graduates who were part of the support programme having a lower average monthly income than those who were not treated, and the difference being statistically significant.

#### Results of propensity score matching

The initial starting point for this estimation is to find the probability of participation using a probit model including treatment-independent variables that determine the probability of participation. The results obtained show that age and the aid index are significant, while the remainder of the variables included were not significant in the estimation.

The results correspond to what was expected, since the younger the person is, the greater the probability of receiving aid, given that the programme has an age limit. Similarly, the treatment assignment index indicates the family's degree of economic need, whereby values below one hundred points indicate that the socioeconomic level does not merit assistance, while as we approach the upper limit of six hundred points the need is greater and, therefore, the percentage of discount on tuition should be increased.

Once the probability of receiving treatment was obtained, only those individuals who are in the common support were considered for the estimation of the treatment effect. Once this assumption was satisfied, the quality of the match was validated by estimating again the probability of receiving it, considering the initial estimate of this probability. The results show that the observable variables included in the original estimate are not significant, as expected.

This validation allowed us to estimate the treatment effect, using parametric nearest neighbour analysis and nonparametric Kernel and local linear regression analysis for each of the outcome variables (salary during the course, at the time of graduation and at present, as well as the probability of employment upon obtaining the corresponding degree).

Regarding salary (in terms of number of times greater than the minimum salary), during the degree course of

those graduates who worked, we have obtained results for the comparison not only with the nearest neighbour but also with the 5 and 10 nearest neighbours and for the common support by excluding the 20% of individuals who have the lowest estimated probability of receiving treatment. It was discovered that there is a negative and significant impact of the programme on the salary received during the course, as shown on Table 3.

**Table 3. Estimated treatment effect on salary during the course (number of times the minimum salary)**

	Common Support			
	Minimum / Maximum		Trimming (20%)	
Nearest Neighbour	Difference (Untreated - Treated)	t-statistic	Difference (Untreated - Treated)	t
(1) (0.2448)	-0.3335 (0.2648)	-1.36	-0.2997 (0.2644)	-1.13
(5) (0.1657)	-0.3536 (0.1657)	-2.13	-0.3179 (0.2644)	-1.83
(10) (0.1653)	-0.3575 (0.1653)	-2.16	-0.3346 (0.16777)	-2.00
Kernel (0.1711)	-0.3385 (0.1711)	-1.98	-0.3020 (0.1638)	-1.84
Linear local estimator (0.1668)	-0.3584 (0.1668)	-2.15	-0.3223 (0.1859)	-1.73

Note. Standard errors are given by the values in brackets. Nearest neighbours indicate the most similar students: (1), (5) or (10).

Source: own elaboration

As shown on the Table above, the difference between treated and untreated using all common support for all methods ranges between 0.33 and 0.36 times the minimum salary. In all cases, these differences show a lower salary level for those who received treatment, which may be due to the need to work and accept a job that does not provide the best benefits, given that the support provided by the programme is relatively low and does not cover even half of what the student must pay to complete his or her degree.

Similarly, we estimated the impact on the salary at graduation (number of times the minimum salary), finding



that the impact is also significant and that there seems to be a reduction in salary when comparing treated and untreated for both the total common support and the cutback, as shown on Table 4.

**Table 4. Estimation of the effect of treatment on the salary at graduation (number of times the minimum salary)**

Nearest Neighbour	Common Support			
	Minimum / Maximum		Trimming (20%)	
	Difference (Untreated - treated)	t-statistic	Difference (Untreated - treated)	t-statistic
(1)	-0.0570 (0.2300)	-2.48	-0.5382 (0.2522)	-2.13
(5)	-0.3800 (0.1348)	-2.82	-0.2810 (0.1386)	-2.03
(10)	-0.3711 (0.1203)	-3.08	-0.3271 (0.1216)	-2.69
Kernel	-0.3002 (0.1092)	-2.75	-0.2438 (0.1066)	-2.29
Linear local estimator	-0.3143 (0.1043)	-3.01	-0.2812 (0.0900)	-3.12

Note. Standard errors are given by the values in brackets. Nearest neighbours indicate the most similar students: (1), (5) or (10).

Source: own elaboration

Table 4 reflects the results found for the impact on salary at the time of graduation and, as can be seen, if the common support is considered in its entirety, the salary of the treated individuals is lower than that of the untreated, with the difference ranging between 0.05 and 0.38 times the minimum salary, while in the 20% trimming in support, the difference is between 0.24 and 0.53 times the minimum salary.

If the analysis is completed with the results for the current salary, it can be seen on Table 5 that the difference between treated and untreated workers widens as the graduate acquires more experience, being in favour of the non-beneficiaries of the programme. Specifically, for the common support, the salary is lower for those treated with a difference that ranges between 0.62 and 0.69 times the minimum salary, and is significant in all cases, while with a reduction in the common support, the difference widens, ranging between 0.57 and 0.79 times the minimum salary.

**Table 5. Estimation of the treatment effect on the current salary (number of times the minimum salary)**

Nearest Neighbour	Common Support			
	Minimum / Maximum		Trimming (20%)	
	Difference (Untreated - treated)	t-statistic	Difference (Untreated - treated)	t
(1)	-0.6959 (0.2807)	-2.48	-0.6767 (0.3129)	-2.16
(5)	-0.6622 (0.1556)	-4.26	-0.5796 (0.1586)	-3.65
(10)	-0.6230 (0.1388)	-4.49	-0.5748 (0.1375)	-4.18

(Continued)

Nearest Neighbour	Common Support			
	Minimum / Maximum		Trimming (20%)	
	Difference (Untreated - treated)	t-statistic	Difference (Untreated - treated)	t
Kernel	-0.6508 (0.1326)	-4.91	-0.5962 (0.1261)	-4.73
Linear local estimator	-0.6308 (0.1502)	-4.20	-0.7976 (0.1356)	-5.88

Note. Standard errors are given by the values in brackets. Nearest neighbours indicate the most similar students: (1), (5) or (10).

Source: own elaboration

In contrast to what occurs in the variables associated with salary levels during the study course, at the time of graduation and at present, the results found for the probability of employment seem to indicate that there is no evidence to confirm the existence of a significant difference between treated and untreated students. Table 6 shows that, except in the case of the nearest neighbour, the probability of employment increases with treatment, being between 1% and 3% higher in those who receive the programme.

**Table 6. Estimated treatment effect on the probability of employment**

Nearest Neighbour	Common Support			
	Minimum / Maximum		Trimming (20%)	
	Difference (Untreated - treated)	t-statistic	Difference (Untreated - treated)	t-statistic
(1)	-0.0317 (0.0456)	-0.69	-0.0145 (0.0515)	-0.28
(5)	0.0103 (0.0343)	0.3	0.0233 (0.0360)	0.65
(10)	0.0265 (0.0329)	0.81	0.0310 (0.0342)	0.91
Kernel	0.0176 (0.0322)	0.55	0.0249 (0.0323)	0.77
Linear local estimator	0.0160 (0.031)	0.50	0.0262 (0.0267)	0.98

Note. Standard errors are given by the values in brackets. Nearest neighbours indicate the most similar students: (1), (5) or (10).

Source: own elaboration

While these estimates might serve as an initial indicator of the presence or absence of impact, as previously mentioned, the methodology is reliable insofar as the decision to apply for financial aid and, more importantly, the decision to grant such aid by the evaluator—meaning the likelihood of receiving financial aid—are not influenced by unobservable characteristics but are determined by observable ones.

## Discussion and conclusion

Studies on educational financing programmes, in any of their modalities and methodological designs, seem to show

robust conclusions in terms of outcome variables associated with student academic performance, whether measured as dropout, continuation or graduation, even if average grades are considered, but little has been studied with respect to long-term effects through variables such as labour income or probability of employment.

Given the above, this research is relevant for three reasons, the first being that there are no studies that employ impact evaluation methodologies of affirmative programmes or actions (except Hernández, 2019; Hernández-Medina & Ramírez-Torres, 2022, 2023) in higher education for Venezuela, in particular, the UCAB's academic support and financial aid programmes have had an impact on academic performance variables, showing a reduction in dropout rates.

Second, there are very few studies that analyse the impact of university student support programmes on post-graduation variables, especially regarding scholarships and grants, and third, the programme analysed is unique in Venezuela, implemented over more than three decades, to which a significant budget is allocated, considering that it is a non-profit institution. This programme thus represents a case study on affirmative action policies and educational management that can be replicated by other higher education institutions, for which its evaluation can lead to the identification of opportunities for improvement, such as the design of more comprehensive programmes that complement the intervention and lead to better results.

In light of the results shown, the programme does not appear to improve the salaries of the treated group in the three moments in which they have been consulted, these findings are valid only for the context of UCAB and of the graduating class analysed, which raises the same impact assessment methodology; rather, the existing difference widens as the graduate acquires more experience, either because the non-beneficiary has additional tools such as computers and languages, or because he/she has a network of contacts that allow him/her to obtain a better job.

These results could be analysed in terms of at least four factors, which would explain the lack of impact of the treatment on the post-graduation variables. The first factor is associated with the treatment itself: it is a grant that does not require repayment, so there is no need to generate additional income or opt for higher wages as might occur in education credit programmes, as Vélez et al. (2018) argue. Thus, the results and behaviour of graduates differs among studies evaluating education loans such as Vélez et al. (2018), Bettinger et al. (2019) and Daniels and Smythe (2019), which assume the need to repay the financing and thus to work longer hours to repay the debt.

Second, it is necessary to understand the reality of the Venezuelan labour market, in which remuneration does not depend on hours worked especially in positions associated with university degrees. Instead, the income derived from a job is a fixed monthly amount, unlike the cases studied by Daniels and Smythe (2019), where income increased by the increase in hours worked. Therefore, despite the graduate's desire to work more to increase their remuneration, it is not

feasible, thus conditioning the impact results and differing from the evaluation of educational credit programmes in countries such as the United States.

Third, the remuneration and labour market insertion of graduates depends, in addition to the structure of the labour market itself on the profession and the higher education institution in which they largely studied. Although in this case they are all part of the same university, the careers are different and so are their salaries, as established by authors such as Beyer et al. (2015) and Bucarey et al. (2018), who explain the differences in salaries based on signalling theory.

Finally, unlike studies that consider the allocation of aid (whether scholarships or loans) considering meritocracy, the programme analysed is awarded based on the student's socio-economic status, which conditions the individual characteristics of the beneficiaries (Bernal et al., 2024; Bozzetti et al., 2024). Studies in which the allocation is through academic merit show positive impacts, as beneficiaries have a higher initial endowment of human capital than those who come from lower social classes (Oh, 2022; Wang et al., 2022). Thus, the labour market tends to reward graduates with better academic performance at least in their first jobs (Forero & Ramírez, 2008; Rangel, 2016).

The most crucial factor is related to the way in which the beneficiaries are determined. It is relevant to indicate that the allocation criteria are not based on academic variables or meritocracy, cases in which the literature does show a positive impact, but rather that in this programme, the beneficiaries come from households with economic difficulties and more disadvantaged social classes, which has important implications in terms of social capital and additional preparation (such as languages or other skills).

Moreover, the allocation to low-income students has an impact not only on academic performance, but also on the stock of social capital and additional skills in languages, technology or other tools desirable to employers. Studies by Forero and Ramírez (2008), Cuervo et al. (2019), Finnegan et al. (2019) and Oh (2022) among others, clearly indicate that students from lower classes have fewer opportunities to access the labour market with equal opportunities than those with higher incomes, networks, relationships, contacts and greater cultural and even human capital, which generate differences in employment and remuneration, and even efforts to massify higher education, though financial support programmes fail to compensate for these limitations (Coleman, 1990; Granovetter, 1985).

In any case, what does seem clear, as the literature suggests, is that a financial aid programme alone does not correct the existing differences between treated and untreated students, so for the most disadvantaged students, it is necessary to incorporate mechanisms for insertion into the labour market by designing employment exchanges that remedy the deficiencies in terms of relationships and networks as a whole, so that the benefits of the degree can at least be equalised between the two groups (Hernández-Medina & Ramírez-Torres, 2022, 2023).

To ensure treatment causality for future research, the design of fuzzy regression discontinuities could be used given that there are treated and untreated around the threshold, depending on the treatment assignment criterion, to complement the results achieved in this study.

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## Authors' contribution

Patricia Hernández Medina: conceptualization, formal analysis, research, methodology, writing (original draft); Daniel Goncalves Hernández: research, methodology, software; Luis Morales La Paz: writing (original draft), writing (refereeing and editing corrections).

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