



Does free tuition promote equity in higher education? impact on academic performance of low-income university students

Óscar Espinoza¹ · Bruno Corradi¹ · Luis Sandoval² · Lucas Sobarzo³ · Catalina Miranda³ · Noel McGinn⁴ · Javier Loyola⁵

Accepted: 6 August 2025

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Abstract

The expansion of higher education has led to new challenges for educational equity, which extend beyond access. A key policy response has been the implementation of different student aid programs. The various types of aid are based on different eligibility criteria, reflecting contrasting conceptions of what constitutes educational equity. This study assesses the impact of the Chilean free tuition policy, a need-based financial aid, on the academic performance of low-income students, comparing it to other forms of student aid. A multilevel model was estimated using administrative data from 10 Chilean universities for cohorts admitted in 2010 and 2016. The results show that, during the first year, students with free tuition outperformed both those without financial aid and those who relied on loans. In the third and fourth years, students who received free tuition continued to perform better than those with loans but showed lower academic performance than recipients of merit-based scholarships. The findings suggest that different types of aid are associated with different academic trajectories, which raise essential questions about the equity implications of merit-based versus need-based funding models. Rather than treating these approaches as mutually exclusive, our results highlight the need for a more balanced design that considers both performance and structural disadvantages. This would contribute to the efficient use of public resources and promote greater equity in higher education.

Keywords Academic performance · Equity · Financial aid · Free tuition · Higher education

Introduction

One of the objectives of the massification of higher education has been to promote educational equity, which calls for all students to have the same opportunity to develop their talents and capacities in higher education, regardless of their family resources (De los Santos et al., 2020; Espinoza, 2007; McCowan, 2015). In this context, the introduction of financial aid mechanisms was one of the main initiatives implemented to reduce the economic barriers faced by low-income students (Salmi & D’Addio, 2020). These aim to partially or fully cover the costs associated with tertiary studies, differing in whether they include academic

Extended author information available on the last page of the article

merit as a requirement or are based solely on the beneficiary's financial situation. In this way, these instruments reflect different distributive logics and represent divergent conceptions of how to address inequities in tertiary education. While merit-based aid emphasizes that only those who meet certain academic standards deserve financial support, need-based aid assumes that students' socioeconomic status should be the primary allocation criterion regardless of academic performance (Herbaut & Geven, 2020; Rios-Jara, 2023).

These financial aid programs originally were designed to promote equity in access to tertiary education. However, true educational equity can be fully achieved only if they also consider the experiences of students once they enter the system. Equity demands that all students have an equal opportunity to acquire the required learning outcomes within the system (Espinoza, 2007; Jordan, 2010). Although this goal can be measured in various ways, several studies have highlighted the importance of promoting more equitable academic performance within universities (Engle & Tinto, 2008; York et al., 2015). Research, however, has shown persistent gaps in students' performance based on their socioeconomic background. University students from lower-income families tend to perform poorly, in part because of their limited prior preparation and reduced time available for study (Delaney & Devereux, 2020; Goldrick-Rab et al., 2016; Rodríguez-Hernández et al., 2020). It is crucial, therefore, to ascertain that their receipt of financial aid contributes greater equity in their academic trajectories, and to what extent this contribution varies depending on the type of aid received.

The specific challenges to advancing equity after massification vary depending on the characteristics of individual university systems. In Latin America, for example, the expansion of higher education has been marked by high levels of social inequality and negative consequences of privatization (Chiroleu & Marquina, 2017; Mendoza-Lozano et al., 2021). In particular, the Chilean higher education system has faced serious challenges over the past 30 years. These were brought on by reforms implemented during the military dictatorship (1973–1990) in the 1980s. These reforms led to the expansion of the system which increased the diversity of the student body and made educational inequity more apparent (Araneda-Guirrman et al., 2018). Specifically, academic trajectories within universities continue to be segmented by students' social background (Catalán & Santelices, 2014; Flanagan, 2017). One of the leading causes is the high cost of higher education in the country, as Chile has the third-highest tuition fees in the OECD (2022).

The Chilean government has struggled to reduce the financial barriers that limit the educational trajectories of disadvantaged students. Efforts have involved the creation of a financial aid system that is currently composed of a diverse set of instruments based on different distributive logics (Subsecretaría de Educación Superior, 2025; Clasing-Manquian, 2024). The financial aid system began with a set of scholarships and loans that combined merit-based and need-based criteria. In 2016, however, the government introduced a free tuition policy, which represented a shift by eliminating direct merit criteria and providing financial support solely based on financial need (Ríos-Jara, 2023; Espinoza et al., 2022). In this context, there is growing interest in understanding the extent to which these financial aid schemes contribute to students' academic performance and, consequently, to the achievement of educational equity.

Internationally, research on student financial aid has largely concentrated on assessing the impact of individual programs on the grades obtained by beneficiaries (Bezerra & Tassigny, 2018; Evans & Nguyen, 2019; Wildschut et al., 2020). Even though these studies provide valuable insights regarding the impact of financial aid, they rarely examine how different types of student aid, grounded in distinct distributive logics, affect students' academic performance. In addition, research evidence is inconclusive. While some studies in South Africa (Van Der Berg, 2017) and in some states in the USA (Johnson, 2022) found that financial

aid contributes to higher academic performance (Johnson, 2022; Van Der Berg, 2017), others report null or even negative effects (Bhayani, 2020; Harrison et al., 2018; Kerkvliet & Nowell, 2014). These mixed results underscore the relevance of comparative analyses that explore the differential impact of student aid schemes to promote both academic outcomes and educational equity.

In this scenario, the objective of this study was to assess the impact of free tuition on the university academic performance of low-income students, compared to the performance of students from similar backgrounds receiving other types of financial aid. By comparing students receiving different types of financial aid, this study explores how the distinct distributive logics embedded in these programs may be associated with differences in academic performance. The results show that, during the first year, students with free tuition outperformed those without financial aid and those who relied on loans. In later years, however, their performance was surpassed by that of students who received merit-based scholarships. Based on these findings, the study aimed to contribute to the international debate on how financial aid promotes equity in higher education by providing empirical evidence to inform policies that not only ensure access but also support student success within universities. Chile is particularly noteworthy, given the coexistence of diverse financial aid instruments based in contrasting perspectives of equity. This permits a comparative analysis of their impact.

Literature review

Equity in higher education

There is currently a general consensus on the importance of promoting equity in education (Li & Carroll, 2019; OECD, 2024; Salmi & D'Addio, 2020). However, there remains a lack of clarity regarding the exact definition of this concept. As a result, the term is often used interchangeably with equality. While these concepts are similar, they have different implications (Espinoza, 2007). Equality focuses on ensuring both equal opportunities and outcomes (Strike, 1985), whereas recent interpretations of equity emphasize the principle of justice (McCowan, 2015). Differences in performance based on effort, abilities, or ambition can be acceptable in terms of equity if they are not the result of the contextual conditions of the students. Consequently, differential treatment of students to achieve equality of opportunity is justifiable from an equity perspective if it takes into account student background and contextual conditions (De los Santos et al., 2020; Espinoza, 2007).

In higher education, this equity perspective involves examining how students' backgrounds impact various stages of their educational journeys. Extensive research has shown that students from lower-income or disadvantaged backgrounds tend to have less access to higher education, poorer academic performance, and lower rates of persistence and completion (Adrogué & García de Fanelli, 2018; Delaney & Devereux, 2020; Goldrick-Rab et al., 2016; Marginson, 2016). Therefore, focusing on educational equity not only should extend beyond simply ensuring access to tertiary education, but should also guarantee that all students have equal opportunities to learn and reach their full potential within the educational system (Jordan, 2010). In this context, academic performance is a crucial aspect of equity, as it is generally understood as an indicator of the acquisition of skills and educational achievement (Rodríguez-Hernández et al., 2020; York et al., 2015). Additionally, academic performance is a major determinant of student continuance in the university and has a major

influence on graduates' labor market outcomes (Khoo & Ost, 2018; Pinto & Ramalheira, 2017; Stewart et al., 2015).

Achieving equitable learning outcomes involves not only acknowledging the impact of students' backgrounds but also implementing public interventions to minimize their effects. Decision-makers, however, encounter a fundamental dilemma: how to allocate limited resources in ways that are efficient, fair, and preserve the quality of education (Hansen, 1972). This tension is evident in higher education funding policies, particularly in the design and implementation of various financial aid instruments.

From an economic perspective, merit-based aid represents a rational mechanism for the allocation of public resources. This approach assumes that directing funding to those who have demonstrated strong past academic performance will yield higher returns on public investment (Durlauf, 2008; McMahon, 1982). This viewpoint is also based on the belief that individuals should receive certain economic benefits based on their actions, specifically their academic achievement (Elster & Roemer, 1991).

While merit-based aid can effectively allocate resources, it can also perpetuate inequities, as prior academic performance is often closely tied to socioeconomic background (DesJardins, 2003; Marginson, 2011). In contrast, need-based programs explicitly recognize these disparities and aim to redistribute opportunities to those who face systematic barriers. Drawing on Rawls' (1971) principle of social justice, need-based aid focuses on equity, allocating resources not to those who "perform best," but to those who are most in need. Thus, need-based aids aim to address structural disadvantages rather than simply rewarding individual accomplishments. This creates a different basis for access to and participation in higher education (Tavares et al., 2022).

Predictors of academic performance: the role of financial aid

The relevance of academic performance both for students' university success and for achieving educational equity has led to increasing interest in identifying its main determinants. Recent studies have concentrated on constructing precise prediction models that employ machine learning and data mining (Miguéis et al., 2018; Zeineddine et al., 2021). Among the numerous factors influencing academic performance, two stand out in recent studies: academic performance before enrolment in university and the sociodemographic characteristics of students. Prior academic performance is the more important predictor of university performance (Alyahyan & Düşteğör, 2020; Shahiri et al., 2015). Once enrolled, performance is most highly related to socioeconomic conditions (Rodríguez-Hernández et al., 2020), ethnicity (Low et al., 2019), and gender (Delaney & Devereux, 2020).

As a result, one of the key mechanisms for reducing performance gaps related to students' socioeconomic backgrounds has been the implementation of financial aid. However, the evidence on the impact of student aid on academic performance remains inconclusive. An American study (Stoddard et al., 2018) reported an overall negative relationship between student loans and performance. On the contrary, Pell Grants (a scholarship based on financial need) had a positive effect, as their beneficiaries improved their academic performance.

In a similar study conducted in the USA with a different group of universities, Evans and Nguyen (2019) found no difference in the performance of those taking loans and those who did not. A study conducted at 101 Chinese universities reported no difference in the academic performance of students who received need-based grants but did observe a slight negative impact on the performance of those who received loans (Huang et al., 2018). In

both the US and Chinese studies, students with bank loans were more likely to engage in part-time employment while pursuing their studies, negatively impacting their academic commitment and performance. Wildschut et al. (2020), based on a study at two prestigious universities in South Africa, found a small but positive correlation between a need-based scholarship program and academic performance.

Evidence of the effect of free tuition is similarly inconclusive. In Ecuador, tuition fees were eliminated in 2008, establishing free access to public universities. While access to higher education increased, this change predominantly benefited students from higher socioeconomic backgrounds (Molina & Rivadeneyra, 2021). In Argentina, where the public university system is both open-access and tuition-free, a study found that disparities in academic success persist based on students' socioeconomic origins (Adrogué & García de Fanelli, 2018). In a study conducted in three US states, Perna et al. (2017) found that free college programs had minimal impact on student performance, attributing this to the absence of complementary academic and financial support. In their Brazilian study of the influence of free tuition on higher education academic performance in two Administration programs, Bezerra and Tassigny (2018) found a positive correlation.

On the contrary, Bhayani (2020), in the United Arab Emirates, compared a tuition-based private and tuition-free public university and found a positive relationship between self-financing and academic performance (grades and persistence to graduation). Similarly, Bruckmeier et al. (2015) examined the introduction of tuition fees in several German states in 2008 and their effect on time to graduation. Their findings showed that in states where tuition fees were introduced, students graduated more quickly. Thus, the evidence on the academic effects of tuition-free policies is mixed, and comparative studies assessing their performance relative to other forms of financial aid remain scarce.

Chilean context

The structural features of the Chilean higher education system are the result of neoliberal reforms implemented under the military dictatorship (1973–1990). These led to the deregulation and marketization of the higher education system, allowing for the establishment of new private institutions and the introduction of tuition fees as the principal source of finance for both private and public universities (Morales, 2025; Salazar & Leihy, 2017). These changes led to an explosive process of expansion of university enrolment, rising from 127,781 students in 1990 to 706,040 in 2024, with nearly 70% now attending private universities (Servicio de Información de Educación Superior [SIES], 2024).

These changes, however, imposed a significant financial burden for many students and their families. The average annual tuition fee in Chilean universities has become the third highest among OECD countries in terms of Purchasing Power Parity (PPP), reaching US\$8132 in 2022 (OECD, 2022). The reorganization of the system transferred the cost of higher education from the state to individuals, based on the notion that higher education is a private good with high personal returns. From this perspective, it was considered fair that those who benefit directly from higher education should bear its cost (Marcucci & Johnstone, 2007).

In this context, various forms of financial aid had been implemented to promote access for low-income students, including scholarships, student loans, and more recently a free tuition policy. This evolution in the design of financial aid reflects underlying tensions between principles inherited from the dictatorship and alternative approaches that view higher education as a social right (de Gayardón, 2019). These competing views have

shaped the notions about what constitutes fairness in access and success (Rios-Jara, 2023). Initially, equity issues were addressed through individually targeted solutions with the introduction of merit-based scholarships and student loans as rational mechanisms for the allocation of public resources. These instruments covered fees based on merit and need eligibility conditions. However, they only covered costs up to the reference tuition, an amount set by the State for each program, which did not necessarily match the actual fees charged by universities and often required students to secure additional funding to cover the full cost (Clasing-Manquian, 2024). In recent years, the introduction of the free tuition policy marked a departure from this logic, reducing the requirements imposed on students and broadening student financial support.

Within the more than 15 scholarship programs available at present, the main initiative is the Bicentenario Scholarship. This is available only for students enrolled in traditional universities and covers the maximum amount possible, the reference tuition. It is awarded only to applicants from the first seven deciles of income who achieve a minimum average score of 510 points across the two mandatory selection tests (Prueba de Acceso a la Educación Superior, PAES, and previously Prueba de Selección Universitaria, PSU), which are graded on a scale ranging to 1000 points. To continue receiving the scholarship each year, students had to pass at least 60% of their annual courses.

Alongside this scholarship, two major loan programs were created: the Fondo Solidario de Crédito Universitario (FSCU), available to students attending traditional universities (founded before 1981); and the Crédito con Aval del Estado (CAE), a state-guaranteed bank loan created in 2005 for students enrolled in accredited institutions, regardless of the type of university. Like the Bicentenary Scholarship, both loans combine need and merit criteria, suggesting that only students who meet specific merit criteria are deserving of financial assistance and reinforcing a conception of higher education as a private good that yields individual returns.

In 2016, in response to intense student mobilizations, the Chilean government introduced a new policy of free tuition for low-income students. This policy sought to reposition higher education as a social right and a public good, marking a significant departure from the previous model grounded in neoliberal principles that framed higher education as a competitive market (Clasing-Manquian, 2024; Rios-Jara, 2023). This policy covers 100% of actual tuition fees during the nominal duration of the degree program, plus one additional year, eliminating the need for complementary funding.

Initially, free tuition was available to students from families in the first five income deciles admitted to a participating university. To qualify, the institutions must meet specific quality standards, such as institutional accreditation, which introduces an indirect element of institutional selectivity. In 2018, coverage was extended to students in the sixth decile of family income (Subsecretaría de Educación Superior, 2021). In 2024, more than 310,000 university students benefited from the free tuition policy, representing 79% of all financial aid recipients and almost 45% of the total university enrollment (Ministerio de Educación, 2025b). In 2023, the cost to the government of the free tuition policy had risen to 57.6% of total public spending on higher education (Superintendencia de Educación Superior, 2024).

Despite its relevance, little research has been done on the impact of free tuition. A qualitative study found that free tuition reduced students' financial stress and allows students to navigate the university experience more easily than if required to finance their studies through their own resources or loans (Espinoza et al., 2022). Research on academic performance has been limited to two case studies of students enrolled in a non-university post-secondary program (less than 4 years) (Flores et al., 2020; Venegas-Muggli, 2022). Both studies found a negative correlation between academic performance and reception of free

tuition. The authors attribute these results to the fact that the institutions included in the studies tend to have lower admission standards, and that recipients of free tuition have been predominantly first-generation students from low-income families.

Methodology

This report is based on a quantitative study that used a quasi-experimental and longitudinal design (Andress et al., 2013). The population studied comprised Chilean students admitted to one of the 28 universities that adhered to the Universal Admission System (“Sistema Único de Admisión,” SUA) and subscribed to the free tuition policy in 2016.¹ Students were admitted to SUA universities based on their scores on the University Selection Test. An intentional sample (Cohen et al., 2007) of 10 universities was initially selected to construct the database. The criteria for inclusion were admission selectivity based on PSU scores (low, medium, high), the type of university, and geographical location (North, Center, South). Universities were categorized as state-owned, traditional private (universities established before 1981), and new private universities created after the higher education reforms of the 1980s.

These criteria were designed to ensure a sample that reflects the heterogeneity of SUA universities that participated in the first year of the free tuition policy. Annex 1 presents descriptive statistics for the 25,675 students who entered one of the 10 universities in the sample, and for the 52,620 students enrolled in the 28 universities participating in the new policy (Department of Evaluation, Measurement and Educational Registration [DEMRE], 2020). There are no large differences between the two groups with respect to gender, education of parents, or the type of secondary school from which the student graduated. The differences between the sample and the universe on academic performance in secondary school are small, considering that scores can vary between 1.5 and 8 (see Appendix 4). We concluded that the sample was representative of the universities that implemented the free-tuition policy in 2016.

Universities participating in the study provided administrative and enrolment data on all undergraduate students admitted in 2010 and 2016. These data included sociodemographic information, prior academic performance, admission test results, and course grades received once enrolled in the university. The data were arranged to create a panel-type database that tracks students from both cohorts during the first 4 years of their university trajectories.

Impact evaluation

An impact evaluation design compares outcomes for a treatment and a control group. In this case, the outcome is the annual grade point average (GPA). If a student receives the treatment (e.g., financial aid) at time t , when the outcome is Y_t , the impact is estimated by comparing the outcome in the following period (Y_{t+1}^1). If there was no treatment in that period, its value would have been Y_{t+1}^0 . Therefore, the impact is estimated as:

$$\text{Impact} = Y_{t+1}^1 - Y_{t+1}^0$$

¹ This group of universities does not include the two new state universities created in 2015.

However, it is not possible to observe both results for the same student. Therefore, it is necessary to establish a control group with similar characteristics to the treatment group. The control group was selected from students in the 2010 cohort who were comparable to the 2016 cohort (recipients of free tuition). The aim was to match the characteristics of the treatment group in terms of family income and the eligibility criteria for free tuition. While free tuition initially covered students from the first five income deciles, university records only provided quintile data. It was impossible to distinguish between students from the fifth and sixth deciles, as both are grouped into the same quintile. Therefore, the control and treatment groups were selected to include students in the first four deciles (two quintiles) of the 2010 and 2016 cohorts, respectively. Consequently, the scope of this study is limited to assessing the impact of free tuition on the academic performance of students from the first four income deciles who enrolled in universities participating in the free-tuition policy during its first year of implementation.

Students' records were excluded for both groups if any variables had missing values. The control group (2010 cohort) included 9921 students, of which 728 (7.1%) had missing values. In the treatment group (2016 cohort), 2104 (18.5%) students of the 11,364 had missing values. The final database included 9493 cases in the 2010 control cohort and 9260 cases in the 2016 treatment group.

Table 1 provides an overview of the characteristics of the control (2010) and treatment (2016) groups. The number of women in both groups is roughly similar. However, there is a difference between the two cohorts in the proportion of students who attended municipal (public) secondary schools and those who attended subsidized (voucher) private schools. In recent years, there has been a notable increase in the number of students attending subsidized private schools compared to municipal schools (Ministerio de Educación, 2025a). There were some differences in the variables describing secondary school academic background. As academic grades range from 1.5 to 8.5, the observed differences can be deemed minor (Table 1).

Variables

The dependent variable in this study was the annual GPA, which is commonly used in previous studies as a measure of academic performance (Rodríguez-Hernández et al., 2020). In Chile, grades range from 1.0 to 7.0, with 4.0 considered a passing grade. Changes in

Table 1 Values of control (2010) and treatment (2016) groups

Variable	Control (2010)	Treatment (2016)
Gender (female)	47.3	48.9
Secondary school type		
Private	2.4	2.5
Private subsidized	51.3	58.5
Public	46.3	39.0
First-generation status	72.3	63.6
	Mean (S.D.)	Mean (S.D.)
PSU Lang	5.78 (0.64)	5.67 (0.75)
PSU Math	5.86 (0.66)	5.69 (0.72)
Secondary GPA	6.05 (0.87)	5.97 (0.86)
<i>N</i>	9493	9260

Author's elaboration

grading practices between 2010 and 2016 could bias the results. Therefore, for each year and university, an annual GPA was computed for each cohort. The difference between these averages (2016 mean – 2010 mean for each year and university) was used to calculate a GPA inflation/deflation coefficient. Grades in 2016 were then adjusted by subtracting this value.

Ten independent variables were employed in the analysis. These were deemed to describe pre-enrolment characteristics of students as well as their trajectory in the university. The pre-enrolment variables included gender (female 0, male 1); parents' education (first-generation status: neither parent attended higher education, 0, 1); students' secondary GPA (1.50–8.50); and admission test scores in math and language (1.50–8.50).² Three types of secondary schools were included: public, subsidized private, and private. Subsidized schools in Chile receive funds from the State as well as from families.

To describe students' trajectory in the university, it was also included the type of financial aid received, field of study, type of university, and yearly course load. Field of study was categorized as follows: administration and business, agriculture, arts and architecture, social sciences, law, education and humanities, health, and STEM. The universities were grouped into three types: State-owned, private traditional, and new private. The number of courses was treated as a continuous variable centered on the average. In addition, the year of study was included as a control variable (1st to 4th years).

Regarding financial aid, only state-financed aid was included. The two largest loan schemes, the State Guaranteed Loan (Crédito con Aval del Estado, CAE) and the University Solidarity Loan (Fondo Solidario de Crédito Universitario, FSCU), were included in the analysis. These were analyzed separately because in 2010 (control group) they operated under different eligibility requirements, as the FSCU was available only to students enrolled in traditional universities. Among the various types of scholarships, only the Bicentenary Scholarship was included in the analysis, as it is the most comparable to free tuition. Given that it did not necessarily match the actual fees charged by universities, students had to cover the difference through their own financial resources or by securing a loan (FSCU). Due to its merit-based allocation and renewal requirements, it was classified as a merit scholarship. Students were categorized into six financial aid profiles: (i) no government aid; (ii) merit scholarship; (iii) merit scholarship and FSCU; (iv) only CAE; (v) only FSCU; and (vi) free tuition.

Type of analysis

The data used in this research is longitudinal, tracking students over 4 years. Multiple linear regression analysis would not be an appropriate statistical approach, as the observations of the same student would be correlated from year to year. Ignoring this would lead to underestimated standard errors and overstatement of statistical significance (Andress et al., 2013). A similar issue arises from the expected similarity in grading practices among students enrolled in the same program or university. The free tuition policy is one of the most recent examples of student aid reforms implemented to address the growing inequities in higher education. To effectively analyze this policy, it is crucial to employ a different statistical approach that considers both longitudinal data and clustering.

² The secondary GPA and PSU scores used in the analysis correspond to students' original scores divided by 100. These scales range from 150 to 850 because the 1000-point scale was introduced in 2023.

An alternative approach that accounts for the longitudinal nature of the data is the use of fixed- and random-effects models. These models partition the variance between observations into two components: on the one hand, the variability between students according to their characteristics (variance *between*), and on the other, the variability for each student over time (variance *within*). While fixed-effects models allow for the estimation of the latter by evaluating changes within the same individual over time, random-effects models enable the analysis of between-student variance based on characteristics such as whether they received the treatment (in this case, students with free tuition) (Andress et al., 2023).

Neither approach, however, helps to model nesting of students in their programs and universities. This analysis requires a multi-level linear model that considers the four layers in the hierarchical structure of the data: observations, students, programs, and universities (Raudenbush & Bryk, 2002). Specifically, a multilevel model with a random intercept was used. This allows the intercept to vary across clusters, making it possible to control the interdependence of students in a given university or program. The database includes 59,194 observations of 18,753 students, enrolled in 456 programs across 10 universities.

The model is estimated using the *lmer* function in the *lme4* package in R version 4.3.2 software (Bates et al., 2015; R Core Team, 2023).

Results

Table 2 provides an initial descriptive analysis of academic performance during the first four university years, categorized by the type of financial aid received. In the first year, students benefiting from the free tuition policy achieved at a higher level than those receiving the FSCU loan or not receiving any financial aid at all. However, grades of these students were lower than those who had merit scholarships or State-guaranteed loan (CAE). From the second year onward, two distinct trends emerge. On one hand, those who received merit-based scholarships performed better than students with free tuition. On the other hand, students who financed their studies through loans (CAE or FSCU) or personal resources showed lower performance compared to those benefiting from free tuition. This gap was particularly pronounced in the third and fourth years, especially between free tuition beneficiaries and those who financed their education through loans (CAE or FSCU). In addition, the data in Table 2 shows fluctuation in academic performance between the 1st and 4th years among students who received free tuition, no aid, or loans. In contrast, students receiving a merit scholarship, whether alone or in combination with the FSCU, showed a gradual improvement in performance.

Table 2 Academic performance for the first 4 years according to financial aid

	Merit Sch	Merit Sch + FSCU	Only CAE	Only FSCU	No Fin. aid	Free tuition
1st year	4.56	4.45	4.70	4.41	4.30	4.45
2nd year	4.80	4.81	4.54	4.50	4.53	4.62
3rd year	4.86	4.92	4.45	4.28	4.30	4.59
4th year	5.15	5.13	4.57	4.52	4.76	4.84

Author's elaboration

The multilevel model was estimated to assess whether the differences observed in Table 2 are attributable to the type of financial aid or other factors. This model includes an interaction between the financial aid profile and year of study, allowing for the estimation of the effect of free tuition each year. The full results of the model are presented in Table 5 (Appendix 2), while Table 3 summarizes the estimated impact of each financial aid profile compared to free tuition across the 4 years. The values reported in Table 3 are based on the interaction terms in the model. For the first year, the impact corresponds directly to the coefficient reported in the second column of Table 5 (Appendix 2). For subsequent years, the impact is calculated as the sum of the baseline coefficient and the interaction coefficient for each year. The statistical significance for the first year is taken directly from the model. For the following years, pairwise comparisons between estimated marginal means were conducted using *z*-tests.

Table 3 shows that the impact of free tuition changed over time and as a function of the type of aid with which it was compared. In the 1st year, those who received an FSCU loan (-0.102) or no financial aid (-0.081) performed at a lower level than recipients of free tuition. During the 2nd year, there were no differences in the level of performance for any type of financial aid. In the third and fourth years, these differences appeared again. On the one hand, students receiving merit-based scholarships, whether alone or in combination with the FSCU, consistently outperform those with free tuition. On the other hand, students who relied solely on the FSCU performed worse than free tuition recipients. These differences are most pronounced in the third year, where the advantage of merit-based scholarship recipients over free tuition students reaches 0.152 and 0.208 (for those who also received the FSCU), and in the fourth year, where students with the FSCU performed 0.161 points below those with free tuition.

Discussion

Recent worldwide transformations in higher education systems have created new challenges to the achievement of equity throughout the different stages of students' academic journeys (Espinoza, 2007). Student aid policies have been one of the main tools used to compensate for differences associated with students' socioeconomic background, initially designed to promote equitable access to tertiary education (Salmi & D'Addio, 2020). However, academic performance also is a crucial indicator, reflecting both the quality of learning that students achieve and their likelihood of continuing and completing their studies (Engle & Tinto, 2008; York et al., 2015). It has become increasingly relevant, therefore, to assess how different types of financial aid influence academic performance. The findings of this study indicate that financial aid does impact academic performance; however, these

Table 3 Estimated impact of financial aid (vs free tuition) on academic performance by year of study

Fin. aid/year	1	2	3	4
Merit Sch	0.028	0.003	0.152**	0.097**
Merit Sch. + FSCU	0.014	0.026	0.208**	0.063*
Only CAE	-0.023	-0.118	0.040	-0.126
Only FSCU	-0.102**	-0.036	-0.060**	-0.161**
No Fin. aid	-0.081**	-0.034	-0.028	-0.042

Author's elaboration

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

effects cannot be fully understood without considering the underlying normative frameworks associated with each type of aid.

First, the results show that students who received merit-based scholarships performed better in their third and fourth years of study than their peers who received free tuition. These findings are consistent with previous international evidence showing that both forms of financial assistance positively affect academic performance, but the effect of merit-based scholarship is more pronounced (Herbaut & Geven, 2020; Stater, 2009). These outcomes can be interpreted in light of the different conditions attached to each type of financial aid. While free tuition has no renewal requirements, merit-based scholarships are awarded based on students' prior performance and tie continued funding to academic performance (Johnson, 2022). These conditions serve not only as eligibility criteria but also as mechanisms that shape student behavior by rewarding students who maintain strong academic outcomes throughout their undergraduate studies.

Building on these results, this study provides new insights on the ongoing debate on the effectiveness of merit and need-based scholarships, particularly in relation to the underlying conceptions of equity embedded in each model (Goldrick-Rab et al., 2016; Herbaut & Geven, 2020; McLendon et al., 2014). While merit-based requirements may seem to improve academic performance, if equity is defined as removing socioeconomic barriers that hinder all students from reaching their full potential, these requirements could actually reinforce pre-existing inequalities (Espinoza, 2007; McCowan, 2015). Students who do not meet the renewal criteria risk losing their financial support, which can jeopardize their ability to continue their studies. The pressure associated with these requirements may negatively affect students' confidence and well-being, possibly discouraging them from pursuing their chosen career (Río-Ruiz et al., 2015). Therefore, to promote equity from a distributive justice perspective, it is essential to acknowledge the structural barriers that may be embedded in merit-based eligibility criteria.

In contrast, students who benefited from free tuition performed better than those who financed their studies through loans in their first, third, and fourth years of university. They also outperformed students who received no financial aid during their first year. These differences may be explained in part by the fact that free tuition allows students to reduce or eliminate their working hours (Espinoza et al., 2022). Reduced financial pressure not only improves their time spent on academics but also helps mitigate stress and anxiety associated with debt. Similar findings have been reported in studies conducted in England and the USA, highlighting the negative consequences of financial stress on students' academic performance and well-being (Bunce et al., 2017; Kerkvliet & Nowell, 2014; Stoddard et al., 2018). In this sense, the benefits of free tuition extend beyond measurable academic outcomes, as they also positively affect students' mental health and overall well-being. Although these dimensions are less visible, they are essential for achieving greater justice within the educational system (Harrison et al., 2018; Reay, 2022).

Conclusions

The criticism regarding the high costs of higher education and the indebtedness produced by university loans led to the implementation of a free tuition policy in Chile in 2016. Since this policy seeks to promote greater equity within the higher education system, it is essential to assess its impact on students' university trajectories. Specifically, the study

aimed to provide evidence on how free tuition affects the academic performance of its beneficiaries. To this end, the grades of students receiving free tuition were compared with those of students from similar income brackets who, in a previous cohort, had accessed different types of financial aid or none.

The results showed that the impact of free tuition is neither uniform over time nor equal in comparison with other forms of financial assistance. In their first year of university, students who received free tuition outperformed their peers who received no aid or relied solely on loans. However, in the third and fourth years, recipients of free tuition performed worse than those who held merit-based scholarships. These patterns suggest that the impact of financial support varies according to the specific conditions and requirements of each aid scheme.

Based on these results, this research provides new insights into the ongoing debate regarding the most effective and equitable mechanisms for allocating financial resources for student aid. In recent years, this debate has been marked by tensions between efficiency-driven rationales and equity-oriented reforms. In Chile, this debate is also shaped by the tension between advancing toward a conception of education as a social right and the persistence of neoliberal principles that continue to underpin the structure of the system. These normative tensions are reflected in the different aid schemes analyzed in this study.

While merit-based aid can sometimes lead to better performance outcomes, its effects must be carefully weighed against the potential risks it may pose for equity. These include reinforcing pre-existing advantages, excluding vulnerable students who are unable to meet performance thresholds, and increasing academic pressure and anxiety. Rather than framing merit- and need-based aid as mutually exclusive approaches, the findings of this study suggest the importance of balancing both. Merit criteria can motivate academic engagement and reward effort. However, they can exacerbate inequalities when applied without considering students' structural disadvantages. Student aid policies should be assessed not only for their short-term academic effects, but also for their capacity to reduce structural disadvantages and promote long-term social mobility for low-income students.

These findings should be interpreted with caution, as the study is subject to certain limitations. The data's observational nature introduces potential selection bias and endogeneity issues, as students were not randomly assigned to different types of financial aid. Unobserved factors such as motivation or institutional support may also influence academic performance. Since the introduction of the free tuition policy in 2016, new universities with different characteristics have joined the policy. Future studies should explore how free tuition affects students in the newly included institutions.

While the study suggests that free tuition can improve academic performance, it does not establish a causal relationship or explain the underlying mechanisms behind these results. Future research should focus on understanding why free tuition has a positive impact on academic performance, particularly when compared to the performance of students who rely on loans or have no financial aid. It would also be valuable to explore the longer-term consequences of different aid modalities, especially regarding student persistence, graduation, and labor market outcomes. Additionally, examining the experiences of students who lose merit-based aid and are forced to find alternative ways to finance their studies could provide interesting insights. Comparative studies between these students and those who benefit from free tuition could reveal differentiated risks and opportunities associated with each policy.

Appendix 1

Table 4 Characteristics of students admitted to the sample of 10 universities and to the 28 SUA universities participating in the Free Tuition Policy (2016)

Variable	Sample (%)	Population (%)
Gender female	47	49
Type of secondary		
Private	11	17
Subsidized	58	55
Public	30	28
FG status	47	47
Secondary GPA	5.97 (0.84)	6.18 (0.94)
PSU Math	5.84 (0.72)	5.98 (0.81)
PSU Len	5.82 (0.76)	5.96 (0.80)
<i>N</i> universities	10	28
<i>N</i> students	25,675	52,620

Author's elaboration based on data obtained from the Department of Evaluation, Measurement and Educational Registration (DEMRE, 2020), accessed via a public records request under Chilean Transparency Law (Ley No. 20.285)

Appendix 2

Table 5 Model of random effects of free tuition on academic performance

Variable	Coefficient (Std. Dev.)	2nd year	3rd year	4th year
Intercept	0.849** (0.211)			
Financial aid (ref = free tuition)				
Merit scholarship	0.028 (0.019)	-0.026 (0.021)	0.124** (0.021)	0.068** (0.022)
Merit scholarship + FSCU	0.014 (0.020)	-0.011 (0.022)	0.194** (0.022)	0.049* (0.023)
Only CAE	-0.023 (0.036)	-0.094 (0.065)	0.063 (0.062)	-0.103 (0.058)
Only FSCU	-0.102** (0.017)	0.066** (0.018)	0.042* (0.019)	-0.059** (0.020)
No financial aid	-0.081** (0.019)	0.047* (0.022)	0.052 (0.028)	0.039 (0.030)
Year (ref = 1)				
2nd	0.054** (0.009)			
3rd	-0.103** (0.010)			
4th	0.115** (0.010)			
Gender (ref = female)				
Male	-0.142** (0.012)			
Parent higher educ (ref = No)				
Yes	0.001 (0.012)			
Type secondary (ref = Priv)				
Priv subsidized	-0.007 (0.034)			
Municipal	-0.055 (0.035)			
Secondary GPA	0.259** (0.007)			
PSU Math	0.280** (0.011)			
PSU Lang	0.057** (0.010)			
Field of study (ref = STEM)				
Adm and Comm	0.319** (0.061)			
Agriculture	0.234* (0.100)			

Table 5 (continued)

Variable	Coefficient (Std. Dev.)	2nd year	3rd year	4th year
Art y architect	0.446** (0.083)			
Social sciences	0.529** (0.055)			
Law	0.106 (0.132)			
Education and humanities	0.622** (0.045)			
Health	0.509** (0.051)			
Type of university (ref=new private)				
Traditional private	-0.099 (0.213)			
State-owned	-0.001 (0.200)			
Number of courses	0.074** (0.001)			
			ICC ID	0.45
AIC	128,307		ICC Program	0.11
BIC	128,711		ICC University	0.04

Author's elaboration

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

Acknowledgements The authors are grateful for the data provided by the universities participating in the research. We also appreciate the support given by the Instituto Interuniversitario de Investigación Educativa (IESED-Chile).

Author contributions All authors made substantial contributions to every section of the manuscript and have reviewed and approved its final version.

Funding This research was supported by the Agencia Nacional de Investigación y Desarrollo de Chile (ANID) through the Fondecyt Project N°1230080 and the Fondecyt Project N°1220635.

Declarations

Ethical approval and consent to participate The research project that led to this study was approved by the Ethics Committee of the University of Tarapacá.

Conflict of interests The authors declare no competing interests.

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Authors and Affiliations

Óscar Espinoza¹  · Bruno Corradi¹  · Luis Sandoval²  · Lucas Sobarzo³  · Catalina Miranda³  · Noel McGinn⁴  · Javier Loyola⁵ 

✉ Óscar Espinoza
oespinoza@academia.cl

Bruno Corradi
bcorradid@gestion.uta.cl

Luis Sandoval
lsandoval@utem.cl

Lucas Sobarzo
lucas.sobarzo@ug.uchile.cl

Catalina Miranda
catalina.miranda.c@ug.uchile.cl

Noel McGinn
nmcginn@igc.org

Javier Loyola
javierloyolacampos@gmail.com

¹ Facultad de Educación y Humanidades, Universidad de Tarapacá, 18 de Septiembre, 2222 Arica, Chile

² Universidad Tecnológica Metropolitana, San Ignacio de Loyola N°160, Santiago, Chile

³ Departamento de Sociología, Universidad de Chile, Av. Capitán Ignacio Carrera Pinto 1045, Santiago, Chile

⁴ Harvard Graduate School of Education, 13 Appian Way, Cambridge, MA 02138, USA

⁵ Programa Interdisciplinario de Investigaciones en Educación, Ricardo Matte Perez 0510, Santiago, Chile