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To cite this article: Oscar Espinoza, Luis González, Luis Sandoval, Bruno Corradi, Noel McGinn & Trinidad Vera (2022): The impact of non-cognitive factors on admission to selective universities: the case of Chile, Educational Review, DOI: [10.1080/00131911.2022.2106189](https://doi.org/10.1080/00131911.2022.2106189)

To link to this article: <https://doi.org/10.1080/00131911.2022.2106189>



Published online: 11 Aug 2022.



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RESEARCH ARTICLE



# The impact of non-cognitive factors on admission to selective universities: the case of Chile

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## ABSTRACT

Some universities, often the most prestigious in a higher education system, select qualified applicants solely on the basis of their measured academic or cognitive abilities. The universities' assumption is that these cognitive abilities are an accurate and complete measure of the applicants' capacity to benefit from university study. This study assesses the extent to which the cognitive measures used are partially the result of other, non-cognitive factors unrelated to future academic performance. Sole reliance on cognitive measures skews university admission in favour of those of higher socioeconomic status. Data for the study were collected by the University of Chile's Department of Evaluation, Measurement and Educational Registration (DEMRE) from 190,000 applicants seeking admission to Chile's 39 selective universities in 2019. The analysis identifies the direct and indirect effects of variables measuring applicants' cognitive and non-cognitive attributes. Logistic regression models were constructed to estimate the differential effect of the two types of factors on admission. The results indicate that non-cognitive factors have an indirect effect on admission through their effect on cognitive scores. Access to selective universities in Chile is partially influenced by students' prior social, cultural, and economic conditions. As a consequence, university education is distributed partially on the basis of social origin and not just ability. The admission process should be changed to reduce discrimination against applicants based on their social origin.

## ARTICLE HISTORY

Received 6 November 2021  
Accepted 19 July 2022

## KEYWORDS

Access; non-cognitive factors; higher education; exclusion; equity

## Introduction

Higher education in Chile has gone through profound changes over the past 40 years. The process began with structural reforms implemented during the 1980s by the military dictatorship (1973–1989). These reforms permitted the development of an educational market by expanding the number of private universities that have less stringent or no admission requirements other than a secondary diploma. In addition, other post-secondary non-university institutions were established (Espinoza & González, 2007; Fleet &

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Guzmán-Concha, 2017). After these changes enrollments grew rapidly, expanding from 249,000 in 1990 to more than 1 million students in 2020 (CNED, 2020).

Growth in the total number of universities contributed to the increased access of students from all income levels raising the coverage rate from 12.7 percent to more than 32 percent in the period 2010–2017 (Ministerio de Desarrollo Social, 2018). Access was also facilitated by several pro-inclusion policies, such as financial aid mechanisms (primarily a system of bank loans and scholarships). Beginning in 2016, the government offered free tuition for students from families in the lower 50 percent of the income scale. In 2018, the offer was extended to the lower 60 percent of the population.

While these various efforts increased enrollments in all groups, they have had only a minor impact on access to and social differentiation within the selective universities. Educational inequality, in the form of relative exclusion of lower-income students from selective universities continues to be an issue (Jarpa & Rodríguez, 2021). Universities are segmented in terms of the profile of students they accept (Espinoza, 2008; Fleet & Guzmán-Concha, 2017). Most low-income students are enrolled in the new non-selective private universities (Espinoza, 2017a, 2017b; Espinoza & González, 2015), rather than in (so-called traditional) universities with greater prestige (Cabrera, 2016; PNUD, 2017).

Currently, there are 60 universities in Chile. Thirty-nine of these participate in the Uniform System of Admission (SUA) overseen by the Council of University Rectors. Applicants to SUA universities must be secondary school graduates and take a standardised test (PSU), modelled after the US Scholastic Aptitude Test with subtests in Language and Mathematics.<sup>1</sup> The SUA is managed by the Department of Evaluation, Measurement and Educational Registration (DEMRE) of the University of Chile.

The first step in the admission process is a decision to register. Those who register then supply their secondary grade (GPA) records and take the University Admission Test (PSU). In the third stage, applicants are told their scores and invited to indicate up to 10 preferences for university and programme combinations across as many universities. The GPA and test scores required for admission vary by university and programme. In the fourth stage, beginning with the applicant with the highest test scores and GPA, universities admit candidates in the order of their preferences, until there are no more openings. No other factors are used in making the admission decision. Those admitted can enroll or turn down the offer.

In fact, the process of applying and being admitted to a university, and then completing requirements for a degree, is affected by a variety of “contextual” factors (Gazeley, 2019). The effect of some of these factors is direct; neither time nor some other factor intervenes to change the size of the effect. Other factors have their effect by changing another factor which then impacts the third. The effect of the first factor on the third is called indirect or mediated.

The current admission process is based on the assumption that selection depends solely on academic ability which is measured by secondary grades and test scores. As will be shown in the research review to follow, however, there is evidence that, independent of academic ability, non-cognitive factors influence applicants’ grades and test scores as well as their preference of universities and degree programmes (Fleche, 2016; Hossler et al., 2019; Saltiel, 2020). As a result of relying solely on cognitive factors to select among applicants, some (lower socioeconomic status) students are excluded from these universities even though they are capable of completing a university degree.

Although these factors have been identified, their relative importance in the admission process has not yet been measured. The purpose of the analysis described below is to assess the direct and indirect influence of non-cognitive factors on student trajectories in the process of enrolling in a selective university. Clarifying their impact would facilitate the design and implementation of more effective public policies to reduce inequality. Consequently, the research question guiding this study was: What are the direct and indirect effects of non-cognitive factors on outcomes of the admission process of selective universities?

## Literature review

### *Non-cognitive factors associated with interest in higher education*

Individual differences in learning ability appear at birth and are modified by interactions of children with people in their environment. Physical health is important but even more so is the level and quality of the communication between parents and others with the child. Language facilitates learning both by the information it conveys as well as development of the capacity to remember and think (Anders et al., 2011; Cunha et al., 2010; Heckman & Kautz, 2012; Kuhl, 2011; Topping et al., 2013).

All these processes are affected by the socioeconomic status (SES) of the child's family. They have a pronounced direct effect during the first 5 or 6 years of life, and then an indirect effect through how teachers and classmates react to the child. As a consequence of their family's social, economic and cultural context, students of advantaged origin are more likely to acquire communication skills and the kind of knowledge taught in schools. Encouraged by their successes they are more likely than children in impoverished circumstances to develop self-confidence and interest in further learning. Once in school, even when learning at the same rate as their less fortunate peers, they are regarded as "brighter" and more capable, and receive more attention. In Chile, for example, Jarpa and Rodríguez (2021) found that between 2000 and 2015 students whose parents had no higher education were less likely to advance at each stage in the admission process (registration, testing, application, admission, and acceptance of admission).

The head start of those from more advantaged backgrounds can result in their scoring more highly on measures of acquired knowledge and skills (Breen et al., 2009; Hossler et al., 2019; Jackson et al., 2007). It can motivate them to attain higher levels of education (Boudon, 1974; Fleche, 2016; Jacob & Kennedy, 2002; Saltiel, 2020). These findings suggest, but do not actually prove, that success in school is not solely the result of a fixed trait. More likely, the privileged students know more because they were taught more, but not because they have a higher ability to learn what universities teach.

It may also be, as researchers have shown, that performance in higher education once admitted depends significantly on non-cognitive traits, such as the motivation of less privileged students to learn and to acquire the cultural capital of the privileged (Caviglia-Harris & Maier, 2020; Cunha et al., 2010; Heckman & Kautz, 2012). Previous research on entrance into secondary (Jackson et al., 2007) and tertiary education (Bachsleitner, 2020; Boliver, 2013; Jerrim et al., 2015) is clear: family SES has more effect on test scores than it does on performance once admitted.

Other studies have found that the likelihood of application to prestigious universities is related to students' social, cultural and economic conditions (Antivilo-Bruna et al., 2017;

Fukushi, 2010; González & Dupriez, 2017; Jiménez & Lagos, 2011). Canales (2016) and Catalán (2016) studied selection processes using cognitive tests and concluded that level of family education and occupation as well as the type of secondary school attended was predictive of which institution was preferred. Lower SES applicants preferred non-selective universities. Research has demonstrated a relationship between characteristics of the student's secondary school and scores on the admission test (Contreras et al., 2007; Farías & Carrasco, 2012; Koljatic & Silva, 2006, 2010; Rodríguez & Jarpa, 2015; Valdivieso et al., 2006). Students who graduated from private schools chose more selective universities. The kind of higher education applicants received varied in part because of ability test scores but also because of students' preferences linked to their families' background.

Researchers in Chile have examined the factors that affect performance on the PSU admission test. Secondary schools have different types of ownership (public, private but publicly subsidised, and private). Within schools, students can take a university preparatory programme (Science and Humanities, SH) or a vocational-technical programme (Technical-Professional, TP). Their programmes, and students, are socially and academically distinct (Bellei, 2013). Graduates of the private schools track routinely obtain higher scores on the PSU than do graduates from subsidised private and public high schools, and those who followed the TP track (Contreras et al., 2007; González & Dupriez, 2017; Koljatic & Silva, 2006, 2010; Valdivieso et al., 2006).

These findings led to the discovery that public and subsidised private schools cover less of the content presented in the PSU admission test than do private schools (Catalán & Santelices, 2014). The TP track covers less of the content tested in the PSU than does the SH track (Farías & Carrasco, 2012; Garcés & Jarpa, 2015). Previous studies suggested the existence of indirect effects in the application to higher education institutions (Canales, 2016) and in the enrollment by students of the TP track (Antivilo-Bruna et al., 2017). However, the magnitude of these effects has not been estimated.

### ***Choice of university and field of study***

Non-cognitive factors also influence students' decisions about where and what to study. Applicants are influenced by prior academic performance, sociocultural background, and school characteristics, among other factors (DeBacker & Routon, 2017; Nakhili, 2010; Noble & Davies, 2009). Young people's knowledge and interest in higher education come initially from their family (Patfield et al., 2021). Parents' education can be a source of their children's interest in higher education (Hunt et al., 2018). Secondary school graduates in the United Kingdom are more likely to apply for admission to higher education if one or both of their parents had attended (Brumley et al., 2019; Garza & Fullerton, 2018). Similar results were found in Sweden (Rimkute et al., 2012) and Germany (Bachsleitner, 2020).

Secondary school experiences also condition aspirations. These can be influenced by aspects of the school or by the relationship the school maintains with higher education institutions (Engberg & Wolniak, 2010; Hossler et al., 2019). Teachers influence students' aspirations (Royster et al., 2015; Wu & Bai, 2015). A study in England reported that teachers had most influence on the aspirations of middle-class students whose parents had no university experience (Alcott, 2017). In Denmark and in Germany, students who took the technical-professional track in secondary school were less likely to enter higher education,

and those who go on to further study were more likely to enroll in a non-university programme (Holm et al., 2013; Tieben, 2020). Research in Chile associates the choice of institution and field of study with the socioeconomic origins of students (Canales et al., 2016; Castillo & Cabezas, 2010; González, 2014; Sepúlveda & Ugalde, 2010; Sepúlveda & Valdebenito, 2014). In Chile, the parents' level of education plays a role at each stage in the process of admission (Jarpa & Rodríguez, 2021).

Controlling for the scores obtained on admission tests, students in Chile whose parents had university education and higher status employment were more likely to apply to selective universities (Canales, 2016). This was true also for graduates of the SH track (Antivilo-Bruna et al., 2017). Given prior educational segregation in Chile, school context influences aspirations to attend higher education (Canales et al., 2016; González & Dupriez, 2017). Similarly, in Chile students in the TP track are less likely to apply for selective universities than are those graduating from the science and humanities track (Catalán, 2016).

## Methodology

The analysis is based on data collected by the Department of Evaluation, Measurement and Educational Registration (DEMRE) in 2019. The data describe characteristics of all students who applied, took and passed the admission examinations, indicated their preferences of university and field of study, and were admitted to a university. Only those students who applied to the admission process in the same year of their secondary school graduation are included. The total number of valid cases included was 199,668. Table 1 indicates the number of students included in the analysis of each stage of the admission process. Slightly more than one-fourth of those applying were offered admission.

### Independent variables

The following variables were used as non-cognitive factors: Parents' Education; Family Income; School Type; Academic Track. Parents' Education is a categorical variable that expresses the highest level of education attained by both parents. Each parent was classified in one of three categories combining the parents produced six categories:

- (1) Both no higher education
- (2) One some higher education
- (3) One graduated from higher education
- (4) Both parents some higher education
- (5) One parent graduated, one with some higher education
- (6) Both parents graduated from higher education.

**Table 1.** Number of students entering each stage of the admission process in 2019.

Stage	<i>N</i>	Percent
Registration	199,668	100.0
Testing	180,140	90.1
Application	87,571	43.8
Enrollment	54,759	27.4

Family Income is divided into four levels representing Low, Medium, High, and Very High. School Type refers to the administration of the secondary school from which the student graduated. There are three categories, Public, Subsidised Private, and Private. Both types of private schools are selective and charge fees. Low-income students can obtain government vouchers to attend Subsidised (voucher) Private secondary schools. The variable track refers to the programme followed in secondary school. The Science-Humanities track (CH) is a university-preparatory programme. The Technical-Professional track (TP) prepares for entry into the work force.

### **Control (mediating) variables**

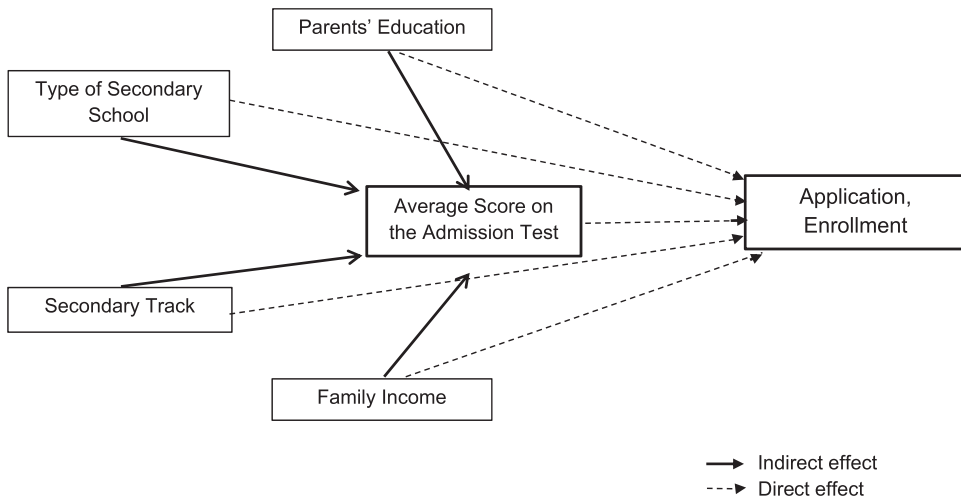
Two kinds of control variables were employed. The first refers to those that reflect the student's prior academic performance, and his/her cognitive knowledge. The DEMRE data includes two measures of academic performance in secondary school: the student's four-year grade point average (NEM) and an adjusted grade point average taking into account the average of grades in that school (Ranking). As these two variables were highly correlated ( $\rho = 0.98, p < 0.000$ ), only NEM was used. The student's academic knowledge or achievement was measured by the University Selection Test (PSU), which includes a scale for Language and a scale for Mathematics. The three measures, NEM, PSU Language and PSU Math, range between 150 and 850. To avoid distortions resulting from range, each was divided by 100.

### **Data analysis**

Logistic regression models were constructed to estimate the size of the direct and indirect effects of non-cognitive factors on movement through each of three steps in the process ending in enrollment. Each model estimates the probabilistic relationship between a student's scores on the non-cognitive variables and the following event sequences: taking the admission test; application; and enrollment in a selective university. The formal model is as follows:

$$\ln \frac{\Pr(y = 1|x_i)}{\Pr(y = 0|x_i)} = \beta_0 + \beta_1 edn2 + \beta_2 edn3 + \beta_3 edn4 + \beta_4 edn5 + \beta_5 edn6 + \beta_6 TP + \beta_7 voucher + \beta_8 Public + \beta_9 Female + \beta_{10} NEM + \beta_{11} avg psu + \epsilon \quad (1)$$

In Equation (1), "y" takes the value of 1 if the student took the test, passed and stated preferences of university and field of study, or was enrolled; "edn2" through "edn6" represent the levels of school attained by parents (level 1 is the base value); TP refers to having graduated from the TP track (the base is SH, Sciences and Humanities); "voucher" and "public" refer to the secondary school from which the student graduated (Private is the base); "Female" refers to the gender of the student (Male is the base category). All these are dummy or nominal variables. "NEM" and "avg psu" are interval scale variables. In the model that predicts to the first stage, taking the test, the PSU scores are not included.



**Figure 1.** Path analysis for the application and enrollment stages.

The Karlson-Holm-Breen (KHB) method was used to isolate the direct and indirect effects of the non-cognitive variables on progress in the third and fourth stages: application and enrollment. This method uses path analysis to decompose effects in probabilistic, non-linear models (see Figure 1) (Breen et al., 2013; Kohler et al., 2011). In the model the independent variables (parents' education, family income, type of secondary school, and track) are mediated by the control variables (admission tests), which determine the probability of seeking and of being granted admission. This probability corresponds to the indirect effect of the independent variables. Once the mediating or indirect effect is controlled, the direct effect of the non-cognitive factors can be observed.

The odds ratios produced by the procedure are not standardised coefficients; they should not be used to compare models or samples (Mood, 2010). For that reason, the analysis examined the average partial effects (APE). The partial effects are observed by holding all other variables constant while changing each independent variable from its base to its maximum value (for example, for a dichotomous variable from 0 to 1).

A total of 18,177 students were missing NEM data; these students did not take the admission tests. Prior research has shown that those students who had registered to take the admission test but did not take it belong to families of lower socioeconomic status (Jarpa & Rodríguez, 2021). Their elimination from the analysis would reduce the relative importance of the non-cognitive factors in relation to the importance of the PSU. For this reason, the variable NEM was eliminated from the model for estimating the probability of the testing stage.

## Results

### *Descriptive results*

Table 2 presents the number of students who signed up for the admission process and the numbers moving to the next stage, for each level of the independent variables. In each stage, the percentages are based on the number of students achieving that stage. The percentage that took the PSU is based on the total number of those registered that



**Table 2.** Percent achieving different stages of admission by levels of independent variables.

Parents' education	Registered to take admission test	Participated in testing (as % of registered)	Applicants (as % of testing)	Enrolled in some university (as % of total admitted)
1	134,685	87.2	39.7	77.1
2	5408	94.4	56.5	79.5
3	29,851	95.1	58.1	79.3
4	879	96.4	64.1	81.6
5	4825	97.9	70.5	83.4
6	24,020	98.5	74.9	84.7
<i>Track</i>				
SH	140,968	92.2	57.2	80.8
TP	58,700	85.5	26.3	71.5
<i>Type of secondary school</i>				
Private	20,790	99.0	79.8	85.9
Subsidised private	103,237	91.5	48.8	78.4
Public	75,641	86.1	38.5	77.1
<i>Family income level</i>				
Low	101,820	86.8	40.8	77.7
Medium	24,436	90.3	44.2	77.6
High	59,039	94.0	54.3	79.2
Very high	14,373	99.0	81.9	87.0
Total	199,688			

took the admission test. The percentage (by each level of the independent variables) of those in the application stage is based on the total entering that stage, and so on. In other words, only 87.2 percent of registered students whose parents had never attended university took the PSU tests. Only 85.5 percent of those who graduated from the Technical Professional track took the tests.

Table 2 shows the impact of non-cognitive factors through each stage of the admission process. First, less-advantaged students were less likely to take the PSU test. Almost 100% of students from advantaged backgrounds took the test, compared to less than 90% of those less advantaged. Second, the application stage shows a lower rate of participation compared to the previous stage (testing) and wider gaps among students from different socio-economic status. Only 40 percent of students from lower income families, or those whose parents had no university education, or who attended a public secondary school reached this stage. The percentage drops to 30 percent of those who graduated from the Technical Professional track. There is a gap of at least 30 percent between first-generation students and those with more educated parents. Differences in Family Income and Private School attendance widen the gap.

In the last stage of the admission process the gaps are less. At least 70 percent of students who were admitted, enrolled, no matter their background. There are gaps between students in the different categories of the non-academic variables, but these are relatively smaller than at the earlier stages of application and testing. They varied 7.6 percent between lowest and higher Parents' Education, and 9.3 percent related to levels on Family Income and Track.

### **Probability of testing, application and enrollment**

The results of the logistic regressions for the testing, application and enrollment stages are presented in Tables 3 and 4. The tables report the coefficients, their levels of statistical

**Table 3.** Logistical regression model (testing stage).

	Coefficient	APE
Intercept	3.097***	–
Female	0.139***	–
Parents' Ed2	0.691***	5.2
Parents' Ed3	0.705***	5.3
Parents' Ed4	0.958***	6.5
Parents' Ed5	1.243***	7.6
Parents' Ed6	1.313***	7.8
Technical professional	–0.248***	–2.2
Subsidised	–1.102***	–5.5
Public	–1.448***	–8.6
Medium income	0.237***	2.1
High income	0.444***	3.6
Very high income	0.948***	6.4

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

significance, and their Average Partial Effects (APE). Table 3 reports the impact of the non-cognitive variables on the decision to take the admission tests. Table 4 includes the direct and indirect effects of the independent variables on the probability of postulating, and then actually enrolling.

### Testing

Table 3 reports on the effect of each of the non-cognitive factors on the decision to take the admission tests. Each factor has a statistically significant impact on participation. Applicants whose parents had some higher education were more likely than first-generation applicants to take the admission tests, by a difference ranging from 5 to 8 percent. The likelihood of taking the tests increased from two percent probability of students from Medium Income families, to 6.3 percent probability for those from Very High Income families. Applicants who graduated from a public or subsidised private school were less likely to take the tests, with probabilities of 5 and 8 percent respectively. Applicants who graduated from a Technical Professional Track were 2.1 percent less likely to take the tests.

### Application

The results shown in Table 4 describe the direct and indirect effects of the non-cognitive factors on the decision of students to choose a university and enroll once they are admitted. Women were more likely than men to reach this stage. Many of the direct effects are small, indicating that the test mediated the effect of the non-cognitive variables. Students with similar scores on the selection tests are equally likely to apply for a specific university and programme. The exception is that of school track. Those who graduated from a TP programme are less likely to proceed.

The direct effect of Parents' Education on the probability of postulating is statistically significant only for levels 2 and 3 and effect sizes were smaller than two percent. On the other hand, the indirect effect of Parent's Education was to increase the probability of postulating by at least 5 percent. Indeed, students with parents at educational levels four, five and six are about 9 percent more likely to apply than their peers whose parents did not reach the tertiary level.

**Table 4.** KHB regression model of application and enrollment stages.

		Application		Enrollment	
		Coeff	APE	Coeff	APE
Intercept		-10.699***	-	-3.888***	-
Female		0.313***	-	-0.262***	-
Parents' Ed2	Direct	0.130***	1.9	-0.006	-0.1
	Indirect	0.427***	6.6	0.116***	1.7
Parents' Ed3	Direct	0.136***	2.0	-0.048	-0.7
	Indirect	0.333***	5.1	0.077**	1.2
Parents' Ed4	Direct	0.119	1.8	0.027	0.4
	Indirect	0.572***	8.8	0.150***	2.2
Parents' Ed5	Direct	0.032	0.5	-0.002	-0.0
	Indirect	0.619***	9.5	0.165***	2.5
Parents' Ed6	Direct	-0.018	-0.3	-0.064	-0.1
	Indirect	0.571***	8.7	0.162***	2.4
Technical vocational track	Direct	-0.400***	-6.1	-0.104***	-1.6
	Indirect	-0.636***	-9.9	-0.298***	-5.0
Private subsidised secondary	Direct	-0.089**	-1.3	-0.016	-0.2
	Indirect	-0.445***	-6.9	0.187***	-2.7
Public secondary	Direct	-0.060*	-0.9	-0.059	-0.9
	Indirect	-0.779***	-11.9	-0.255***	-3.8
Medium income	Direct	-0.100***	-1.5	-0.108***	-1.6
	Indirect	0.125*	1.8	0.030	0.4
High income	Direct	-0.186***	-2.7	-0.166***	-2.5
	Indirect	0.289***	4.3	0.075*	1.1
Very high income	Direct	-0.160***	-2.4	-0.101*	-1.5
	Indirect	0.589***	8.8	0.198***	2.9
NEM		0.411***	-	0.167***	-
Average PSU		1.659***	-	0.853***	-

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

School track plays a role not only through the scores obtained in the admission tests, but also through direct effects. Controlling for test results, a student from the TP track has about a 6 percent lower probability of going on to the next stage than does a student from the SH track. School track mediates the effect of scores on the selection tests by almost 10 percentage points; graduates of the TP track are much less likely to go on. On the other hand, the type of secondary school plays a role predominantly through the PSU scores. The direct effects on the probability of postulating show a small advantage for graduates of private education, with effect size of less than two percent. The indirect effects are large:  $-6.9$  and  $-11.9$  percent for private subsidised and public schools respectively, the latter effect size being the largest in the model. The impact of Family Income was significant but not large for the lower level, but large for the Very High category. Its effect size through the PSU scores reaches almost 9 percent.

### Enrollment

Admission was granted beginning with the highest scoring students. If their choice of university and programme was met, they were admitted. The Enrollment APE indicates that most of the non-cognitive variables had a mild effect. The largest positive effect was that for Very High-Income students, followed by level 6 Parents' Education. The largest negative probabilities of enrolling once admitted were for students who graduated from a TP track (APE =  $-5.0$ ) and those who graduated from a public school (APE =  $-3.8$ ). All of these refer to indirect effects.

## Discussion

The KHB method was effective in sizing and differentiating the direct and indirect effects of the non-cognitive factors. Prior research has shown that achievement tests (and school grades) reflect not just cognitive abilities, but also non-cognitive abilities (Heckman & Kautz, 2012, 2014; Kautz et al., 2015). The non-cognitive abilities are affected by factors independent of the “intellectual merit” of the test-taker. The use of achievement tests affected by these factors has the effect of reproducing socioeconomic and cultural capital inequalities in society. The results show the incidence of non-cognitive factors in the admission process. They are further confirmation of the fact that access to selective universities is influenced by students’ social, cultural, and economic conditions, by their contextual factors (Antivilo-Bruna et al., 2017; Fukushi, 2010; Gazeley, 2019; Jiménez & Lagos, 2011).

The first decision leading to exclusion is taken by students who fail to take the achievement tests required by the universities. Not all secondary school students choose to take the required tests once they have started the admission process. This is most common among first-generation students (those whose parents have no higher education experience); those from lower income families; those who graduated from public or subsidised private (voucher) secondary schools; and those who chose the Technical Professional track in secondary. Using data for the years 2000–2015, Jarpa and Rodríguez (2021) reported similar findings among first-generation students. Students from high income families with university-educated parents who attended a private school were five percent more likely to take the admission tests.

What makes the most difference with respect to attending university is the student’s GPA and scores on the admission test. More than half of the students who initially indicated interest made it to the application stage. All the four non-cognitive factors, mainly through their impact on other variables (PSU score), played a part. The single most important factor was graduation from a private secondary school. If we assume that private school attendance is related to family income and level of parents’ education, the importance of those factors becomes clearer. The decisions students make with respect to their future education are shaped by factors in their present environment. Current selection procedures are based on the assumption that all applicants have had the same formative experiences.

For each of the four factors studied, students in the most advantaged category are 10 percent more likely to apply than those in the base category. This is not, however, evidence that less advantaged students lack motivation to apply for admission. If admitted, first-generation and lower income students go on to choose a university at the same rate as their more advantaged counterparts, confirming that the aspiration to study in a university is widespread (Castillo & Cabezas, 2010; Espinoza & González, 2015; González, 2014). It is the admission test, the scores of which are highly associated with socioeconomic status, that filters out aspiring youth (Contreras et al., 2007; Farías & Carrasco, 2012; Garcés & Jarpa, 2015; Koljatic & Silva, 2006, 2010).

The effect of using this form of selection is to continue and perhaps expand the inequalities that begin to appear in earlier levels of education (Larroucau et al., 2015). If the objective is to improve access to higher education in Chile, more attention should be paid to secondary schools (e.g. financial resources, infrastructure, labs, libraries,

quality of teachers) (González & Dupriez, 2017). In this study, students who graduated from a public school and those who took the Technical Professional track were 11.9 and 9.9 percent less likely to apply for admission to a selective university, reaffirming the social and academic segregation of secondary schools (Bellei, 2013).

Finally, it is significant that the non-cognitive factors included in this study have smaller effects on the enrollment of students who have passed the admission tests. The admission process filter that excludes most students are PSU scores. Those who finally enter a university are primarily those selected before they chose which one to enter. Family background was an important determinant of who would be allowed to indicate the university and degree programme they wished to attend.

## Conclusion

The decision to admit a student is made by the university on the basis of prior academic performance and current knowledge or achievement. Once passing the selection tests, the decisions about which institution and field of study are made by the student. In both cases, non-cognitive factors or characteristics of the students affect the decision. Their effect on the students' decisions is primarily indirect, as the effect of the non-cognitive factors is mediated by the students' academic performance and test-measured achievement.

The current process of selection favours applicants prepared for the testing instrument. Their parents are university graduates, with higher levels of family income, who attended a private secondary school and took a university preparatory track. From infancy they have been prepared for this selection process. Current selection procedures reproduce socioeconomic inequality in Chilean society. Secondary school graduates from the lower income levels are 10 percent less likely than their more advantaged counterparts to even take the university admission examination. Those who do take the test confront questions about material they were not taught in secondary.

The admission system conforms to the principle of admission based on "merit", but "merit" is highly related to socioeconomic factors that determined access to education beginning with birth. These non-cognitive conditions limited opportunities to acquire the cognitive skills required to pass the selection test. Their lack of "merit", therefore, is the result of exclusion from opportunities to demonstrate their capacity to learn how to contribute to society. Over time, their aspirations and ambitions have been shaped by factors over which they had little or no control. The admission processes of the selective universities reproduce the social and economic structures that have maintained inequality over time.

The results suggest two directions for correction of this situation. The most important is to ensure that opportunities to learn, beginning at an early age, are more equitably distributed. This includes expansion of early education, and improvements in the quality of primary and secondary schooling. Special attention should be given to the use of research-proven methods of effective teaching, coverage of the curriculum, and teacher-led formative assessment of students.

The university admission process should be changed so as to reduce or eliminate discrimination of students on the basis of their social origin. This requires more than modification of the PSU selection test. This has been attempted in the past, with little success.

Structural inequalities were unaffected. Future instruments to predict success in the university should ensure that instruments measure learning ability and not just prior knowledge.

Future research should focus on identification of those university and school processes and structures that enhance learning independent of the socioeconomic conditions of the learner. The objective will be to develop and enhance the variety of abilities of those admitted to the university. This will have the desirable effect of increasing the diversity of talents that universities can develop and contribute to society. The current organisation of teaching, in Chile and elsewhere, may have been appropriate for that period in history when relatively few, drawn from the advantaged classes, entered higher education. A new higher education should identify and build upon the diverse knowledge and abilities found in all sectors of society.

## Note

1. The PSU was replaced in 2021 by a new test (PDT) of similar design that measures a more narrow range of academic knowledge.

## Acknowledgments

We appreciate the support given by the Instituto Interuniversitario de Investigación Educativa (IESED-Chile). We also acknowledge data provided by the Department of Evaluation, Measurement and Educational Registration (DEMRE), Universidad de Chile.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## Funding

This research was supported by the National Agency of Research and Development of Chile (ANID) through the FONDECYT Project N°1200343.

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