Rethinking the admission processes to higher education in Engineering: the case of a university in Chile

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Abstract

Various international investigations have focused on higher education admission systems as these seek to identify the academic potential of new admissions. In many countries, standardized admission tests are used as they are considered good predictors of future academic performance by candidates. Further to this, as is the case in Chile, the Single Admission System (SUA, in Spanish) employs and additional ranking that seeks to consider the long-term performance of students in terms of their study context. This is done using a candidate's average school grades and weighing this result with a ranking associated with their school. This weighing aims to reduce the importance that a single selection test may have and so provide opportunities to underrepresented groups in higher education. However, this system has been widely criticized for not fulfilling its central aim and worse still in that it increases discrimination against students who come from less favored sectors. In Engineering degrees in particular, the SUA calculates the scores by assigning different weights to the ranking, which may vary from 10% to 40% depending on the engineering career considered.

This present study seeks to analyze the different sources of information that the SUA system uses to determine the correlation that these may have with academic performance in first year students. The data analyzed is for a population of 7,845 students entering engineering careers between 2013 and 2017, where a stratified random sample of 675 students from a private Chilean university was considered, having the highest enrollment at the national level in engineering careers. Using a correlational analysis, the aim is to detect variables that may play a relevant role in first-year academic success. The data considered includes age, gender, type of school, school ranking, scores attained in selection tests, and their course grades at the end of their first year at university. Preliminary results show that SUA indicators are not sound predictors of academic performance for this sample of first-year engineering students. Results obtained are discussed and suggestions presented on the use of available information to improve a university selection and admission system. Moreover, the uptake of these study results by higher education institutions is encouraged to develop actions that may accompany and buttress academic performance during the first year of university studies for students identified as being at risk.

Keywords: engineering, admission process, standardized test, predictors, drop out.

Introduction

The academic performance of university students is a multidimensional problem that affects not only young people who enter university. This undoubtedly affects their families, both economically and socially, as well as the higher education institutions they are admitted into. It also ends up affecting the school institutions in which students are schooled before going onto universities, ultimately affecting the State and society.

Schools in Chile currently require their graduates to obtain good results in higher education admission exams so they may keep their current ranking or be promoted. While University institutions welcoming these new students must deal with their entry characteristics in such a way that they may in turn chisel out the graduation profiles that they have set for each of the cohorts that they form.

The consequences of higher education entry processes are diverse and affect different actors. The first to be affected are students themselves, seeing how they achieve their own personal goals or, on the contrary, seeing how their plans are cut short, leading to frustration. The State itself is affected as it invests economic resources in supporting this educational stage, as is wider society, which must adapt to decisions made by future students in terms of where and what to study. How students are assigned to higher education will affect future availability of professionals in the areas that they specialize in. The different and specific study rhythms and methodologies define how long students will take in finishing their studies. If the study period is lengthened, the frustration that they must tolerate so as to be able to graduate increases, eventually dropping out if unable to deal with this situation.

Given the context described and impacts seen, it becomes paramount to provide tools that may predict student performance, leading to identify various strategies that may increase student retention possibilities in each university.

Many countries have thus incorporated standardized admission tests that are considered good predictors of future academic performance by candidates. In Chile, the Consejo de Rectores de las Universidades Chilenas (CRUCH – Chilean Universities Council of Deans) is responsible for establishing a Single Admission System (SUA) for the higher education institutions that are attached to this system. As of 2003, this process uses a standardized test called the Prueba de Selección Universitaria (PSU - University Selection Test) that replaced the Prueba de Aptitud Académica (PAA - Academic Aptitude Test) used from 1966 to 2002. From 2013 onwards, the admission process included a system whereby average school grades were weighed and factored in as a variable used for university selection. This new ranking uses information on student academic performance in relation to their educational context, which is added to their high school grades (NEM) and university selection tests (PSU) in force until that date. In 2016, an improvement was made in how this ranking was calculated, incorporating within it the complete student trajectory, independently of the number of schools they may have gone to.

By adding this new variable in the ranking, the State seeks to acknowledge the effort that the student may have made during their high school career and so benefit those who may have had a good performance relative to their context, which in turn is a product of the educational establishment they went to, and the type of education received. Each University that forms part of the Sistema Único de Admisión (SUA - Unified Admission System) in Chile, defines a weighting to each of their degrees, giving the ranking a relative weight within the total weighted value [1].

Given the above, it becomes relevant to analyze the role of the ranking, as well as other variables, as academic performance predictors for students in their first year of study. In order to do this, the constructs associated with Chilean university admission system and some related

research need to be reviewed. A proposed methodology for this work will then be presented, as well as the results and conclusions.

Literature review

There are various university admission systems in operation around the world. In Brazil and Chile, there are demanding entrance exams in force, aiming to stimulate study among secondary school students who aspire to go on to graduate from university. These entrance exams are like those in force in Cuba, Ecuador, Mexico, and Colombia, as well as in Asian countries such as Vietnam, China, Japan and South Korea, European countries also have similar entrance exams [2]. While in the United States, university admission system requires students to take the Scholastic Aptitude Test (SAT) and/or the American College Testing (ACT), whose objective is to measure the analytical capacity of students in problem solving [3]. Lastly, in Cuba, students must take three entry exams, namely Math, Spanish, and History [4]. Similarly, in Brazil, students must pass a selective process imposed by each university, while from 2009 onwards, the grades obtained in the National High School Examination (ENEM) can be used to access some universities [2].

The different admission systems aim to identify the academic potential of students entering higher education institutions. This means that various and different international investigations converge on studying higher education admission systems [5], [6]. Countries such as the United States and Australia have also investigated other variables that may allow to fathom why students do not persist in university education. For example, a study analyzes how the fulfilment of first year university expectations influences the consolidation of student persistence during the rest of their years at university [7]. Factors such as student mental health and well-being and how these were affected by student motivation during their first year were studied. Although these factors are not leading players in this present study, it is worth reviewing how they have been addressed in the literature, since they have an important influence on results expected by students.

The study cited above concludes that first year university studies correlated highly with student continuity if they are not compromised by mental health issues attributable to difficulties in meeting their expectations and if their well-being is not affected by schooling conflict. Different countries, including Chile, implement various strategies to ensure student success in higher education and seek to guarantee equity in accessing higher education.

The Chilean admission system has seen various changes aiming to try and predict future student performance given student university selection test results. However, the different proposals that have been generated for this admission system have detractors who indicate that they do not effectively guarantee equity in the process. Criticism that the system has received is that it promotes socioeconomic segregation and favors students from higher socioeconomic levels [3].

Evolution of public education policies in Chile

Higher education in Chile has a history that can be divided into four stages: "a) the period prior to the 1967-68 university reform, b) the reform period, which ends with the coup d'etat of 1973, c) the period of military intervention prior to the 1980 reform, and d) the period after the reforms of 1981 and which lasts until present day" [8]. The authors state that the most important reforms were made in this last period, and which have contributed to modernizing higher education.

As can be seen in Figure 1, between 1900 and 2003, higher education regulations and normative framework focused on quality and equity. It was aimed, mainly, at the forms of admission to higher education. As argued by some authors [8], up to 1966, university selection consisted of a series of written tests that concluded with a "Baccalaureate in Humanities" that gave access to the university. In addition to the baccalaureate, universities considered high school grades and other aspects for the selection, but the criteria were far from standardized, and the baccalaureate did not adequately predict University student drop-out rates.

Given the difficulties described, authors point out that, starting in 1967, a new University selection instrument emerged known as the Academic Aptitude Test (PAA), designed by the University of Chile in 1962. The PAA was designed following the same pattern as the Scholastic Aptitude Test (SAT) used in the United States. The AAT was not exempt from criticism, and its modernization became necessary, which arrived in 2003 with the PSU (University Selection Test), fully aligned with secondary education curricular content.
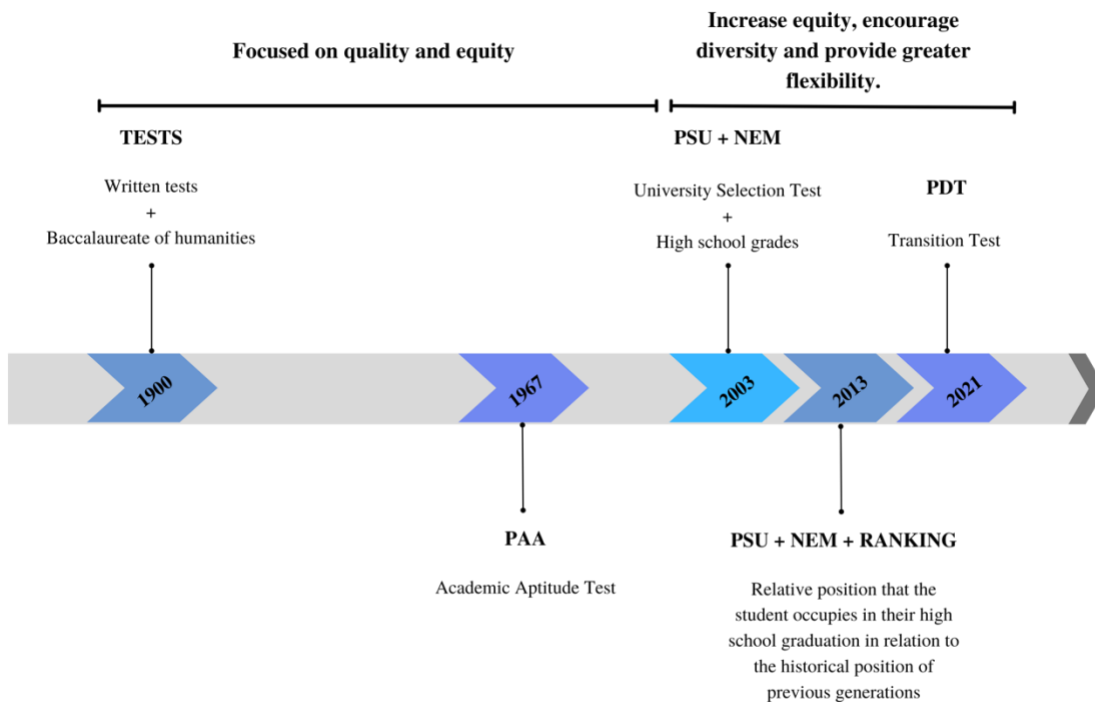

Figure 1. Evolution of university selection criteria in Chile

Before 2013, the main criteria for admission to Chilean universities were the result obtained at the University Selection Test (PSU). The objective of this test was to measure how well the

curricular contents of secondary education was learnt, as stipulated by the Ministry of Education [9]. Together with the PSU grades, another selection criteria used was high school grades (NEM).

From 2013, the Chilean Universities Council of Deans (CRUCH) added another factor in assessing access to higher education, subtracting relative weighing from the PSU and the NEM. This new factor became known as Ranking. The grade ranking is defined as "the relative position that the student occupies in their high school graduation in relation to the historical position that the three previous generations attained" [9]. Thus, both the ranking and NEM system value high school results that university applicants may have had.

As of the 2021 admission process, in adherence to Law 21,091, the Ministry of Education, through the Undersecretary of Higher Education, became responsible for the system of access to higher education. Together with the Technical Access Committee, changes were made aiming to increase equity, encourage diversity and provide greater flexibility. One of the most notorious changes was the elimination of the University Selection Test (PSU) and its replacement by the Transition Test (PDT), which, unlike the previous test, has less specific content and gradually adds new types of questions, such as those that assess skills deemed essential for success in higher education.

University Selection Criteria: Ranking

As mentioned earlier, ranking is understood as a scoring system assigned to the high school within a national ranking. This is assigned based on student performance with respect to their educational context. A higher score is assigned to those who have an average high school grade (NEM) which is above the average for their generation, gradually increasing to 850 points, which is equivalent to the highest average grade in high school. Those students who obtain an average high school grade which is equal to or lower than that of their educational context receive a ranking score which is equal to the equivalent of their NEM average.

There is a limitation when scoring the ranking, as it is a static variable, predefined by the Chilean State and which may only be modified by the State. There are studies [10] where ranking predictability was studied based on a new ranking created by the authors who proposed their own indicator which "minimizes the weaknesses of this indicator", referring to the existing official one.

Adding a ranking as an instrument in helping decide on university admission was motivated by research results commissioned by CRUCH and published in 2006, 2008 and 2010, prior to including the ranking as a selection criterion. Given research results, those findings published in 2009 stand out, where the predictive value of PSU scores and NEM scores on university performance is analyzed, together with a dichotomous variable related to the ranking (whether or not they are found within the top 5 % in performance within their graduation establishment), finding that this last variable linked to their ranking captures aspects that are not present in other variables [11].

More recently, the relationship between the admission selection variables and subsequent academic performance was analyzed in another research [6], where the high school grades (NEM) better explain academic performance in first semester and more strongly correlated in the second semester.

Since ranking inclusion, numerous studies acknowledge this milestone as being a step forward in equity in admissions criteria. They state that this is so when considering the academic trajectory of the student, the role of their broad-ranging skills is revealed and new spaces for social equity is generated [12].

Other authors [13] point out that the higher education access system shows up differences in young people who have been trained in municipal schools and those trained in private schools. This is since the majority of those attending municipal schools have not had the opportunity to be exposed to all the contents present in the curriculum or had them taught to them at the depth to which these subjects were taught in private schools. They therefore point out that the use of this ranking becomes a tool for social integration since, when considering student performance in the context of the school they came from, the ranking includes elements that cannot be evaluated by a standardized knowledge test [14].

Testing the hypothesis that ranking is a predictor of academic performance during higher education will allow universities to take a series of actions aimed at reducing university dropout rates. For example, connecting the student with their new academic reality, obtaining resources or generating instances to close the most important gaps. This would lower the first-year dropout rate and pave the way for a successful graduation.

Given the above, doubts arise as to whether the university environment is implementing adaptive changes that may enable dealing with the variations seen in students entering university [9]. And in particular, what alternatives are being considered in order to even out knowledge disparities in students entering university and who come from municipal schools and also from some privately subsidized schools.

This question is justified since, as Gil, Paredes & Sánchez point out [12], "the quality of education received in basic and secondary education, as well as cultural capital acquired, influence both the PSU and academic performance at university". The relationship between ranking and subsequent academic performance during higher education will also be influenced by the ability shown by the higher education institution to adapt to this new social reality. Given the aforementioned considerations, to include this high school ranking as part of admission criteria may turn into a double-edged policy, in that what is proposed as a solution to the issue of social inequality and discrimination in accessing higher education becomes a much more serious problem [13].

Given what has been presented above, research aims are to analyze if the ranking assigned to their high school is indeed a predictor of first year student academic performance at university. The aim is also to study what other variables in student performance in their high school may provide further information in this regard. The study will work with a population of 7,845 students entering engineering careers at one of the largest private universities in Chile.

Methodology

The present work aims to shed light on the relationship between some variables used as university entrance criteria and their capacity to predict the grades that a student will obtain at the end of their first year of engineering studies.

The study used a database obtained from secondary sources to which the study team had direct access from a private university in Chile, after signing a confidentiality letter. This database includes a population of 7,845 first-year engineering students from a private university in Chile. A representative stratified random sampling of 675 students is carried out, whose strata are fundamentally the year admitted to university, from 2013 to 2017. All these necessary analyzes were performed with a confidence level of 95% and a margin of error of 4%. The selection within each strata is made with a simple random sample and proportional allocation.

The variables of interest for this study are presented in Table 1. The ORIGIN variable was included as a discrete variable, with each place of origin receiving an associated code.

The RStudio software is used to carry out descriptive and regression analyzes to analyze the relationship between the average grades obtained by students at the end of their first year of university and the rest of the academic and sociodemographic variables.

Table 1. Description of the variables

Variables	Definition	Possible values
AGE	Age of student when admitted to university	
GENDER	Male or female gender	1: female 0: male
SCHOOL	Type of school they come from: (Municipal - Private - Subsidized Private)	1: private 0: Municipal or subsidized
ORIGIN	Place of origin	
NOTES_COL	Average school grades	4.7 – 7.0
NEM	High school grades. The average between first and fourth grade, becoming a standard score through conversion tables, as assigned by the Department of Educational Evaluation, Measurement and Registration (DEMRE)	358 – 805
RANK	It is a selection factor that considers the academic performance of a school age student with respect to their educational context.	358 – 850
NOTES_U	Average student grades at the end of their first year at university.	1.0 – 7.0

Data analysis and results

Descriptive statistics

From the data analyzed in terms of distribution, 22.8% of students are female and 77.2% are male (data that is alligned with the engineering student population). Regarding the type of school they went to, 87.5% went to a municipal or subsidized private school while 12.5% to a private school. Table 2 presents relevant descriptive data with reference to the sample.

Table 2. Descriptive statistics

Variable	Average	ST
AGE	19	2.09
NOTES_COL	5.63	0.39
RANK	559.80	99.04
NOTES_U	4.39	1.15

Correlation analysis

The first step proposed is to review the degree of linear correlation existing between variables, for which the RStudio software is used, and with which the Pearson correlation matrix presented in Table 3 is calculated. As can be seen in the last column, the level of association between the variables that represents the average grade at the end of the first year (NOTES_U) versus the rest of the variables, there is a linear correlation as values are very close to 0%, the ideal being close to an absolute value of 1. However, there are statistically significant correlations between NOTES_U and the variables NOTES_COL, NEM and RANK (see Table 3).

Table 3. Pearson correlation matrix. N=675. Significance $p < 0.001$

	GENDER	ORIGIN	SCHOOL	NOTES_COL	NEM	RANK	AGE	NOTES_U
GENDER	1,000	0.007	-0.030	-0.152	-0.152	-0.129	0.019	-0.012
ORIGIN	0.007	1,000	0.004	-0.164	-0.165	-0.121	-0.058	-0.063
SCHOOL	-0.030	0.004	1,000	-0.091	-0.090	-0.110	-0.009	0.054
NOTES_COL	-0.152	-0.164	-0.091	1,000	1,000*	0.977*	-0.080	0.426*
NEM	-0.152	-0.165	-0.090	1,000*	1,000	0.977*	-0.078	0.424*
RANK	-0.129	-0.121	-0.110	0.977*	0.977*	1,000	-0.087	0.399*
AGE	0.019	-0.058	-0.009	-0.080	-0.078	-0.087	1,000	-0.050
NOTES_U	-0.012	-0.063	0.054	0.426*	0.424*	0.399*	-0.050	1,000

This correlation analysis between the variables involved is relevant and must be taken into account for subsequent regression analyses. It is important to highlight in the correlation matrix (Table 3) the high correlation seen between predictor variables, such as NOTES_COL, NEM and RANK. This may lead to multicollinearity problems when incorporating these variables in future models. This means that when explanatory variables in a model are highly correlated, it becomes very difficult to separate the partial effect of each of these variables on the dependent variable. The sample information incorporating these variables is almost the same as the rest of those correlated with it.

The most pernicious effect regarding the existence of a high degree of multicollinearity is to increase the variances of the estimated coefficients for the regression equation, consequently, the significance tests for the individual parameters are not reliable. In this sense, and to solve this issue, the most frequently used recommendation is to eliminate one or more predictor variables. This is also in line with the parsimony criterion, widely used in linear models.

Regression Analysis

Multiple linear regression analysis allows generating a linear model in which the value of a variable, called dependent or response, is determined from a set of predictor variables. In this case, the aim is to analyze the relationship between the variable NOTES_U, which will be the response variable, with the predictor variables SCHOOL, GENDER, ORIGIN, AGE, NOTES_COL, NEM and RANK. The formulation of a multiple regression model will allow to predict both the value of the variable NOTA_U, as well as to evaluate the influence of the variables SCHOOL, GENDER, ORIGIN, AGE, NOTES_COL, NEM and RANK on it. With this, as a first step, a multiple linear regression model is evaluated that considers all predictor variables for this study (Table 4).

It can be seen in Table 4 that total variability explained by the model is $R^2 = 0.2126$, a value theoretically far from a value of one, however this low variability does not mean that the model in itself is not very explanatory, even more so on seeing the strength of the p-value.
It is interesting to note that this first model has all predictor variables, there are three variables whose influence is not statistically significant in explaining the values of the NOTES_U variable. These are AGE, ORIGIN and RANK.

From the above, the next step is to apply the parsimony criterion. This refers to the fact that the best model is the one capable of explaining with greater precision the variability observed in the response variable using the least number of predictors, therefore, with fewer assumptions. To meet this criterion, the step-by-step method will be used using the forward strategy for selection, removing the variables AGE, ORIGIN and RANK

The result of this model can be seen in Table 5. The average grades at the end of the first year depend on an intercept value, the school of origin, grades earned at school, and the NEM.

Consequently, with 95% confidence, the best model available for this sample, which is representative of incoming engineering students between 2013 and 2017, is given by:
NOTES_U=-812,15 + 1,79*GENDER + 3,59*SCHOOL+275,38*NOTES_COL-1,28*NEM

Table 4. Multiple linear regression – Variables SCHOOL, GENDER, ORIGIN, AGE, NOTES_COL, NEM and RANK. N=675

	Estimate	ST	t value	Pr (>|t|)
INT	-7.595e+02	2,111e+02	-3,598	0.000345 ***
C_{GENDER}	1,904e+00	9.637e-01	1975	0.048628 *
C_{ORIGIN}	4.391e-05	1.373e-04	0.320	0.749200
C_{SCHOOL}	3,399e+00	1,219e+00	2,788	0.005454 **
C_{NOTES_COL}	2,567e+02	7,087e+01	3,622	0.000315 ***
C_{NEM}	-1.154e+00	3.507e-01	-3,291	0.001051 **
C_{RANK}	-2.794e-02	1985e-02	-1,407	0.159760
C_{AGE}	-1.507e-02	1932e-01	-0.078	0.937861

Meaning codes: 0 '***' ; 0.001 '**' ; 0.01 '*'
Residual standard error: 10.32 on 666 degrees of freedom
Multiple R-squared: 0.2126,   Adjusted R-squared: 0.2043
F-statistic: 25.68 on 7 and 666 FD, p-value: < 2.2e-16
NOTES_U= INT + C_{GENDER} * GENDER + C_{ORIGIN} * ORIGIN + C_{SCHOOL} * SCHOOL + C_{NOTES_COL} * NOTES_COL + C_{NEM} * NEM + C_{RANK} * RANK + C_{AGE} * AGE

It is important to note that despite the fact that the Ranking variable has a degree of linear association quite similar to other variables, such as grades from school and NEM, the fact that it is in turn collinear with these variables is already accounted for by the method, as its contribution does not improve upon it.

Table 5. Multiple linear regression – Variables SCHOOL, GENDER, NOTES_COL, and NEM. N=675

	Estimate	ST	t value	Pr (>|t|)
INT	-812.1456	205.5715	-3,951	8.62e-05 ***
C_{GENDER}	1.7876	0.9594	1,863	0.062861#
C_{SCHOOL}	3.5894	1.2101	2,966	0.003123 **
C_{NOTES_COL}	275.3771	69.0179	3,990	7.34e-05 ***
C_{NEM}	-1.2788	0.3364	-3,802	0.000157 ***

Meaning codes: 0 '***' ; 0.001 '**' ; 0.01 '*' ; 0.05 '#'
Residual standard error: 10.31 on 669 degrees of freedom
Multiple R-squared: 0.2102,   Adjusted R-squared: 0.2055
F-statistic: 44.52 on 4 and 669 FD, p-value: < 2.2e-16
NOTES_U= INT + C_{GENDER} * GENDER + C_{SCHOOL} * SCHOOL + C_{NOTES_COL} * NOTES_COL + C_{NEM} * NEM

Results Discussion

Once the representativeness of the sample was verified, the correlation between the variables was analyzed. It is possible to conclude that the hypotheses supported by ranking creators, which indicate that it is a good predictor of academic performance and that it is also related to the student's curricular progress, does not hold.

Indeed, the school ranking (RANK) showed, for the selected sample, to have a statistically significant correlation with the student's academic performance (NOTES_U). However, this correlation is moderate (r=0.399, p<2.2e-16) so it cannot be considered as being a good predictor. Furthermore, in the linear regression models presented, the school ranking (RANK) is not presented as a predictor variable of academic performance in the first year of university (NOTES_U).

Both from the correlation analysis (Table 3) and from the proposed regression models (Tables 4 and 5), for this sample the variables NOTES_COL and NEM are better predictors of academic performance in the first year of university. Both variables, due to their construction, represent the academic performance of students in secondary education and we can see this in the strong and statistically significant correlation that exists between them (r=0.977, p<0.001). This result is in line with another research carried out [6].

The school's ranking (RANK) is a selection factor that considers the academic performance of a student (NOTES_COL) with respect to their educational context. This means that RANK considers an external weighting that modulates NOTES_COL. However, the results obtained for the sample studied allow us to maintain that NOTES_COL is a good predictor of performance in the first year of university, while RANK is not. It is then possible to say that there are factors involved in building a school's ranking that must be further analyzed, as other authors have already indicated for these indicators built by the SUA [3].

This reflects a structural problem as would be the preparation of students to face university. Many decisions are made based on the categorizations made of schools. Categorizations that are responsible for the existence of the ranking as a measure of the student's contextual performance [13].

It is also important to clarify that the rebuttal of the hypotheses that this work proposes should not be seen as a value judgment on public education policies in Chile or the inclusion of the ranking as an element of evaluation for higher education admission. What is sought by highlighting that this hypothesis has been rebutted is to generate reflection from all parties involved in the creation and application of public policies in education, in particular it is sought that this reflection reaches the Chilean state and permeates into private universities.

The regression models showed that variables such as GENDER and SCHOOL were good predictors of university performance. Although the school ranking aims to incorporate a socio-demographic context, socio-demographic variables such as GENDER and SCHOOL were more associated with first year university performance than was the RANK variable. This shows, as

other research has shown in similar context [3], that it is necessary to include more socio-demographic variables in these models. This would allow a more in-depth study of the problem and offer a more equitable admission process to education.

Conclusions and future efforts

The aim of this research was to explore the relationship between the score assigned to the school ranking and the academic performance of students at a private university in Chile, using a statistical study of a representative sample.

An analysis of the sample data reveals that school ranking is not a variable that may predict first-year university student performance. However, variables related to academic performance by students in middle school, do indeed come up as good predictors.

Various investigations have addressed this issue with the intention of providing information on how to identify the academic potential of students entering university. However, it is also possible to visualize this study as a tool to identify vulnerable students with disadvantaged learning opportunities. As mentioned earlier, this situation invites reflection on these indicators built by the SUA and used by universities to determine student admission and the accompanying actions carried out with these students during their first year of college. In particular, specific measures providing students with levelling or contextualization opportunities in the educational system, in such a way that they may overcome their first-year academic burden and move forward to their subsequent years in college.

This study has limitations related to some sociodemographic variables, such as income level and parental training, or additional variables such as motivation, expectations, the school educational model, etc., that were not incorporated. A larger study is planned in the future using this information and analyzing in depth how each influences performance in first year at university. However, we can conclude that this study shows that it is necessary to rethink the role that for years has been assigned to school ranking as a predictor of university performance.

References

[1]   DEMRE, "Normas y Aspectos Importantes del Proceso de Admisión 2018", *DEMRE - Departamento de evaluación, medición y registro educacional.* https://demre.cl/publicaciones/2018/2018-17-06-01-cruch-normas-proceso [Accessed january 27, 2022].

[2]   Centros de Estudio - CEA, "Ingreso a la Universidad en Brasil, Chile y Argentina", Universidad de Belgrano, Buenos Aires, Argentina, Informe 50, jul. 2016. Accedido: 27 de enero de 2022. [Online]. Available: http://www.ub.edu.ar/centros-de-estudios-ub/centros-de-estudio-cea-informes

[3]   J. Gallego Mardones & N. Campos-Requena, "Can higher education admission be more equitable? Evidence supporting the inclusion of relative ranking in the

process", *Economic Research-Ekonomska Istraživanja*, vol. 34, n.o 1, pp. 2539-2554, jan. 2021, doi: 10.1080/1331677X.2020.1833745.

[4] J. A. Vilalta Alonso, M. J. Becerra Alonso, & R. Lau Fernández, "El éxito académico en el primer año de la carrera de Ingeniería Industrial y su vínculo con factores académicos previos", *PE*, vol. 13, n.o 1, pp. 42-57, mar. 2020, doi: 10.22235/pe.v13i1.1918.

[5] D. Edwards, H. Coates, & T. Friedman, "A survey of international practice in university admissions testing", *Higher Education Management and Policy*, vol. 24, n.o 1, pp. 1-18, apr. 2012, doi: 10.1787/hemp-24-5k9bdck3bkr8.

[6] G. Vergara-Díaz & H. Peredo López, "Relación del desempeño académico de estudiantes de primer año de universidad en Chile y los instrumentos de selección para su ingreso", *Rev. Educación*, vol. 41, n.o 2, p. 1, jun. 2017, doi: 10.15517/revedu.v41i2.21514.

[7] T. H. Bailey & L. J. Phillips, "The influence of motivation and adaptation on students' subjective well-being, meaning in life and academic performance", *Higher Education Research & Development*, vol. 35, n.o 2, pp. 201-216, march. 2016, doi: 10.1080/07294360.2015.1087474.

[8] Bernasconi & F. Rojas, "Informe sobre la educación superior en Chile: 1980-2003", Instituto Internacional de la UNESCO para la Educación Superior en América Latina y el Caribe , Informe IES/2003/ED/PI/55, ago. 2003. Access: january 27, 2022. [Online]. Available: https://unesdoc.unesco.org/ark:/48223/pf0000140395

[9] Rodríguez Garcés & G. Padilla Fuentes, "Trayectoria Escolar y Ranking: valoraciones y estrategias institucionales en el nuevo escenario de selección universitaria", *Estud. pedagóg.,* vol. 42, n.o 3, pp. 313-326, 2016, doi: 10.4067/S0718-07052016000400017.

[10] F. Kri, F. Gil, M. González, & C. Lamatta, "Ranking de Notas como predictor de éxito en la educación superior. Caso de estudio USACH," Universidad de Santiago de Chile, Santiago, Tech Memo. Consejo Nacional de Educación CNED, dec. 2013.

[11] D. Contreras, S. Gallegos, & F. Meneses, "Determinantes de desempeño universitario: ¿importa la habilidad relativa?", *Cal E*du, n.o 30, p. 18, apr. 2009, doi: 10.31619/caledu.n30.172.

[12] F. Gil, R. Paredes & I. Sánchez, *"El ranking de las notas: inclusión con excelencia",* Centro de políticas públicas de la UC, vol. 8, nº 60, pp. 1-19, may. 2013.

[13] C. Pérez, L. Ortiz & P. Parra, "Prueba de Selección Universitaria, rendimiento en enseñanza media y variables cognitivo-actitudinales de alumnos de Medicina", *Rev Educ Cienc Salud*, vol. 8, nº 2, pp. 120-127, 2011.

[14] F. Gil & C. Muñoz, "La incorporación del ranking de notas en el sistema de admisión universitaria," in *Contexto, experiencias e investigaciones sobre los Programas Propedéuticos en Chile*, C. Román Pérez, Ed. Santiago: Andros impresores, 2014, pp 29-52.