Higher Education
https://doi.org/10.1007/s10734-023-01094-w

Financial aid uncertainty and low-income students' higher education preferences

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Accepted: 13 August 2023
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Abstract
Low-income students' preferences for higher education might depend on the uncertainty of financial aid. Using a time discontinuity design, this paper exploits the unanticipated cancellation of a nationwide Colombian merit and need-based scholarship, called *Ser Pilo Paga*, to study its consequences on students' preferences for higher education. Preferences are measured using a discrete choice experiment administrated to 949 low-income high school students in 2018. The findings reveal that the scholarship's cancellation reduced higher education ambitions among low-income students due to the decreased interest in both financial aid and high-quality universities. The effects were particularly concentrated on income-eligible individuals who were more likely to obtain the scholarship, as their choices for financial aid and high-quality institutions declined by 15 to 50% of the baseline preference.

Keywords Higher education · Discrete choice experiment · Financial aid · Prior-college preferences · Ser Pilo Paga

JEL classification D82 · I22 · I24

Introduction

Understanding behavioral responses to educational opportunities is crucial for effectively designing higher education policies. Existing literature on the pre-college effect of increasing educational opportunities for disadvantaged students has primarily focused on outcomes such as their motivation, effort in high school, or higher education enrollment

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Published online: 13 September 2023

(Hastings et al., 2012; Hastings et al., 2015; Alon & Malamud, 2014). However, there is limited knowledge about the underlying mechanisms that influence student's aspirations for higher education. This paper contributes to this literature by analyzing students' declared preferences (henceforth preferences) for higher education by exploiting the unexpected cancellation of a nationwide merit and need-based scholarship program in Colombia: *Ser Pilo Paga* (SPP).

Expanding educational aid opportunities helps targeted students perceive higher education as more realistically attainable, resulting in increased effort and pursuit of these opportunities (Fryer & Loury, 2005). Changes in financial aid to enroll higher education can redirect students' aspirations and preferences (Grau, 2018; Kemptner & Tolan, 2018), which in turn could alter their educational attainment (Boxer et al., 2011; Khattab, 2015; Ou & Reynolds, 2008). For instance, need-based financial aid can influence disadvantaged students' choice of higher quality education institutions (Dynarski et al., 2018), or increasing families' willingness to invest in human capital for completion of compulsory education (Angrist et al., 2002). Conversely, removing such incentives can reduce educational aspirations, leading to a behavioral poverty trap or self-perpetuation of poverty (Ross, 2019).

In Colombia, the cancellation of the SPP scholarship directly reduced educational possibilities for low-income students to enroll in high-quality colleges. The program, which roughly translates to "it pays to be smart," was the first widely publicized national large-scale university scholarship. It required individuals to achieve high scores on the standardized test *Saber11* and belong to a low socioeconomic status in order to be eligible. The scholarship awarded 10,000 students annually and covered both tuition and living expenses. While SPP has been shown to more than double the enrollment rate among eligible students (Londoño-Velez et al., 2020) and have positive spillovers on exit examination scores (Bernal & Penney, 2019), it faced criticism for its elevated cost and the allocation of public resources to private universities. During the 2018 Colombia presidential elections, SPP was a popular topic of discussion. The presiding president was the only candidate out of six who supported the program as initially designed. Yet, just 1 month after taking office, his Ministry of Education suddenly announced the discontinuation of the program for new awardees after 2018, with vague plans for future alternatives.

By exploiting the unexpected discontinuation of the SPP scholarship, the present study aims to estimate the impact of the SPP program on students' preferences for higher education. In addressing this question, this paper proceeds as follows: First, we analyzed an online survey dataset that captured responses from low-income 10th graders participating in a discrete choice experiment (DCE) focused on higher education bundles, allowing us to elicit preferences. The dataset includes choices (dependent variable) expressed by 949 students for various choice sets that contained attribute levels of higher education, such as institution quality, location, public-type, financial aid, and living expenses subsidy (independent variables). The survey was conducted between July 31 and December 31, 2018, coinciding with the cancellation of SPP on September 6th.[1] Sociodemographic characteristics were also incorporated from administrative data obtained months later. Second, we employed a time discontinuity design, dividing the sample into two groups: those who responded to the survey *before* and *after* the discontinuation of the SPP program. By combining this design with preference elicitation from the DCE, we can compare the average

[1] The survey used is originally designed for a randomized control trial study (see Bernal & Witte, 2022).

weight that students assign to different attributes of higher education before and after the event. This measurement allows us to assess the effect of the SPP scholarship cancellation on students' higher education preferences. Third, we exploited the fact that not all surveyed students were income eligible for SPP, as determined by the government-calculated poverty index score known as *Sisben* index. We performed an examination of differential effects based on students' income-eligibility status for SPP.[2] In short, we find that the effects of the cancellation on preferences were most pronounced among individuals who were more likely to be recipients of the scholarship. We observe a decrease in interest in both financial aid and attending high-quality universities among this group.

This paper contributes to the literature in at least two aspects. First, it elicits and contrast students' *declared* preferences for higher education *before* and *after* an exogenous event. Using DCE for eliciting preferences presents an advantage over typical approaches because students' characteristics are here orthogonal to their higher education alternatives, thus avoiding endogeneity traps in estimation (Carneiro & Heckman, 2002; Parker et al., 2016). Second, it examines student's prior preferences for higher education in the face of a *negative* shock to educational opportunities. Existing literature predominately concentrates on *positive* shocks, such as the implementation of new scholarship program, overlooking negative events.

The closest related papers exploring contraction in higher education opportunities for disadvantaged students primarily focus on the impact of affirmative action bans on prior college behavior among minorities. Studies by Antonovics and Sander (2013), Furstenberg (2010), Caldwell (2010), Dickson (2006), and Hinrichs (2012) have explored this topic. With the exception of Antonovics and Sander (2013), who found no effects, these studies show evidence that minorities experienced reduced motivation and a decline in college applications due to the ban. However, the banning of affirmative action differs from the cancellation of SPP in several important ways. First, the cancellation of affirmative action in the USA was a known change carrying, which introduce endogeneity and anticipation issues. Second, while affirmative action aims to increase the representation of racial minorities (Hispanic and Black students), the SPP's goal is to enhance the representation of low-SES students, who constitute a majority in Colombia.[3] Third, affirmative action relied on discretionary admission criteria of each university, whereas SPP had uniform sharp eligibility criteria based on *Saber11* score and the *Sisben* index. These criteria remained consisted across all accredited universities over time and region.

The paper presents a concise overview of the Colombian higher education system and the SPP program in the "Context and setting" section. "Methods" and "Data" sections provide detailed information on the methods and data employed, respectively. The "Results" section estimates the causal effect of the SPP program's cancellation, while the "Discussion and conclusions" section discusses the results and concludes the paper.

Context and setting

The Colombian higher education has a decentralized and major specific application process. Most universities prioritize performance in the high school exit examination, *Saber11*, as the main admission criteria. High-quality universities are identified by the

[2] At the time of data collection, students were aware of their eligibility for SPP program based solely on their *Sisben* score, as they have not yet taken the *Saber11* exam.

[3] In 2018, 69% of the student population based on *Saber11* examinations

National High-Quality Accreditation award (henceforth accredited). Private accredited universities can be expensive, even by international standards, whit cost reaching up to $6700 USD per semester (not correcting for purchasing power parity).[4] Admission to top public universities is highly competitive, with average admission rate of 36.6% among applicants.[5] These stringent entrance criteria lead to significant underrepresented of low-income students, including high achievers, in top quality universities.

Moreover, access to loans for low-income students to pursue college is limited and mainly administrated by the Colombia's Higher Education Student Loans Institute (ICETEX). In 2018 high school cohort, less than 5% students (11,181) with *Sisben* received loans from ICETEX to attend college, and these credits, mostly *Tú Eliges*, were not as generous as SPP. While university scholarships do exist, they are scarce. Essentially, SPP served as the primary scholarship option for low-SES students to access college.

The Ser Pilo Paga (SPP) program

In an attempt to increase the representativeness of high achieving low-income students into accredited universities, the administration of President Santos administration created the SPP program. It was a merit and need-based scholarship launched on October 1st of 2014. Importantly, the scholarship covered 100% tuition fees of any accredited university chosen by the student (after passing the admission process). An additional stipend (approximately between $223 and $892 USD per semester) was offered based on where the student lives. Strictly, the support provided by SPP came in the form of a loan that can be forgiven upon graduation within a stipulated period of study of 5 years on average. From 2015 to 2018, on average, 10,000 scholarships were awarded annually, with the goal of benefiting approximately 40,000 students over the 4-year period. There was a strong eagerness among low-SES students to accept the financial aid, as evidenced by the fact that out of the 39,998 awardees certified by the Ministry of Education, 37,629 (94%) actually signed the agreement.[6] To become merit-income-eligible, students must fulfill two sharp eligibility criteria on both the poverty index score measured by the *Sisben* index and the exit examination scores measured by the *Saber11* examination.

The *Sisben* score is a proxy of socioeconomic status and is critical variable in this study to distinguish the heterogeneous effects of the SPP scholarship's cancellation. The government assigns the score to households based on housing quality, public utility services, possession, and human capital endowments, among others. As the index was designed to qualify low-income population to target social welfare program recipients, the medium and high-class Colombians are usually not assigned to any score. The *Sisben* score goes from 0 to 100, where lower numbers correspond to the poorest. For all fourth cohorts of SPP, the *Sisben* criteria were set using the same thresholds.[7] For most people, *Sisben* was

[4] Conversion using an exchange rate of 3400 COP per USD

[5] Authors' calculations from SNIES 2018 database: https://www.mineducacion.gov.co/sistemasinfo/Informacion-a-la-mano/212400:Estadisticas

[6] A caveat to consider is that the number of awardees certified by the government may slightly exceed the eligible group.

[7] SPP established three different *Sisben* cutoffs, which vary depending on where the student lives: 57.21 for students who live in one of 14 major cities, 56.32 for students who live in other metropolitan areas, and 40.75 for students who live in rural areas. These cutoffs are important to classify students into the income-eligible group for SPP.

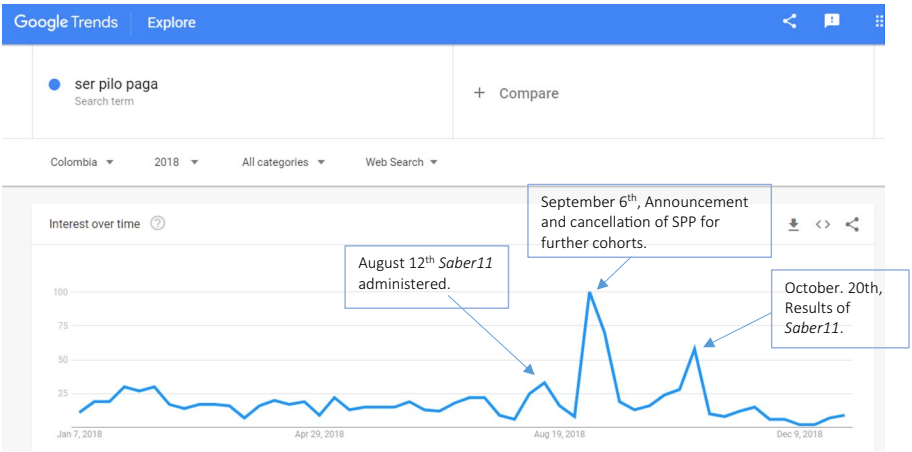


Fig. 1 Google Trends exploration on "ser pilo paga" searches. Note: the announcement of the cancellation of SPP and the actual cancellation of the program for future cohorts was contemporaneous. For simplicity, we only refer to the shock as the cancellation of SPP. Source: Google Trends. https://ahrefs.com/blog/how-to-use-google-trends-for-keyword-research/

determined in an initial assessment phase from 2009 to 2011 and do not expire until the new version takes place (in 2020). During the data collection phase, students were aware of their *Sisben* score, even though they had not taken the *Saber11* exam yet. It is worth noting that having knowledge of their *Sisben* score could generate expectations regarding their likelihood of getting the SPP scholarship.

The SPP program was well known in the country. Government awareness campaigns were widespread during prime time on television, and scenes such as beneficiaries being congratulated by the president were also common. It was also widely covered in the press. For instance, accounting for only the 10 principal newspapers across regions in Colombia, we found 1.4 articles per day mentioning the phrase "*Ser Pilo Paga*."[8] The program was highly controversial. On the one hand, it was recognized to boost social mobility by increasing immediate enrollment of low-income high achievers from 56.6 to 86.5% into high-quality universities (Londoño-Velez et al., 2020). On the other hand, it was a costly program, covering only 3% of low-SES high school graduates.

Exogenous shock

In the first quarter of 2018, SPP was a central topic during the presidential campaigns. Out of the six presidential candidates, only one (i.e., Ivan Duque) promised to keep up the program as it was conceived.[9] He won the election on May 27, 2018, and took office on

[8] Using Python, we screened 10 principal newspapers between October 2014 and December 2018. The newspapers included in the search are Diario del Sur, El Colombiano, El Diario, El Espectador, El país, El Tiempo, El Universal, La Nacion, La Opinion, and La Vanguardia.

[9] Notice that the candidates debated resource allocation for education instead of cutting funding entirely. Duque supported funding the SPP program (which mainly benefits private universities), while other candidates preferred investing resources in public universities. Duque's victory made it plausible for the SPP program to continue, as it heavily benefited private universities.

August 7, 2018. However, on September 6th, the minister of education made a surprising announcement that the SPP program was no longer going to award additional scholarships. Existing recipients were to continue to receive support, and new higher education program was mentioned without further details. The administration's main argument for the SPP cancellation was costs overruns.

Inspecting for the possible anticipation of the shock, Fig. 1 displays Google Trends concerning "*ser pilo paga*" searches in 2018.[10] Three spikes can be observed in the figure. The first peak is on August 12th, which is the date in which Colombian students take the exit examination, which arguably aroused a natural curiosity on the program and its requirements. The second peak is on September 6, 2018, the day in which the government announced the cancellation of SPP. The sharp increase of interest in the topic suggests that the event was both a surprise and a call for attention. The third peak is on October 20, 2018, when students received their exit examination results and when the new higher education financial program "*Generación E*" was launched without any specific details.[11] Web searches for SPP when it is no longer available suggest some ignorance about its recent cancellation. If many students did not know about the SPP events, our coefficients would result in a lower bound estimation of the effects of the cancellation on students' preferences for higher education. Moreover, the fact that the trend of Google searches on "*ser pilo paga*" was fairly stable before the cancellation (if something, searches actually *decreased* before the announcement) and that any of the ten main newspaper referred to the termination of the program in previous months provides evidence of no anticipatory behavior, which is consistent with the classification of the shock as exogenous.[12] Furthermore, the fact that results in the "Data" section display a significant effect of the shock (mainly driven by income-eligible students) is consistent with the exogeneity of the event. For example, if there has been some degree of anticipation, it would have been expected that both groups of students—*before* and *after*—would react similarly to university bundles, which was not the case.

In addition, we examined several specific higher education funding interventions, as well as national changes in higher education expenditure and the policy positions of political parties during the relevant period. We did not identify any obvious candidates for a policy change that could have caused the observed effect, nor did we find any evidence of anticipation effects. That said, we cannot completely discount that some other contemporaneous change might have caused the observed effect.[13]

[10] The Google Trends index is on a range of 0 to 100. It shows the relative popularity of a search as the ratio of a query's search volume to the sum of the search volumes of all possible queries. A score of 100 corresponds to the highest popularity within the queried time period. https://ahrefs.com/blog/how-to-use-google-trends-for-keyword-research/

[11] According to the ministry of education, Generación E is a program designed to strengthen access to higher education in Colombia. It has three components: equity, excellence, and team. The equivalent replacement to SPP is the excellence component. It was less generous than SPP. Generación E offered a partial scholarship to 4000 students every year, where 50% of the expenses is assumed by the government, 25% by the higher education institution, and 25% is from other funds (in some cases, a student loan). When launched in October 20, 2018, the government did not give many details on the criteria to be eligible.

[12] We read all newspaper articles referring to SPP, from the top 10 national journals, published 2 months before September 6th.

[13] We examined for changes in higher education funding interventions such as "Tú Eliges," a significant soft credit program offered to low-income students in 2018 and administered by ICETEX, similar to SPP, and "Jóvenes en Acción," which provides financial aid to vulnerable young people enrolled in higher education. Additionally, we investigated potential policy changes including budget cuts in higher education, gov-

Finally, we asked surveyed students if they knew of the SPP program, retrospectively using a short follow-up survey in June 2019. Only 35% of subjects answered the form. Results indicate that 96% of students knew about SPP, and 86% knew about its cancelation back in 2018. Interestingly, 76% of respondents declared they need to access to some governmental financial aid in order to fund (at least partially) their higher education.

Methods

Although the evaluation of time discontinuity is straightforward, its interaction with a DCE presents a more complicated analytical task. We first overview of the DCE, contextualized it in our study, and then present the empirical specification including the DCE interacting with the exogenous variation introduced by the cancellation of SPP.

The discrete choice experiment (DCE)[14]

The DCE aimed to gather participants' preferences and choices regarding various attributes of higher education. Participants were asked to imagine being accepted into their preferred program and having multiple higher education options (bundles) to choose from. They were presented with different sets of choices, each containing two alternatives (bundles) with varying attribute levels. The experimental design comprised 9 choice sets for each student, and each choice set consisted of 2 bundles, each having 5 attributes with varying levels. Figure 2 illustrates the attributes (and levels) included in the DCE: institution quality, location, type of HEI, scholarship tuition fee, and living expense subsidy. These attributes were determined based on college choice reviews (Bergerson, 2009) and interviews with experts and low-income high school students (for more details, refer to Bernal et al, 2022).[15]

A D-efficient design was used to streamline the number of choice sets while maintaining statistical efficiency. This design ensures minimal correlation between attribute levels, balanced representation of each level, and minimal overlap within choice sets. This results in a research design with two blocks, each containing 9 choice sets. Each student was randomly presented with one of the two blocks.

Figure 3 shows an example of a choice sets offered to the participants. After an individual chooses their preferred alternatives in the choice set, they are then offered the next

Footnote 13 (continued)
ernmental reforms, and the Plan Nacional de Desarrollo, but we found no evidence of a contemporaneous shock. See Figure A in the appendix.

[14] This technique has been applied in human capital scenarios, and studies have revealed that DCE results have internal validity and consistency (Lambooij et al., 2015). There are few studies that have focused on students' preferences for higher education using a discrete choice experiment methodology (Walsh et al., 2018; Dunnett et al., 2012; Czajkowski et al., 2020). None of those studies has examined the effect of an exogenous shock regarding educational opportunities that can eventually influence students' preferences.

[15] The DCE used in the present study was originally designed for a randomized control trial study to elicit higher education preferences among low-income students under information provision (see Bernal & Witte, 2022). For the purpose of this research, we used the information of the control group only, which was not "contaminated" by any aspect of the experiment. Survey Link.

Attribute	Categories	Level coding
University quality ☆☆☆☆☆	5 stars (accredited) 4 stars (accredited) 3 stars (non-accredited) 2 stars (non-accredited)	5 4 3 2
Location	The city where your parents live. 2 hours by bus from where your parents live. You can choose to move or not. 4 hours by bus from where your parents live. You can choose to move or not. 10 hours by bus from where your parents live. You have to move. 14 hours or more by bus from where your parents live. You have to move.	0 2 4 10 14
University type	Public Private	1 0
Scholarship (tuition fee)	Scholarship of 100% of the tuition fee. Scholarship of 75% of the tuition fee. The remaining 25%, you will be able to pay back by giving up 20% of your salary received during 3 years after graduation. Scholarship of 50% of the tuition fee. The remaining 50%, you will be able to pay back by giving up 20% of your salary received for 5 years after graduation. Scholarship of 25% of the tuition fee. The remaining 75%, you will be able to pay back by giving up 20% of your salary received for 7 years after graduation. No scholarship. You will be able to pay the costs back by giving up 20% of your salary received for 9 years after graduation.	100 75 50 25 0
Living expense stipend	Yes (COP $312.000 monthly – about USD $100) No	1 0

Fig. 2 Attributes and levels in the discrete choice experiment

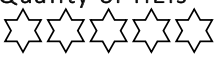
choice set, and this process continues until they have completed a total of 9 choices. Skipping choice sets was not permitted.

Statistical model

To examine the impact of cancellation of SPP on student preferences in the DCE, students are assumed to choose the preferred alternative among the choice sets. This following the random utility model, where individuals' choses the bundle that provide her the highest utility (McFadden, 1974). Utility is derived from the attributes associated with each bundle. By manipulating the choices available to students, i.e., varying the attribute levels within the choice sets, we can estimate the impact of each attribute level on the likelihood of selecting a particular bundle. To assess the causal impact of the cancellation on students' decisions, we introduce interaction terms between the timing of the survey (before or after SPP was cancelled) and each attribute. By combining the DCE with the time discontinuity interaction, SPP, the model can be expressed as follows:

$$U_{\mathrm{njk}} = \beta'_{\mathrm{n}} A_{\mathrm{njk}} + SPP * \delta'_{\mathrm{n}} A_{\mathrm{njk}} + \gamma + \varepsilon_{\mathrm{njk}} \quad (1)$$

Assuming you are accepted into the program you like the most (at 2 different institutions), which one of the following bundles would you prefer?

Attribute	Bundle 1	Bundle 2
Quality of HEIs 		
Location of HEIs	The city where your parents live	2 hours in bus from where you live. Move or not.
Type of HEIs	Private	Pública
Scholarshipa (%)	Scholarship: 50% 50% - The remaining 50%, you will be able to pay back by giving up 20% of your salary received during 5 years after graduation.	Scholarship: 0% 0% - The 100%, you will be able to pay back by giving up 20% of your salary received during 9 years after graduation.
Subsidy	NO	yes = $312.000 montly (108USD)

Which one do you prefer? ☐ ☐

Fig. 3 Activity instructions to the students before starting the DCE and an example of a DCE choice set (original text in Spanish)

where U_{njk} represents the utility experienced by student (n) when making a choice within a specific choice set. The choice set (j) ranges from 1 to 9, and there are two alternatives ($k=1$ or 2) within each choice set. Thus, the dependent variable is the choice made by each student for each choice set. In practical terms, U_{njk} is a dichotomous variable, taking the value of 1 if the individual chooses a specific alternative and 0 otherwise. A_{njk} is a vector of attributes associated with the chosen alternative, each attribute level coded as dummies, β_n represents unobserved individual-specific coefficient that vary across the population, γ_t represents the choice set fixed effects to account for unobserved heterogeneity specific to each choice set, and ε_{njk} represents unmeasured variation in preferences that is independent and identically distributed. The variable *SPP* takes the value of 1 for individuals who answered the survey after the cancellation event, and 0 otherwise. The reference group for each attribute corresponds to a two-star HEI, same city as home, public institution, 0% scholarship, and no stipend. The estimated coefficients β_n represent the preferences for the attributes. A positive sign of the coefficient implies that the attribute has a positive impact on the take-up of a given higher education bundle. Higher coefficients indicate a higher importance of the attribute on decision-making. The δ_n corresponds to the interaction between SPP and the attributes and represents the causal effect of the cancellation on student's preferred choices for the after group. These coefficients identify the extent to which students' preferences are influenced by the cancellation of SPP compared to the

control group. Significant coefficients of these interactions suggest that cancellation of SPP was able to change the importance of the attributes in the choice for higher education bundles. For facility in interpreting the coefficients, we estimate Eq. 1 using linear regression clustering standard errors at the school level. To account for peer effects, we clustered the standard errors at the school level. Complementary, we run Eq. 1 using the mixed logit model, which allows for random taste variation among individuals. The former supports the OLS results.

Coarsened exact matching (CEM)

We accounted for confounding influence of covariates by using the coarsened exact matching (CEM) approach proposed by Iacus et al. (2008). CEM enables the generation of covariate balance for the *before* and *after* group, which leads the comparison of preferences of similar students between the two groups. Comparing to other matching methods, CEM allows covariates to be coarsened into meaningful strata such that an "exact matching" algorithm is applied to the coarsened data.

Data

Invitations to schools to participate in the study were done by ICFES, the institution that administers exit examinations in Colombia. Phone calls started on June 18, 2018, and ended on November 30, 2018. The school selection for the earlier or later survey was random, based on a randomized draw of school names from a previous paper that used an RCT design (Bernal & Witte, 2022). Therefore, the date of cancellation is orthogonal to the date we invited them to participate. In fact, 53% of the schools received their first call *after* the cancellation of SPP. This reduced possible selection biased (i.e., we have enthusiastic schools in either the before or the after group). Participation from schools was voluntary. Schools were instructed to apply the survey to at least one complete grade 10 class. The survey was administrated during school hours. Students could skip questions if they did not feel comfortable answering. Data collection started on July 31st and ended in December 31st. Out of the original 1925 surveys conducted, 1567 were electronic based and dated, while 555 were paper based and not dated. We eliminated the 555 paper-based surveys due to the absence of dates, as well as 288 surveys due to non-response in the DCE section and 9 surveys that failed the consistency test for the DCE. We also disregarded the few number or respondents, 61, respondents who express no interest in pursuing higher education.[16]

In addition, we enriched our survey dataset by merging new variables reported by each student at the exit examination *Saber11*, 2019, which occurred approximately 5 months after our survey. The merge was successful in 81% of cases, and the correlations between few common variables in the two datasets were above 80%.[17] ICFES merged the official

[16] One possible outcome of the cancellation of SPP is a total loss of interest in pursuing higher education. While lack of statistical power prevents us to statistically test this hypothesis, the evidence from the 61 students not pursing higher education shows this might not be the case. The distribution of students located in the after group are similar to the final sample: 0.66 vs 0.64.

[17] The main reason for failing to match is due to students who reported an incomplete or invalid ID in our survey.

Sisben score index updated to 2018 provided by the National Department of Planning in Colombia and then anonymized the dataset for use by the authors.

We use the merged administrative dataset to identify and contrast the characteristics of the non-respondents to those in our sample. We find that from all students that graduate in 2019 from the schools we applied the survey, 31.6% answered the questionnaire. Nevertheless, this percentage is probably higher if we consider that the instruction to schools was to apply the survey to only one classroom (as supposed to the entire cohort) in grade 10 in 2018. Unfortunately, the 2019 exit examination does not have classroom identifier, so we cannot determine the real percentage of attrition, non-respondents, within the classroom.

In the analysis performed on characteristic differences between respondents and non-respondents, we observe only few differences, which suggest fair balance among observables (see Table A, column 5).[18] Moreover, when we split the total sample into two groups: students who answered *before* the cancellation ($n=354$) and those who answered *afterwards* ($n=626$) and tested covariate balance (Table A, column 4), no differences in the eligibility criteria, *Sisben*, for SPP were found between the two groups. Nonetheless, as mother's education (a key variable for students' preferences on higher education) was imbalanced, we performed CEM for balancing the two groups on observables. Given the similarities between the results with raw and coarsened data, we only discuss in what follows the CEM (most conservative) specification.

Results

Effect of cancellation of SPP on student's preferences

This section examines the impact of the sudden stop of a scholarship program targeting low-SES students on their preferences for higher education.

Table 1 shows the coefficients estimated in Eq. 1 using the coarsened dataset.[19] The coefficient estimates in the upper level pertain to the levels of attributes, β_n, while coefficients in the bottom panel represent the levels of attributes interacted with the treatment, δ_n. Column 1 shows the results for the complete sample, while columns 2–4 display the results for three subsamples according to *Sisben* index score classification, which is further explained in the "Heterogeneous effects" section.

In the top panel, almost all coefficients are statistically significant at the 1% level, indicating that each one of these attributes is relevant to students when choosing bundles. Percentage of scholarship, HEI quality, being public and receiving a monthly stipend (approx. $108 USD) is positively valued by the students. In contrast, HEI being located 10 or 14 + hours from home is valued as a negative attribute. The higher the coefficients, the stronger preferences for a particular attribute relative to the others.

Scholarship is the most important aspect for students to choose a higher education bundle (coefficients is 0.40 for a tuition scholarship of 25% and 0.84 for a full scholarship). The higher the scholarship, the more weight the students give to a particular higher education bundle, which validates the monotonic assumptions of the preferences. In addition, quality

[18] We observe that non-respondents are oldest and have less educated mothers, while the other covariant resulted significantly alike between the two groups.

[19] Estimations on the raw data can be consulted in Table B, in the Appendix.

Table 1 Effects of the cancellation of SPP on students' preferences, by subsample according to their *Sisben* poverty index level. CEM specification

	(1) All		(2) Subsample 1—income-eligible SPP, poorest		(3) Subsample 2—income-eligible SPP, poor		(4) Subsample 3—non-income-eligible SPP	
	Choice	s.e	Choice	s.e	Choice	s.e	Choice	s.e
Scholarship (% tuition)								
25%	0.403***	(0.0314)	0.376***	(0.0601)	0.470***	(0.0698)	0.348***	(0.0299)
50%	0.555***	(0.0754)	0.426***	(0.0878)	0.755***	(0.0953)	0.480***	(0.0412)
75%	0.665***	(0.0643)	0.586***	(0.102)	0.802***	(0.111)	0.565***	(0.0442)
100%	0.841***	(0.0431)	0.790***	(0.0533)	0.870***	(0.0897)	0.802***	(0.0539)
HEI quality (ref: 2 stars)								
3 stars	0.296***	(0.0807)	0.129**	(0.0548)	0.383***	(0.108)	0.334***	(0.0690)
4 stars	0.355***	(0.0534)	0.236***	(0.0730)	0.373***	(0.0672)	0.388***	(0.0657)
5 stars	0.394***	(0.0527)	0.209***	(0.0574)	0.497***	(0.0652)	0.449***	(0.0762)
HEI type (ref: private)								
Public	0.154***	(0.0326)	0.172***	(0.0501)	0.172***	(0.0489)	0.142***	(0.0354)
Stipend (ref: no stipend)								
Stipend	0.154***	(0.0326)	0.132***	(0.0434)	0.218***	(0.0538)	0.138***	(0.0328)
HEI location (ref: same city)								
2 h from home	−0.0175	(0.0489)	−0.0889**	(0.0348)	0.0151	(0.0959)	0.0199	(0.0982)
4 h from home	0.0359	(0.0579)	−0.0278	(0.0973)	0.0530	(0.0378)	0.114	(0.0761)
10 h from home	−0.166***	(0.0473)	−0.164**	(0.0615)	−0.231***	(0.0727)	−0.116	(0.0859)
14 h from home	−0.140***	(0.0464)	−0.191***	(0.0508)	−0.0990	(0.0633)	−0.0880	(0.0808)
Attributes*After_SPP								
*Scholarship*AfterSPP*								
25%*AfterSPP	−0.0684*	(0.0399)	−0.00960	(0.0712)	−0.134	(0.0810)	−0.00517	(0.0457)
50%*AfterSPP	−0.0824	(0.0823)	0.0640	(0.104)	−0.247**	(0.102)	0.0193	(0.0629)
75%*AfterSPP	−0.161**	(0.0752)	−0.0903	(0.120)	−0.311**	(0.120)	0.0325	(0.0727)
100%*AfterSPP	−0.111**	(0.0538)	0.0446	(0.0867)	−0.131	(0.0994)	−0.0971	(0.0849)

Table 1 (continued)

	(1) All		(2) Subsample 1—income-eligible SPP, poorest		(3) Subsample 2—income-eligible SPP, poor		(4) Subsample 3—non-income-eligible SPP	
	Choice	s.e	Choice	s.e	Choice	s.e	Choice	s.e
HEI quality and AfterSPP								
3 stars*AfterSPP	−0.0988	(0.0848)	0.103	(0.0689)	−0.186*	(0.111)	−0.170**	(0.0778)
4 stars*AfterSPP	−0.0997*	(0.0591)	−0.0263	(0.105)	−0.121	(0.0771)	−0.111	(0.0765)
5 stars*AfterSPP	−0.0909	(0.0623)	0.0807	(0.0822)	−0.248***	(0.0789)	−0.149	(0.0906)
HEI type and AfterSPP								
Public*AfterSPP	0.0216	(0.0407)	0.0309	(0.0581)	−0.0121	(0.0574)	0.0761	(0.0471)
Stipend and AfterSPP								
Stipend*AfterSPP	0.0643*	(0.0360)	0.0620	(0.0617)	0.0140	(0.0559)	0.0696*	(0.0357)
HEI location and AfterSPP								
2 hrs_home*AfterSPP	−0.0521	(0.0559)	0.0821	(0.0505)	−0.128	(0.103)	−0.0970	(0.116)
4 hrs_home*AfterSPP	−0.0496	(0.0635)	0.0447	(0.108)	−0.0818	(0.0520)	−0.118	(0.0869)
10 hrs_home*AfterSPP	−0.0132	(0.0530)	0.0767	(0.0728)	0.0473	(0.0748)	−0.113	(0.0899)
14 hrs_home*AfterSPP	−0.0974*	(0.0559)	0.0836	(0.0775)	−0.121	(0.0747)	−0.186*	(0.0998)
Constant	−0.286***	(0.0496)	−0.268***	(0.0650)	−0.334***	(0.0571)	−0.289***	(0.0621)
Observations	12,960		4788		5454		5238	

Coarsened exact matching (CEM) include mother education, *Sisben* index and living in urban area. Standard errors clustered at the school level are in parentheses. The outcome is student choice to each of the 9 choice sets. All models have been estimated using OLS and choice set fixed effect. Students with a *Sisben* index from 0 to 24 are in subsample 1, whereas those with *Sisben* between 24.1 and SPP cutoff are in subsample 2. Those with scores above the SPP eligibility cutoff or students with no *Sisben* index are in subsample 3. The *Sisben* score was established by DNP before this study took place. Administrative data were collected 4 to 5 months after our study concluded, when all subjects were already aware of the cancellation

of the HEI is the second most important attribute (for a 3-star HEI coefficient is 0.30, for 4 stars is 0.35, and for 5 stars, it is 0.39). On the other hand, the reminding attributes such attending a public HEI, having a subsidy and location from the HEI, hold less important to the students, with coefficients being lower than 0.16. These results align with prior studies eliciting preferences for higher education, demonstrating the prevailing role of quality/reputation in student's choices. It is worth noticing that students from disadvantaged backgrounds are particularly sensitive to higher fees, as evidenced in previous research (Dunnett et al., 2012; Walsh et al., 2018).

The main focus of the present paper is testing the influence of the cancellation of the SPP scholarship on students' preferences for higher education bundles. In the bottom panel of Table 1, column 1 shows all attributes interacted with being exposed to the SPP cancellation shock by the time of the survey response. The coefficients in the table represent the percentage point (pp) change in the weight that students assign to a specific attribute when comparing to those who responded *before* and *after* the cancellation of the SPP. Among all students surveyed, the interaction coefficients for financial aid, institution quality, and distance yielded negative values. This indicates that, on average, the importance attached to these attributes decreased for those who responded the survey *after* SPP was cancelled.

Among the significant attribute-level coefficients, the 25%, 75%, and 100% scholarship levels exhibited negative values ($-0.07, -0.16, -0.11$, respectively), indicating reduced interest in financial aid by 7 to 16 pp after the cancellation. The 4-star institution quality level also showed a negative coefficient (-0.10) suggesting a modest reduction of interest on high-quality institutions, by 10 pp, in one of the categories). On the other hand, the attribute-level coefficient of the 14-h distance showed a positive value (0.10). The only significant attribute level resulting positive is stipend (0.06), indicating an increased interest by 6 pp.

As follows, we analyze the results dividing the students by socioeconomic subgroups, given that the chance to be income eligible or obtaining the scholarships varies according to their *Sisben* classification.

Heterogeneous effects

We run heterogeneous analyses for three subsamples according to the students' *Sisben* (socioeconomic) index, which students are aware of when sitting for the survey. In subsample 1, we included students with a *Sisben* index from 0 to 24, representing income-eligible individuals for the SPP program and categorized as the poorest. Subsample 2 consisted of students with *Sisben* between 24.1 and SPP *Sisben* cutoff (included), also income eligible for SPP program, but considered as poor. Subsample 3 included students with *Sisben* scores above the SPP eligibility cutoff or without *Sisben* index, making them non-income eligible for the program. Historical data indicates that poor students (subsample 2) were 2.5 times more likely to receive the scholarship compared to the poorest students (subsample 1), possibly due to their worse living conditions. Therefore, the cancellation of the SPP program is expected to have a greater impact on poor students (subsample 2) than on the poorest students (subsample 1).[20]

Estimations in the upper panel of Table 1, columns 2–4, show similar pattern and consistency as in column 1. Nevertheless, there are differences among the three subsamples.

[20] Authors' calculations based on beneficiaries of SPP in 2014.

In column 2, poorest students, coefficient values for financial aid and HEI quality are lower compared to eligible poor and non-eligible students (columns 3 and 4, respectively). Additionally, the preference for public universities is higher in this subsample compared to the others. In column 3, poor students display higher coefficients of preference for financial aid and HEI quality compared to their counterparts. This could be attributed to the fact that poor students' group is the most likely to receive financial aid. A potential explanation is that poor students, being economically more disadvantaged than non-eligible, consider these attributes more crucial as they require more financial aid to afford higher education and seek high-quality universities to ensure it is worthwhile.

Table 1, bottom panel, presents the effect of the SPP program cancellation on student preferences. The coefficients represent percentage point changes in the weight that students assigned to a specific attribute when comparing responses *before* and *after* the SPP cancellation. In column 2, no changes in preferences for higher education were observed among the poorest individuals (subsample 1). By contrast, for poor students (subsample 2) in column 3, the findings indicate a greater importance placed on financial aid and higher education quality after SPP was cancelled, compared to their counterparts. In column 3, the negative and statistically significant coefficients for financial aid levels of 50% and 75% scholarship fee indicate that the availability of financial support significantly and negatively influenced the choices of the most eligible population by 25 pp and 31 pp, respectively. This represents a reduction of about 33% and 39% of the baseline preference for a scholarship at significant levels and a reduction of 28% and 15% for non-significant coefficients of 25% and 100% scholarship, respectively. Similarly, the negative coefficients for two levels of higher education institution quality (3 stars and 5 stars) falling by 19 to 25 pp highlight the importance of quality considerations for poor students (subsample 2). This translates to a reduction of about 49% and 50% of the baseline preference for quality (2 stars also dropped by 32% relative to the baseline, although it was not statistically significant). In contrast, relatively wealthier students (subsample 3 in column 4) displayed a different pattern, as they did not show the same sensitivity to financial aid availability and higher education quality, except for 3 stars which fell by 17 pp. It is important to note that the estimated coefficients are significant relative to the *before* group within the corresponding subsample. Additionally, when using the raw data (Appendix, Table B), the results remain consistent, and the coefficients are even stronger compared to the CEM specification (Table 1).The fact that the termination of the SPP scholarship mostly affected students of the poor group, who were more likely income eligible for the SPP scholarship, is robust evidence of a drop-in aspirations due to the event.[21]

These results dismiss a possible substitution effect, where students would show increased interest in financial aid after SPP option was eliminated. Several possible explanations can be considered for the perceived decrease in the importance of financial aid in the after group. One explanation could be that students are now choosing lower-quality institutions with lower costs, which makes financial aid less salient. Another possibility is that students have lost confidence in promised aid, leading them to assign less weight to this attribute. Although there is no definitive explanation as to why students actually seem

[21] However, it is important to note that overall (considering both the baseline and interaction coefficients) financial aid and quality consistently remain the most important attributes for both the before and after group, with coefficients ranging between 0.2 and 0.9). Conversely, the attributes of HEI type, subsidy, and distance do not show statistically significant, possibly indicating that the cancellation has affected the attributes that students initially valued the most.

to want financial aid less after abolishing the program, the findings show a decline in educational aspirations following the cancellation of SPP.

Robustness

We conducted two additional empirical exercises. First, out of the DCE preference setting, we test if variables related to aspirations for higher education asked in the survey were subject of change due to the event. We find that students who filled out the survey *after* the cancellation of SPP prefer less costly private HEIs (by 600 USD) and are, on average, less willing to use governmental loans than their counterparts who answer the survey *before* the event (by 40% point). Second, we run a more restricted CEM analysis in which we conditioned the matching to four more variables: *gender*, *age*, *altruism*, and *present oriented* (Appendix, Table C). Results indicate similar coefficients, although less statistical significance. Loss of statistical power is attributable to the drop of almost half of the observations after performing the more restricted matching. The former robustness check supports our finding that diminishing educational aspirations is not due to chance.

Discussion and conclusions

This study aimed to estimate the impact of the nationwide low-income targeted SPP scholarship's cancellation on students' preferences for higher education. Two exogenous sources of variation distinguish this paper from others. First, the unexpected cancellation of the SPP program provides a causal measure of a negative shock on educational opportunities. Second, exogenous variations in the higher education bundles offered to students allowed for elicitation of preferences, overcoming the limitations of real choice records, where choice is usually endogenous to students' characteristics.

The results indicate that the cancellation of the SPP scholarship had a significant impact on reducing the higher education aspirations of disadvantaged students, particularly among income-eligible individuals who are not in the low end of the income distribution, i.e., poor individuals (subsample 2). Within this subgroup, there was a notable decline in interest in financial aid (from 15 to 39% of the baseline preference) and university quality (from 32 to 50% of the baseline preference) compared to the corresponding *before* group. These findings are essential as changes in perceptions are strong predictors of schooling outcomes, and low-SES students are particularly responsive to credit constraints (Kaufmann, 2014).

While the cancellation of the SPP program could potentially have effects on other low-income populations, we cannot draw conclusions about them. The unavailability of data from schools that utilized paper-based survey methods prevents us from assessing the policy change's effects on students in those schools. There is a possibility that students completing the survey using paper-based methods differ systematically from those completing it electronically (e.g., limited internet access), making it challenging to infer the impact on this population. The effects of the SPP cancellation on these students may or may not be different. This aspect requires further investigation to gain a comprehensive understanding.

Given that higher aspirations can significantly affect investments in human capital (Macours, & Vakis, 2009) and consequently affect labor supply, reducing educational opportunities to minorities can have disastrous losses for human capital accumulation among affected students and for society. Some consequences of the cancelation of scholarships can include diminishing college enrollment, placing into lower-quality universities

(both public and private), diminishing applications in STEM fields, declining potential earnings, and the deterring of well qualified students from applying to high-quality colleges (Bleemer, 2020). Further research, which includes multiple cohorts spanning the implementation of the SPP, is needed to examine the impact of SPP cancellation on these outcomes. In turn, decreasing the funding opportunities of low-income students not only affects them to reach selective universities but also has negative consequences on economic success and intergenerational mobility for the nation (Chetty et al., 2020; Zimmerman, 2019).

From a policy perspective, helping the poor to enhance their aspirations can have a positive effect on reducing poverty (Chiapa et al., 2012). Scholarships could be created to promote increasing investments in human capital for low-income students, as it can be a powerful means to increase educational ambition and interest for pre-college students with lower socioeconomic backgrounds. The mere existence of scholarship programs can increase effort and aspirations of a wider number of students than those that would be ultimate beneficed. When making decisions, policymakers should internalize potential spillover effects. Furthermore, these policies must be cost-sustainable, as its cessation will carry a step back for students that were enthusiastic for the existence of the possibility of financial support for higher education.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s10734-023-01094-w.

Acknowledgements We would like to thank the ICFES institution for their collaboration in establish contact with high schools for this project and to Pontificia Universidad Javeriana for the administrative support. The analysis, views, and opinions expressed in this article are those of the authors and do not necessarily represent those of ICFES or Javeriana University. We also would like to thank seminar participants at the 5th LEER Workshop on Education Economic, the UNU-MERIT workshop 2018 for their valuable comments and suggestions.

Author contribution All authors contributed to the study conception and design. Material preparation was performed by Gloria Bernal and Luz K. Abadía. Data collection was performed by Luis Esteban Álvarez. Gloria Bernal and Kristof De Witte did the analysis. The first draft of the manuscript was written by Gloria Bernal, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Funding Open Access funding provided by Colombia Consortium

Data availability The data for this study are protected by a confidentiality agreement, and we are impeded from sharing the data with others. Readers who are interested can contact the corresponding author for information on how to obtain access to the data and code.

Declarations

Ethical approval To carry out this research, we received the approval from the ethics committee at the Economics and Business Faculty at Javeriana University, registry: FCEA-DF-0128-2018. The study was also registered in the AEA RCT under the unique identifier AEARCTR-0003726 on December 27, 2018, retrospectively registered.

Conflict of interest The authors declare no competing interests.

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