Improving the Access to Higher Education for the Poor: Lessons from a Special Admission Program in Chile

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Abstract

This paper presents a higher education special access program for students from disadvantaged socioeconomic backgrounds, custom-designed by the author for one of the leading Chilean universities, and implemented as a pilot during the 2013 and 2014 admission periods. A non-experimental comparison of the academic performance of special and ordinary admission students after enrollment finds evidence that, consistent with Arcidiacono et al (2011), although on average special admission students have comparable final grades than their ordinary admission peers, they tend to perform comparatively worse in "hard" subjects (i.e. those with a strong mathematical component). However, although special admission students seem more likely to decide to withdraw earlier, no significant differences in voluntary withdrawal or dismissal rates are observed between the latter and their ordinary admission peers. Moreover, an initial gap in GPA between special and ordinary admission students is closed by the end of the third semester of enrollment. All this suggests that, with some nuances, students from disadvantaged socioeconomic backgrounds can successfully catch up with their peers when provided with adequate support, and that special admission programs can therefore be an effective tool to improve the access to higher education. Nonetheless, the fact that the program was undersubscribed suggests that, apart from potential information diffusion problems, the minimum requirements set forth for special admission may have been too stringent, and/or that the demand for special admission among the targeted student population may not be as large as predicted.

The views expressed in this paper are solely those of its author, and do not necessarily represent the views of, and should not be attributed to, any other individual or institution.

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1. Introduction

In the case of Chile, although there have been numerous advances with respect to the access to higher education, the consensus is that there is still a lot of room for improvement in many dimensions. In particular, the economic development experienced by the country calls for a comparison with countries with a similar per-capita income, which have much more resources devoted to higher education (see for example Comisión de Financiamiento Estudiantil para la Educación Superior, 2012; OECD, 2011; or Sánchez, 2011). Also, many of the students from disadvantaged socioeconomic backgrounds, for which the net coverage[1] of higher education has increased more noticeably, have very likely not being admitted on "quality" universities. This means that their education may not have necessarily have translated into a higher income, even if they still have incurred a considerable cost to fund it. Taking all this into account, it is not surprising that the access to higher education is currently one of the most pressing issues for Chilean society, and the main reason behind the notorious student protests which have taken place there during the last years (see for example Loofbourow, 2013).

In view of the above, the Faculty of Economic and Administrative Sciences ("Facultad de Ciencias Económicas y Administrativas") of the Pontificia Universidad Católica de Chile decided to contribute to the national effort to improve the access to higher education, devoting additional resources to run a two-year pilot of a special admission program, with the goal of facilitating the access to its Commercial Engineering degree to students from disadvantaged backgrounds. This program, called "Talento + Inclusión" (*Talent + Integration*), aimed to identify and attract talented students from public and subsidized secondary schools who could succeed in higher education if provided with adequate support, but who may be screened out in the ordinary admission process. In order to do this, alternative admission criteria better tailored to the context of this type of students were set.

A non-experimental comparison of the academic performance of special and ordinary admission students finds that, although special admission students on average have comparable final grades to their ordinary admission peers, they tend to perform comparatively worse in "hard" subjects (i.e. those with a stronger mathematical component). This is consistent with the information provided by the School of Engineering about the performance of students admitted to the Engineering degree via their own special access program, and with the findings of Arcidiacono et al (2011) in their study of the time path of racial differences in GPA and major choice at Duke University. Also, no significant differences in voluntary withdrawal or dismissal are observed between special and ordinary admission students, although special admission students seem more likely to decide to withdraw earlier in the program (suggesting potential non-academic adaptation problems).

[1] The net coverage of higher education is defined as the percentage of the population between 18 and 24 years old enrolled in higher education.

Finally, an initial gap in GPA between special and ordinary admission students is closed by the end of the third semester of enrollment, and no special admission student was dismissed during the period of study.[2]

All the above suggests that, at the time of enrollment, the special admission students featured in this study had a disadvantage in academic performance terms (relative to their ordinary admission peers). Also, it seems that they may be more likely to decide to abandon their studies early. However, it seems that special admission students are in any case very unlikely to be dismissed due to poor academic performance, and that they actually catch up with their ordinary admission peers in terms of GPA as early as after three semesters of enrollment in the degree. This suggests that, with some nuances, students from disadvantaged socioeconomic backgrounds can successfully catch up with their peers when provided with adequate support, and that special admission programs can therefore be an effective tool to improve the access to higher education. However, it also seems that it would be advisable to further increase the additional support provided to special admission students (of course, this support could also be expanded to ordinary admission students, in order to also reduce their withdrawal and dismissal rates). This would mean both addressing adaptation problems to reduce the likelihood of withdrawal, as well as reducing the academic gap with more remedial and tutoring resources (particularly regarding mathematical ability).

Finally, the fact that the program was undersubscribed suggests that, apart from potential information diffusion problems, the minimum requirements set forth for special admission may have been too stringent, and/or that the demand for special admission among the targeted student population may not be as large as predicted.

The rest of this paper is organized as follows: Section 2 presents its motivation and background; Section 3 describes the special access program in detail; Section 4 presents the main findings; Section 5 concludes.[3]

2. Background

Facilitating the access to higher education for talented students from disadvantaged socioeconomic backgrounds is a challenge for any educational system. This is attributable to financial market imperfections which difficult the access to funding for higher education, but also to other non-financial barriers. Also, it is worth noting that this challenge is similar to that of improving the access to primary and secondary

[2] Note that catch-up in terms of GPA may be due to pure academic improvement, but also due to differences in subject choice, as observed by Arcidiacono et al (2011).

[3] As mentioned above, Appendix A discusses the original experimental design of the special admission program, while Appendix B presents the results of the experimental comparison of information dissemination methods during the program awareness campaign.

education, but that there are some differences which aggravate the problem in the case of higher education. For example, the cost of higher education is generally much higher than that of primary and secondary education, therefore highlighting access to funding problems. Also, the fact that the access to higher education is generally not universal means that admission tests are used. These may constitute a barrier to access for students from disadvantaged socioeconomic backgrounds, who many times receive a primary/secondary education of lower quality, and therefore may have significant knowledge gaps and/or may not be able to afford test preparation courses. Finally, both the higher degree of specialization in higher education, as well as its stricter academic requirements, tend to highlight vocational and adaptation problems which cause students to drop out or be dismissed.

In the case of Chile, although there have been numerous advances in recent years, it seems that there is still a lot of room to improve the access to higher education along many dimensions. This is particularly evident when taking into account the economic development experienced by Chile, which calls for a comparison with countries with a similar per-capita income, which generally devote much more resources to facilitate the access to higher education (see Sánchez, 2011, for a pre-2014 reform discussion of the challenges facing the higher education system in Chile). For example, although the net coverage[4] of higher education has increased substantially in the last two decades, in 2012 it was still only 36.3 % on average. That is already substantially below the OECD average of 59 % (Chile joined the Organisation for Economic Co-operation and Development in 2010), but for the lowest decile of the income distribution the figure goes down to 16.4 % (OECD, 2011; Comisión de Financiamiento Estudiantil para la Educación Superior, 2012). Also, primary and secondary students from the lower end of the income distribution usually attend public or subsidized secondary schools, which generally offer a lower educational quality than their private counterparts (which are attended by the majority of students from the top of the income distribution). Only 10 % and 13 % of graduates from public and subsidized secondary schools are respectively admitted to "traditional" universities (i.e. those which are members of the the "Consejo de Rectores de las Universidades Chilenas" - CRUCH, or *Council of Rectors of Chilean Universities*-, generally considered to offer an education of higher quality). However, that figure goes up to 31 % in the case of graduates from private secondary schools, which means that there is a very high correlation between socioeconomic status and the likelihood of attending a higher education institution of high quality. Moreover, the percentage of students who complete their studies is very low: 51 % for university students, 48 % for technical education students, and 37 % for professional education students. [5] Furthermore, higher education degrees on average last more than 13 semesters (i.e. 6.5 years), compared to a mean degree duration of about 8 semesters (i.e. 4 years) in the OECD. Finally, there is a

[4] The net coverage of higher education is defined as the percentage of the population between 18 and 24 years old enrolled in higher education.

[5] Note that "technical educations students" are defined as those attending a "Centro de Formación Técnica" (*Technical Education Center*), while "professional education students" are defined as those enrolled in a "Instituto Profesional" (*Professional Institute*). Also, it is worth noting that the figures provided constitute an upper bound for the degree completion percentage, as they include those students who are still enrolled but have not graduated.

large variance in the income distribution of students, even among those graduating from the same degree (the ratio of the highest to the lowest income can usually be 3:1, or in some cases even reach 4:1).

All the above suggests that many of the students from disadvantaged socioeconomic backgrounds, for which the net coverage of higher education has increased more pronouncedly in recent years, have very likely not being admitted to high quality universities. Therefore, their education may not have necessarily translated into a higher income, even if they have still incurred large expenses to fund it. Therefore, it seems that the net coverage of higher education may be a misleading measure of the success of the Chilean higher education system, since it ignores the quality dimension and other nuances of the funding and admission system. However, it is also worth noting that the higher net coverage of higher education in other OECD countries is not necessarily efficient, either, as it might be the result of indiscriminate higher education subsidies which do not take into account income or aptitude criteria (e.g. although the system is currently being reformed, in 2012 public higher education in Spain was 85 % subsidized for all students, irrespective of their academic performance or income level.. Taking all this into account, it is not surprising that the access to higher education is one of the most pressing issues for Chilean society, and the main reason behind the notorious student protests which have taken place there during the last years (see for example Loofbourow, 2013). However, it is worth noting that this is an issue which is considered key in almost any other country, including the United States (see for example Dickert-Conlin and Rubenstein, 2007). Therefore, the findings of this paper are relevant for the overall academic debate on how to improve the access to higher education.

From an academic point of view, there are several possible explanations (which are not necessarily mutually exclusive) for the current state of education in Chile in general, and in the Pontificia Universidad Católica de Chile and its Commercial Engineering degree in particular. For example, the financing model of public schools (which are administered by the municipalities, and depend on their resources) might not be appropriate, and may be causing widespread underfunding and quality problems in this type of secondary education institutions (which for many are the only free primary and secondary schooling options available). While subsidized schools also receive government funds to help them operate, they charge fees to students, and the quality of education provided can differ considerably from one institution to another.[6] Also, there might be motivational and incentive issues at play, which may be impacting the performance of both teachers and students (see for example: Duflo et al, 2012, who experimentally evaluate the impact of an incentive scheme intended to reduce teacher absenteeism in India; Glewwe et al, 2010, who analyze the randomized trial of a program which rewarded Kenyan primary school teachers based on student test scores; or Garibaldi et al, 2007, who using quasi-experimental methodology study the relationship between tuition paid and the time required to complete a degree at Bocconi University in Italy). Moreover, there may be incomplete

[6]Note that one of the measures announced by President Bachelet after assuming her office in early 2014 has been the prospective implementation of policies intended to break the link between municipal resources and public school funding. Also, another of her proposed reforms proposed would eliminate fees for students attending subsidized schools.

information problems, or other structural issues which might be affecting the educational decision-making of parents, students and teachers (see for example: Dinkelman and Martínez, 2011, who experimentally evaluate the impact of providing information about financial aid to secondary school students on higher education enrollment; Hoxby and Turner, 2012, who also look at the same issue in the United States using a randomized control trial; or Pallais (2013), who finds that a small change in the cost of sending standardized test scores to colleges in the U.S. resulted in low-income test takers attending more selective colleges). Furthermore, the availability and characteristics of financial aid may be preventing the access to higher education for some students, and/or impacting their academic performance (see for example: Rothstein, 2003, who studies the impact of employment during high school on grade point averages; or Williamson and Sánchez, 2009, who discuss the necessary basic features of a potential government-funded public higher education system in Chile). Also, the characteristics of the higher education admission tests in use may be biasing against students from disadvantaged backgrounds (see for example Banerjee et al, 2012, who experimentally evaluate the impact of providing access to higher education admission test preparation courses for secondary school students). Finally, even those students who surmount all the above mentioned potential barriers may be subject to adaptation problems once they enroll in higher education (see for example: Arcidiacono et al, 2011, who analyze the time path of racial differences in GPA and major choice at Duke University in the United States, finding that African-American students have a comparable GPA to their peers, but self-select into "soft" elective courses with a smaller mathematical component; or Angrist et al, 2006, who using a randomized experiment evaluate the impact on student academic performance of offering peer advise and organized study groups, and/or offering merit-based scholarships according to first year grades). However, although there are some studies which explore the above mentioned issues in the context of higher education, the majority of the existing research focuses on primary and secondary schooling. Therefore, there is ample scope to improve our understanding of which policies are more effective to facilitate the access to higher education for students from disadvantaged socioeconomic backgrounds.

In the particular case of the Pontificia Universidad Católica de Chile, in 2011 71.7% of students admitted to the university belonged to the top quintile of the income distribution, while only 3.4% belonged to the lowest quintile. This could be simply a reflection of intrinsic student characteristics, but it could potentially also be due to a bias in the admission process (e.g. if the standardized admission test used in the centralized admission process in Chile puts more emphasis on knowledge than on skills, this may be holding back talented students from public and secondary schools, who may present significant training gaps attributable to the lower quality of their education). However, with the right support some students might be able to catch up with (and perhaps even surpass) the academic performance of their private secondary schools peers.[7] To

[7] It is worth noting that, *a priori*, it cannot neither be ruled out that some students from public and subsidized secondary schools may have had such an incomplete primary and secondary education that, while they are comparably talented, their knowledge and formative gaps are so important that they will not be able to overcome them in a reasonable time frame (even with additional support resources).

leave this talented students out just because they happened to be born in a less favorable environment does not only go against the equality of opportunity principle, but constitutes a potentially very large economic inefficiency by not fully realizing the human capital potential the country.

In any case, the Pontificia Universidad Católica de Chile has demonstrated a keen interest in improving the current situation, and there are already some initiatives in place in several areas. For example, Preuniversitario UC is experimentally evaluating the impact of providing preparation aid for the standardized university admission test (the PSU -"Prueba de Selección Universitaria", or *University Selection Test*-) to students from disadvantaged socioeconomic backgrounds who could otherwise not afford it (see Banerjee et al, 2012). Also, the School of Engineering has implemented the "Talento + Inclusión" *(* Talent + Integration) special access program. This focuses on exploring new admission criteria which might be less biased against students from disadvantaged socioeconomic backgrounds, but it also incorporates features intended to address potential adaptation, motivation and expectation problems of this type of students. In particular, it consists of a separate special application process for students ranked in the top 5 % of their secondary school (although the special application process is also open to students enrolled in the Penta UC program -which targets talented secondary school students from disadvantaged backgrounds-, who have their own special quota). This process is in addition to the ordinary admission process, and provides more information about the students, including another standardized test score (this corresponds to the TEDIB -"Test Estandarizado de Destrezas Intelectuales de Berlín", or *Berlin Standardized Test of Intellectual Skills*-, a test based on the *Berlin Model of Intelligence Structure*, or *BIS*; for further information see Rosas, 1990, and Jäger, 1984). All the information gathered is used to compute the predicted undergraduate GPA of each student, according to a purpose-fitted statistical model. This is the criterion to determine admission via the special program, and all admitted students receive additional support prior to enrolling on a summer camp, as well as support courses during the academic year (for illustration purposes, in 2010 there were 126 candidates who satisfied all the special access program prerequisites, of whom 44 were admitted to the Engineering degree).

According to the School of Engineering, some students admitted via its special access program attended public and subsidized secondary schools with a very limited (or altogether non-existent) admission record to the Pontificia Universidad Católica de Chile. Also, in general the grades of special admission students were found to be comparable to that of students admitted via the ordinary application process. However, according to the School there seems to be a more noticeable grade gap in "hard" subjects (i.e. those with a larger mathematical component), than in "soft" ones.[8] This would be consistent with the findings of Arcidiacono et al (2011), who in their above mentioned analysis of the time path of racial differences in GPA and major choice at Duke University find a substitution effect between "soft" and "hard" subjects among students with a primary and secondary education of lower quality. In any case, it is worth noting that

[8]Note that the School of Engineering provided this information for policy analysis purposes, but did not actually disclose the detailed data; therefore, these claims could not be independently verified.

the above described facts were obtained ex-post through an in-house evaluation of the program performed by the School of Engineering, since the design of this special access program did not incorporate ex-ante evaluation features (experimental or otherwise). This raises some robustness concerns, and leaves room to try to better understand the causal mechanisms involved in this type of programs. For example, according to the documentation provided by the School, the ex-post fit of the statistical model used to generate the predicted undergraduate GPA of candidates (which is used ex-ante as the criterion to determine admission into the program) does not seem to be particularly good. Therefore, it is plausible to think that other characteristics of the program (different from the admission criterion), may be driving the above described results.

3. Special Admission Program

In view of all the above, the Faculty of Economic and Administrative Sciences ("Facultad de Ciencias Económicas y Administrativas") of the Pontificia Universidad Católica de Chile decided to contribute to the national effort to improve the access to higher education. In order to do so, it devoted additional resources to run a two-year pilot of a special admission program, which was intended to facilitate the access to its Commercial Engineering degree for students from disadvantaged backgrounds.[9] In particular, the two-year pilot had as its ultimate goal to identify and attract talented students from public and subsidized secondary schools who could successfully complete the degree, but who may be left out by the system in use in the ordinary admission process. In order to do this, alternative admission criteria, which were judged to be better tailored to the context of this type of students, were set. Also, additional resources were devoted to publicize the existence of the program and the availability of financial aid, and existing support programs were reviewed to identify potential opportunities for improvement. The program thus featured three distinct phases: (a) an awareness campaign, intended to disseminate information about the program among target secondary schools; (b) a new special admission process for the Commercial Engineering degree at the university, intended to bypass some of the perceived barriers to the access of students from disadvantaged backgrounds; and (c) additional support provided after enrollment to the students admitted via the program.

In particular, the new special admission process entailed the opening of twenty additional vacancies in each of the 2013 and 2014 academic years. In order to be eligible to apply via the program, students must: (i) have attended a public or subsidized secondary school; (ii) rank in the top 5 % among their secondary school peers; and (iii) belong to the lowest four quintiles of the income distribution (it is worth noting that these requirements might be considered to be quite restrictive, but the Faculty was concerned with reducing the negative implications arising from the admission of students who would not be able to keep up with the

[9] After a preliminary analysis (see Díez-Amigo, 2011, and Díez-Amigo, 2012), a final proposal was drafted and subsequently implemented during the 2013 and 2014 admission periods (see Díez-Amigo, 2012).

demanding academic standards at the institution; also, students in the top 10 % of their secondary school class qualified to receive a government scholarship ("Beca de Excelencia Académica", or *Academic Excellence Scholarship*), so that the second criterion described above also helped to ease the financial burden of the program; similarly, students from the lowest three quintiles of the income distribution with a PSU score greater than 550 points qualified to receive a university partial scholarship, so that the third criterion again helped to ease the funding of the program). Moreover, after the initial application all candidates needed to satisfy two additional minimum eligibility criteria: (iv) pass the special admission tests; and (v) obtain more than 650 points in the ordinary admission test (note that this can be either the average score in the standardized admission test (PSU), or the weighted ordinary admission score).[10] Therefore, special admission students only needed to obtain the above mentioned minimum score in the standardized admission test, while for ordinary admission candidates this was the criterion determining admission into the program (i.e. ordinary vacancies were filled by descending score in the standardized admission test).

It is worth noting that once enrolled these special admission students had additional academic support (and access to full financial aid resources), but they were nonetheless subsequently subject to the same academic criteria as their ordinary admission peers. This was so on purpose, so that the meritocratic principles of the university and the Faculty were upheld, and to avoid the possibility that special admission students were stigmatized. Also, additional vacancies were created for the special admission program, by expanding the number of students admitted to the degree, and keeping the number of ordinary admission vacancies constant. Therefore, no ordinary admission student was left out by the implementation of the special admission program (in principle it could be argued that ordinary admission students may be worse off because of the increased enrollment in the degree, but resources were also expanded accordingly, and in any case the number of special admission vacancies created corresponds to less than 10 % of total vacancies).

Also, it is worth noting that, while this was not the first program of its kind in the country (or even in the university), it was the first to try to incorporate experimental evaluation methodology in its design (which was conceived by the author of this study). In particular, whenever feasible, experimental features were included in the original design, using random assignment to address non-experimental robustness concerns (e.g. self-selection). This was intended to facilitate the impact evaluation of the program, in order to not only ensure the efficient use of resources, but to also inform the decision-making processes and the policy debate at both the university and national levels. Unfortunately, as discussed on Appendix A, the majority of the intended experiments could unfortunately not be carried out, either due to the lack of excess demand for admission to the program, or because it was not considered ethical to offer differential additional academic support to admitted students. In the end, the only randomized control trial which could be carried out was

[10] A personal interview was initially included as a sixth criterion, but it was later discarded due to time and resource limitations. However, it would likely have been very informative, and provided very detailed data about the candidates. This is particularly important given the very small sample size available in the experiment.

the experimental comparison of information dissemination methods during the program awareness campaign. However, since its results are not directly related to student performance, they are presented separately on Appendix B.

4. Findings

4.1. Admissions

When the application period for special admission for academic year 2013 closed in mid-November 2012, a total of 240 secondary school students had initiated an application. However, only 103 had completed it, and after further screening 56 students were found eligible for the program. These subsequently took the special admission tests, in addition to the standard admission ones. A total of 48 students passed the special admission tests, but after taking into account the minimum standard admission test score criterion[11] only 25 students satisfied all the minimum requirements set forth for the special access program. In the end, 10 students enrolled in the Commercial Engineering degree in the 2013 academic year via the special access program, filling 50 % of the 20 available vacancies. The figures for the 2014 are proportional to the above, although the overall interest in the special access program increased. In particular, 118 students took the special admission test, and 18 enrolled in the Commercial Engineering degree through the special access program, filling 90 % of the 20 available vacancies (note that one student delayed enrollment because of *force majeure*.

In view of the above, it first of all seems that the information diffusion and program awareness campaign for admission year 2013 was not successful, since it did not generate enough demand to have enough candidates fill all the vacancies created for the program, nor to allow for the use experimental evaluation methodology. Therefore, it seems that in the future it may be advisable to implement a larger and earlier information diffusion campaign to disseminate information about the special access program. In particular, given that the large majority of applicants to the program originated from the Santiago Metropolitan Region, it seems that in the future it would be advisable to extend the program awareness campaign efforts to other areas of the country.

However, it also seems that the minimum requirements set forth for special admission may perhaps have been too stringent, and/or that the demand for special admission among the targeted student population

[11] Note that, as already mentioned, special admission students only needed to obtain a 650 minimum score in the standardized admission test, while for ordinary admission candidates this was the criterion determining admission into the program, i.e. ordinary vacancies were filled by descending score in the standardized admission test.

may not be as large as predicted. In particular, for the 2013 academic year the minimum standard admission score requirement of 650 points resulted in the disqualification of 23 candidates out of the 48 who have passed the special admission test (i.e. a 48 % disqualification rate). This seems to be too high, particularly taking into account that it resulted on half of the special admission vacancies not being filled, suggesting that the standard admission score required may have been too high. Therefore, it seems that in the future it may be advisable to rely more on the results of the additional tests required for special admission, further relaxing the requirement of obtaining a minimum score in the ordinary admission test (see Díez-Amigo, 2014, for a detailed discussion of the characteristics and impact of the mathematical ability test used as one of the additional criterion for special admission).

4.2. Academic Performance

As it can be observed on Figure I.A, the performance of students admitted to the Commercial Engineering degree at the Pontificia Universidad Católica de Chile via the special access program in 2013 varied across subjects. In particular, it seems that on average special admission students had comparable grades to their ordinary admission peers in "soft" first semester compulsory subjects (i.e. "Accounting I" and "Horizons and Challenges in Business Management").[12] However, they fell behind in first semester compulsory "hard" courses, which featured a greater mathematical component (i.e. "Algebra", "Calculus I" and "Introductory Microeconomics"). This is consistent with the the evidence found by Arcidiacono et al (2011) in their study of the time path of racial differences in GPA and major choice at Duke University, and also with the information provided by the School of Engineering about the performance of students admitted to the Engineering degree via their own special access program. However, note that according to II, these differences are not statistically significant for any of the first semester compulsory courses in 2013. Once again, this is likely due to the reduced number of special admission students not providing enough statistical power to observe differences of this magnitude (the number of special admission students entering the degree in the 2013 and 2014 academic years is 10 and 17, respectively, and the number of ordinary admission students is about 260 in both years; however, some students did not take certain courses, for example because the corresponding credits were recognized by the university, or because of early withdrawal).

As it can be observed on Figure I.B, the above described differences in average first semester final grades

[12] Note that "special admission student" means a student who applied and was admitted via the special admission program "Talento + Inclusión" (Talent + Integration), irrespective of whether ex-post s/he may have been entitled to be admitted via ordinary admission, e.g. because of having obtained a standard admission test score higher than the cut-off required for that academic year. Also, it is worth noting that for robustness purposes only first semester compulsory courses are included in the comparison, because students who fail the first course will not be eligible to take further courses in the sequence (e.g. students who fail Calculus I in the first semester are not eligible to take Calculus II in the second one), nor do all students take the same elective courses.

are accentuated in the case of students entering the Commercial Engineering degree in academic year 2014. In particular, on average special admission students had comparable final grades to their ordinary admission peers in only one of the two "soft" first semester compulsory subjects ("Horizons and Challenges in Business Management"), but fell behind in the other ("Accounting I"). The latter was also the case on all the "hard" courses, featuring a greater mathematical component (i.e. "Algebra", "Calculus I" and "Introductory Microeconomics"). As before, this is consistent with with the findings of Arcidiacono et al (2011) and the information provided by the School of Engineering about the performance of students admitted via their own special access program. However, note that according to Table II, in this case the observed differences are indeed statistically significant in the case of "Algebra", "Calculus I" and "Introductory Microeconomics". This suggests that, although there may be some differences across cohorts, the lack of a significant difference in average final grades in 2013 is indeed very likely attributable to the more reduced number of special admission students that academic year, and its associated limited statistical power. In particular, given the available sample size, power calculations suggest that the minimum detectable effect sizes for "Algebra", "Calculus I", "Accounting I", "Horizons and Challenges in Business Management" and "Introductory Microcoenomics" are around 0.3, 0.4, 0.34, 0.16 and 0.29, respectively (fixing the confidence and power levels at 90 % and 80 %, as is standard). This is, given the sample size in this experiment, and fixing the probability of a false positive at 10 %, differences in average final grades smaller than the above would not be observed with a probability of 20 % or less. Since this paper finds that any observed differences larger that the above mentioned minimum detectable effect sizes are significant, this suggests that many of the larger differences which are found not to be significant are likely to be so, but just cannot be detected with the available sample size (this is particularly true for the large differences in average final grades observed in "hard" courses).

Note, however, that the above notwithstanding the "true" coefficients for the 2013 and 2014 cohorts need not necessarily be equal, for example because of differences in cohort characteristics between 2013 and 2014. Also, it is worth noting that in the Chilean education system grades range from 1 (lowest) to 7 (highest), with 4 usually being the lowest passing grade. According to Figure I.A, this means that in 2013 ordinary admission students on average passed all first semester compulsory subjects, while special admission students on average failed "Calculus I" with an average final grade of 3.8. Also, it means that according to Figure I.B, in 2014 ordinary admission students on average passed all first semester compulsory subjects, while special admission students on average failed "Algebra", "Calculus I" and "Accounting I", with average final grades of 3.90, 3.81 and 3.93, respectively. Also, in both 2013 and 2014 it seems that the variance of average final grades in "hard" courses may generally be higher for special admission students than for their ordinary admission peers.

With respect to academic situation, as it can be observed on Figure III, at the end of the first semester (March-July) of academic year 2014 (i.e. after three semesters enrolled in the Commercial Engineering degree) only

one special admission student admitted in 2013 had withdrawn (10 %). This stands in stark contrast to the total of eighteen ordinary admission students admitted in 2013 who had abandoned their studies by that date (6.9 %). Also, by that date two ordinary admission students admitted in 2013 had been dismissed due to poor academic performance (0.75 %), and another two were not enrolled for other miscellaneous reasons (0.75 %), while all nine special admission students who had not withdrawn from the program were still enrolled in it. As for students admitted in 2014, at the end of the first semester (March-July) of academic year 2014 (i.e. after one semester enrolled in the Commercial Engineering degree) two special admission students (11.8 %) and three ordinary admission (1.2 %) ones had withdrawn, while all other students were still enrolled in the degree (note that in the Commercial Engineering degree it is generally not possible to be dismissed due to poor academic performance until the second semester of the first academic year, so that the number of students admitted in 2014 and dismissed at the end of the first semester of academic year 2014 is zero by definition). However, as it can be observed on Table IV, none of the above mentioned differences is statistically significant. As in previous cases, this may be due to the reduced number of special admission students not allowing for enough statistical power to observe differences of the appropriate magnitude. In particular, given the available sample size, power calculations suggest that the minimum detectable effect sizes for GPA, enrollment likelihood, withdrawal likelihood, dismissal likelihood and other non-enrollment likelihood in 2013 are around 0.25, 3.3 %, 2.8 %, and 0.3 %, respectively (with confidence and power levels fixed at 90 % and 80 %, as usual). For 2014 the corresponding minimum detectable effect sizes for GPA, enrollment likelihood, withdrawal likelihood, and dismissal likelihood sizes are 0.25, 0.5 % and 0.5 %, respectively (note that in 2014 it is not possible to compare dismissal and non-enrollment for other reasons, since its incidence is exactly the same in both the special and ordinary admission student subpopulations). This is, given the sample size in this experiment, and fixing the probability of a false positive at 10 %, differences in average final grades smaller than the above would not be observed with a probability of 20 % or less. Since in the case of the likelihood of enrollment/withdrawal/dismissal the thresholds are quite low, it seems that either there indeed are no significant differences with respect to those outcomes of interest between special and ordinary admission students, or that if they exist they are very small (i.e. smaller than the respective thresholds mentioned above). With respect to GPA, as it can be observed on Table IV, as of July 2014 (after one semester enrolled in the degree) special admission students admitted in 2014 had significantly lower grades than their ordinary admission peers, while special admission students admitted in 2013 had no statistically significantly different grades from their ordinary admission peers (after three semesters enrolled in the degree).

As it can be observed above, student withdrawal is not a rare event, either in the special admission and ordinary admission subpopulations. However, it seems that special admission students may be more likely to decide to withdraw earlier in the program than ordinary admission students, suggesting potential non-academic adaptation problems. Also, although once again these figures need to be taken with a grain of

salt due to the relatively small sample size (note that percentage figures can be particularly misleading given the very large difference of size between the ordinary and special admission subpopulations), it seems that special admission students are very unlikely to be dismissed, and have caught up with their ordinary admission peers by the end of their third semester enrolled in the degree[13]. However, they may decide to abandon their studies earlier, and may have lower grades than their peers to start with.

All the above suggests that, while special admission students in this study start with a disadvantage in academic performance terms, they are very unlikely to be dismissed due to poor academic performance. Also, they catch up with their ordinary admission peers in terms of GPA rather soon (after three semesters). This seems to support the case for this and other special admission programs, but also suggests that improvements could be made. In particular, it seems that it would be advisable to increase the additional support provided to special admission students (of course, this support could also be expanded to ordinary admission students to reduced their withdrawal and dismissal rates). This would mean both addressing adaptation problems to reduce the likelihood of withdrawal, and reducing the academic gap with more remedial and tutoring resources (particularly regarding mathematical ability).

5. Conclusion

This paper presents a higher education special access program for students from disadvantaged socioeconomic backgrounds, custom-designed by the author for one of the leading Chilean universities, and implemented as a pilot during the 2013 and 2014 admission periods. Although this was not the first program of its kind in the country (or even in the university), it was the first which tried to incorporate experimental evaluation methodology to its design. Unfortunately, as discussed on Appendix A, only one of the planned experiments could actually be implemented. Since its results are not directly related to student performance, but rather to the effectiveness of dissemination information methods tested during the program awareness campaign, they are presented separately on Appendix B.

In any case, although the original experimental design of the special admission process could not be implemented, a non-experimental comparison of the academic performance of special and ordinary admission students was carried out in its place. Evidence is found suggesting that, although special admission students on average have comparable final grades to their ordinary admission peers, they tend to perform comparatively worse in "hard" subjects (i.e. those with a stronger mathematical component). This is consistent with the information provided by the School of Engineering about the performance of students admitted to the

[13]Note that catch-up in terms of GPA may be due to pure academic improvement, but also due to differences in elective selection, as found by Arcidiacono et al (2011).

Engineering degree via their own special access program, and with the findings of Arcidiacono et al (2011) in their study of the time path of racial differences in GPA and major choice at Duke University. Also, no significant differences in voluntary withdrawal or dismissal are observed between special and ordinary admission students, although special admission students seem more likely to decide to withdraw earlier in the program (suggesting potential non-academic adaptation problems). Finally, an initial gap in GPA between special and ordinary admission students is closed by the end of the third semester of enrollment, and no special admission student was dismissed during the period of study.

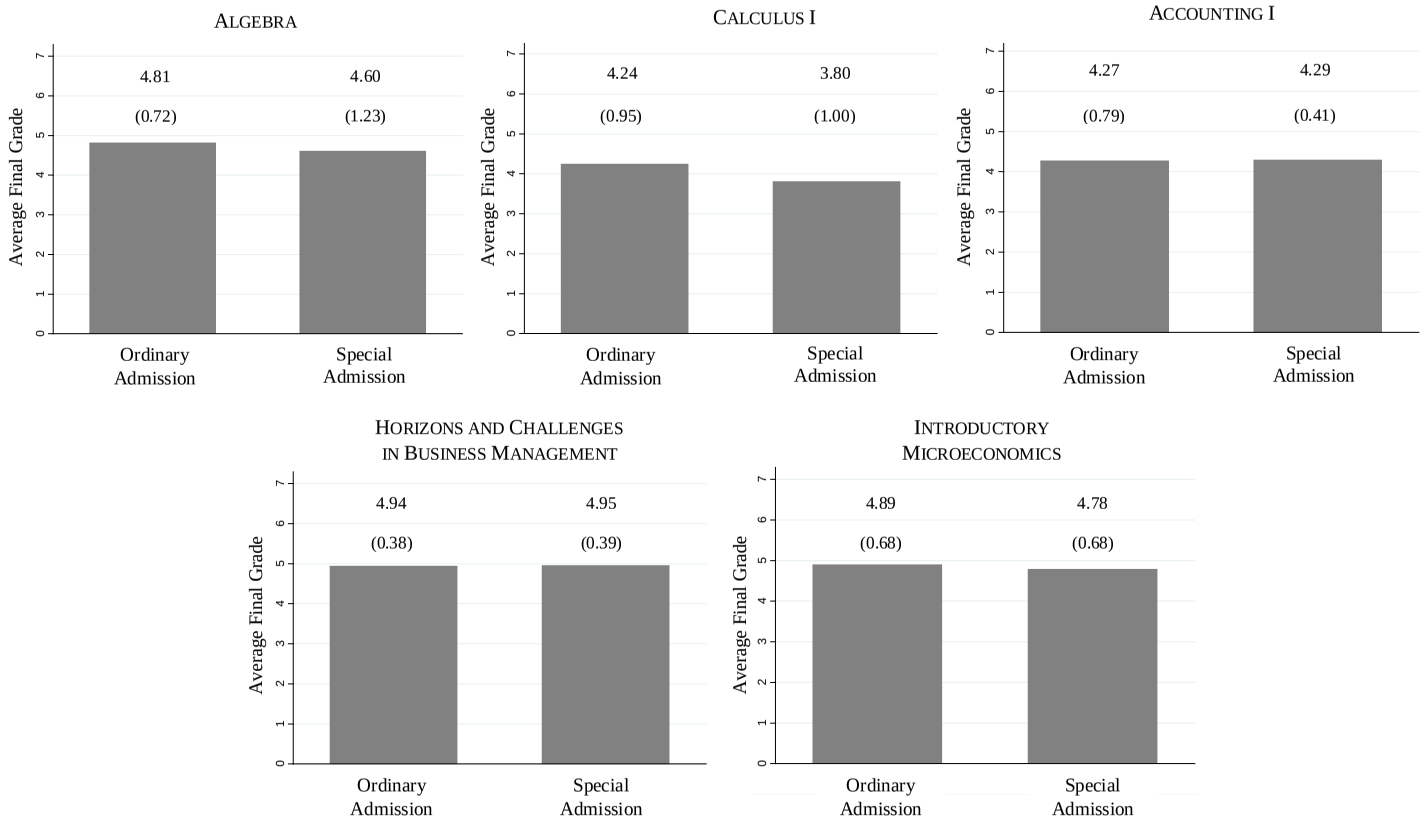
All the above suggests that, at the time of enrollment, the special admission students featured in this study had a disadvantage in academic performance terms (relative to their ordinary admission peers). Also, it seems that they may be more likely to decide to abandon their studies early. However, it seems that special admission students are in any case very unlikely to be dismissed due to poor academic performance, and that they actually catch up with their ordinary admission peers in terms of GPA as early as after three semesters of enrollment in the degree. This suggests that, with some nuances, students from disadvantaged socioeconomic backgrounds can successfully catch up with their peers when provided with adequate support, and that special admission programs can therefore be an effective tool to improve the access to higher education. However, it also seems that it would be advisable to further increase the additional support provided to special admission students (of course, this support could also be expanded to ordinary admission students, in order to also reduce their withdrawal and dismissal rates). This would mean both addressing adaptation problems to reduce the likelihood of withdrawal, as well as reducing the academic gap with more remedial and tutoring resources (particularly regarding mathematical ability).

Finally, the fact that the program was undersubscribed suggests that, apart from potential information diffusion problems, the minimum requirements set forth for special admission may have been too stringent, and/or that the demand for special admission among the targeted student population may not be as large as predicted.

In any case, it is worth noting that all the proposed measures would be a complement, but not a substitute, to deeper educational reform in the medium and long term (e.g. improvement of the quality of secondary education for all, and/or review of the ordinary admission process).

FIGURE I.A

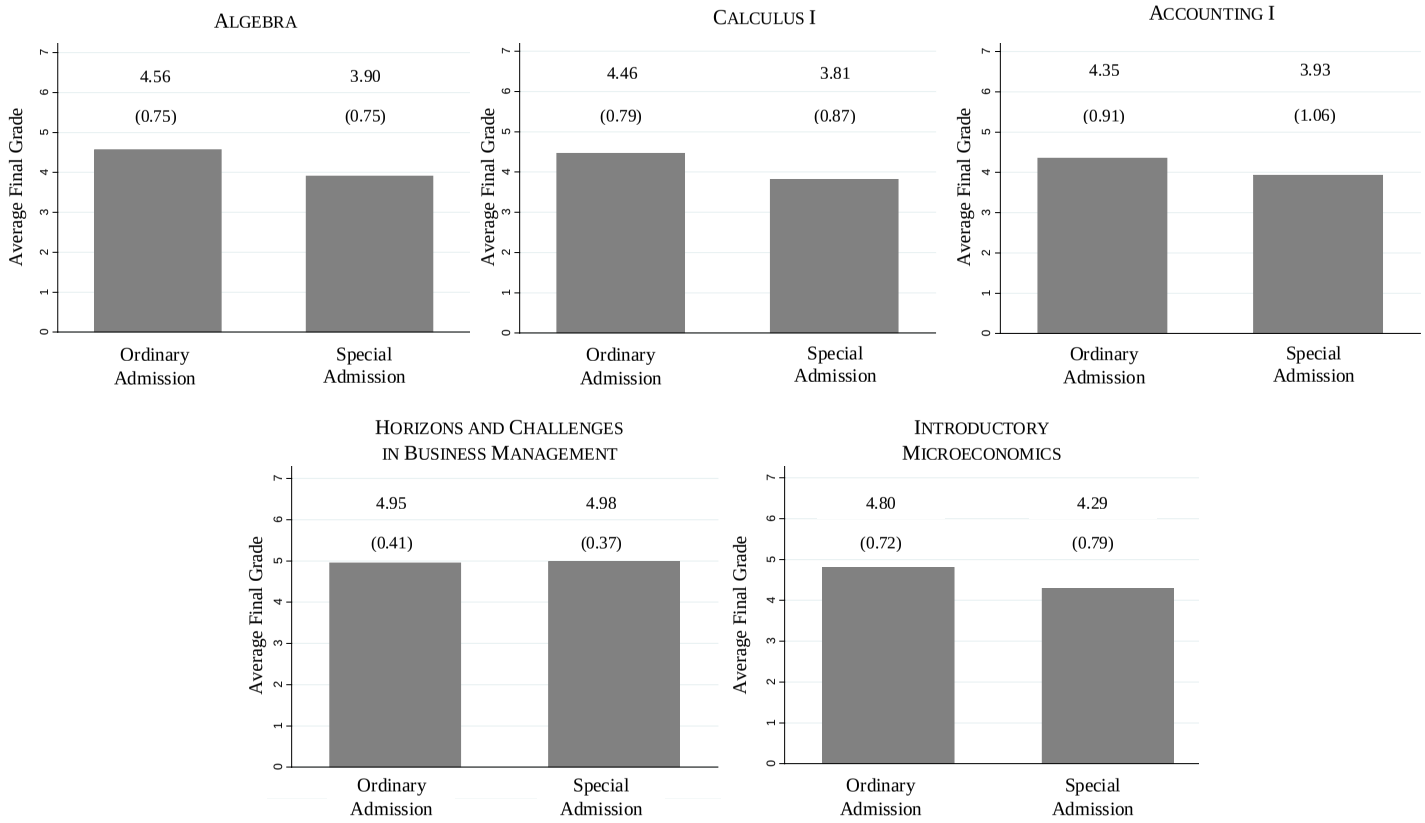
AVERAGE FINAL GRADE FOR ORDINARY AND SPECIAL ADMISSION STUDENTS BY FIRST SEMESTER COMPULSORY COURSE (2013)



NOTES. The figures above depict the average final grade for ordinary and special admission students admitted to the Commercial Engineering degree at the Pontificia Universidad Católica de Chile in the academic year 2013 in each of the first semester (March-July 2013) compulsory courses (i.e. Algebra, Calculus I, Accounting I, Horizons and Challenges in BusinessManagement, and Introductory Microeconomics). The average final grade determines the height of each bar, and is also written over it, with standard deviations reported between parentheses. Grades range from 1 (lowest) to 7 (highest), and 4 is the lowest passing grade. The number of special admission students entering the degree in the 2013 and 2014 academic years is 10 and 17, respectively, and the number of ordinary admission students is about 260 in both years (note that some students did not take some courses, for example because the corresponding credits were recognized by the university, or because of early withdrawal). Note that "special admission student" means a student who applied and was admitted via the special admission program "Talento + Inclusión" (*Talent + Integration*), irrespective of whether ex-post s/he may have been entitled to be admitted via ordinary admission because of having obtained a standard admission test score higher than the cut-off required for that academic year.

FIGURE I.B

AVERAGE FINAL GRADE FOR ORDINARY AND SPECIAL ADMISSION STUDENTS BY FIRST SEMESTER COMPULSORY COURSE (2014)



NOTES. The figures above depict the average final grade for ordinary and special admission students admitted to the Commercial Engineering degree at the Pontificia Universidad Católica de Chile in the academic year 2014 in each of the first semester (March-July 2013) compulsory courses (i.e. Algebra, Calculus I, Accounting I, Horizons and Challenges in BusinessManagement, and Introductory Microeconomics). The average final grade determines the height of each bar, and is also written over it, with standard deviations reported between parentheses. Grades range from 1 (lowest) to 7 (highest), and 4 is the lowest passing grade. The number of special admission students entering the degree in the 2013 and 2014 academic years is 10 and 17, respectively, and the number of ordinary admission students is about 260 in both years (note that some students did not take some courses, for example because the corresponding credits were recognized by the university, or because of early withdrawal). Note that "special admission student" means a student who applied and was admitted via the special admission program "Talento + Inclusión" (*Talent + Integration*), irrespective of whether ex-post s/he may have been entitled to be admitted via ordinary admission because of having obtained a standard admission test score higher than the cut-off required for that academic year.

TABLE II

DIFFERENCES IN FIRST SEMESTER COMPULSORY COURSES FINAL GRADES BETWEEN ORDINARY AND SPECIAL ADMISSION STUDENTS

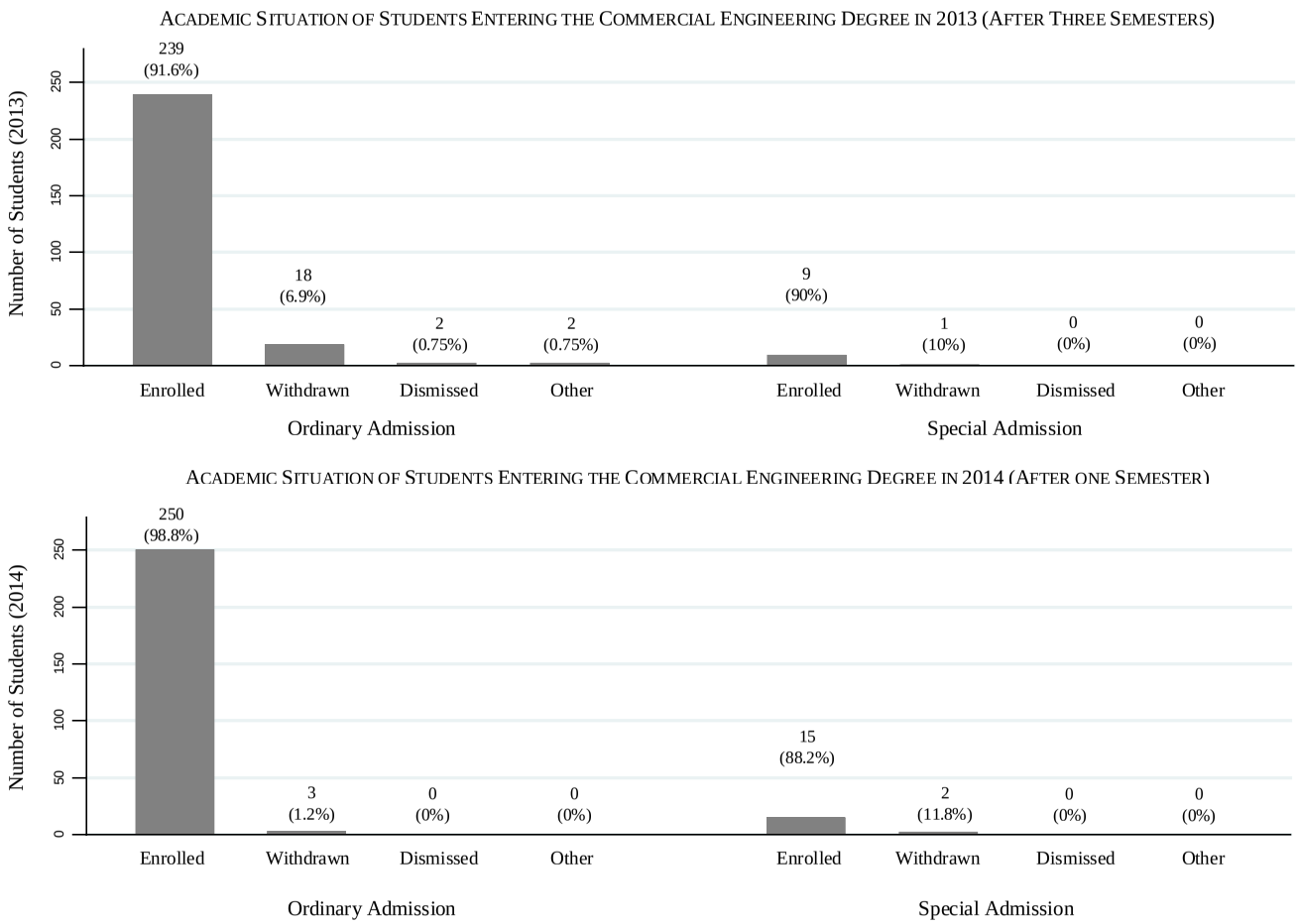
	Student's First Semester Final Grades	(1) Algebra	(2) Calculus I	(3) Accounting I	(4) Horizons and Challenges in Business Mgmt.	(5) Introductory Microeconomics
Admitted 2013	1 = Special Admission Student	-0.208	-0.438	0.020	0.014	-0.112
		(0.372)	(0.309)	(0.134)	(0.119)	(0.208)
	Constant Term	4.808	4.238	4.270	4.936	4.892
		(0.045)***	(0.060)***	(0.049)***	(0.024)***	(0.042)***
	R^2	0.00	0.01	0.00	0.00	0.00
	Observations	269	262	266	251	270
Admitted 2014	1 = Special Admission Student	-0.656	-0.646	-0.424	0.033	-0.518
		(0.194)***	(0.223)***	(0.272)	(0.097)	(0.203)**
	Constant Term	4.563	4.460	4.351	4.947	4.805
		(0.048)***	(0.050)***	(0.058)***	(0.026)***	(0.046)***
	R^2	0.04	0.04	0.01	0.00	0.03
	Observations	261	260	265	262	263

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

NOTES. This table analyzes the differences in first semester final grades between ordinary and special admission students admitted to the Commercial Engineering degree at the Pontificia Universidad Católica de Chile during academic years 2013 (above) and 2014 (below). The dependent variable in all regressions is the student's final grade for each the subject in the corresponding column, i.e. (1) Algebra, (2) Calculus I, (3) Accounting I, (4) Horizons and Challenges in Business Management, and (5) Introductory Microeconomics. The independent variable "1 = Special Admission Student" denotes the indicator variable which takes a value of 1 if the student enrolled via the special admission program "Talento + Inclusión" (*Talent + Integration*) and 0 otherwise (i.e. if the student enrolled via ordinary admission). Grades range from 1 (lowest) to 7 (highest), and 4 is the lowest passing grade. The number of special admission students entering the degree in the 2013 and 2014 academic years is 10 and 17, respectively, and the number of ordinary admission students is about 260 in both years (note that some students did not take some courses, for example because the corresponding credits were recognized by the university, or because of early withdrawal). Note that "special admission student" means a student who applied and was admitted via the special admission program "Talento + Inclusión" (*Talent + Integration*), irrespective of whether ex-post s/he may have been entitled to be admitted via ordinary admission because of having obtained a standard admission test score higher than the cut-off required for that academic year. Huber-White heteroskedasticity-consistent standard errors are reported between parentheses.

FIGURE III

ACADEMIC SITUATION OF STUDENTS BY ADMISSION YEAR AND TYPE AS OF JULY 2014



NOTES. The figures above depict the academic situation by admission year and type of students entering the Commercial Engineering degree at the Pontificia Universidad Católica de Chile. The upper figure depicts the academic situation as of July 2014 of students entering the degree in the 2013 academic year, i.e. after three semesters of undergraduate studies. The lower figure depicts the academic situation as of July 2014 of students entering the degree in the 2014 academic year, i.e. after one semester of undergraduate studies. The situation of students entering via the ordinary admission process is depicted on the left, while that of students entering via the special admission program "Talento + Inclusión" (*Talent + Integration*). Students may either be still enrolled in the degree (first bar), have decided to withdraw (second bar), have been dismissed because of poor academic performance (third bar), or not be enrolled for any other reason, such as *force majeure* (fourth bar). The total number of students in each category is noted over each bar, and the percentage with respect to the total is provided between parentheses. The number of special admission students entering the degree in the 2013 and 2014 academic years is 10 and 17, respectively, and the number of ordinary admission students is about 260 in both years (note that some students did not take some courses, for example because the corresponding credits were recognized by the university, or because of early withdrawal). Note that "special admission student" means a student who applied and was admitted via the special admission program "Talento + Inclusión" (*Talent + Integration*), irrespective of whether ex-post s/he may have been entitled to be admitted via ordinary admission because of having obtained a standard admission test score higher than the cut-off required for that academic year.

TABLE IV

DIFFERENCES IN ACADEMIC SITUATION BETWEEN ORDINARY AND SPECIAL ADMISSION STUDENTS AS OF JULY 2014

	Academic Situation as of July 2014	(1) GPA	(2) Enrollment	(3) Withdrawal	(4) Dismissal	(5) Other
Admitted 2013	1 = Special Admission Student	-0.054	-0.016	0.031	-0.008	-0.008
		(0.207)	(0.097)	(0.097)	(0.005)	(0.005)
	Constant Term	4.776	0.916	0.069	0.008	0.008
		(0.038)***	(0.017)***	(0.016)***	(0.005)	(0.005)
	R^2	0.00	0.00	0.00	0.00	0.00
	Observations	269	271	271	271	271
Admitted 2014	1 = Special Admission Student	-0.476	-0.106	0.106	0.000	0.000
		(0.162)***	(0.079)	(0.079)	(0.000)	(0.000)
	Constant Term	4.658	0.988	0.012	0.000	0.000
		(0.036)***	(0.007)***	(0.007)*	(0.000)	(0.000)
	R^2	0.04	0.04	0.04	.	.
	Observations	265	270	270	270	270

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

NOTES. This table analyzes the differences in academic situation (as of July 2014) between ordinary and special admission students admitted to the Commercial Engineering degree at the Pontificia Universidad Católica de Chile during academic years 2013 (above) and 2014 (below). The dependent variables in each regression (column) are (1) GPA as of July 2014, (2) an indicator variable which takes a value of 1 if the student is still enrolled in the degree, (3) an indicator variable which takes a value of 1 if the student decided to withdraw from the degree, (4) an indicator variable which takes a value of 1 if the student was dismissed due to poor academic performance, and (5) an indicator variable which takes a value of 1 if the student is not enrolled for any other reason, such as *force majeure*. Note that for students entering the degree during the 2013 academic year this table analyzes their academic situation after three semesters of undergraduate studies, while for students entering the degree during the 2014 academic year this table analyzes their academic situation after one semester of undergraduate studies. The independent variable "1 = Special Admission Student" denotes the indicator variable which takes a value of 1 if the student enrolled via the special admission program "Talento + Inclusión" (*Talent + Integration*) and 0 otherwise (i.e. if the student enrolled via ordinary admission). The number of special admission students entering the degree in the 2013 and 2014 academic years is 10 and 17, respectively, and the number of ordinary admission students is about 260 in both years (note that some students did not take some courses, for example because the corresponding credits were recognized by the university, or because of early withdrawal). Note that "special admission student" means a student who applied and was admitted via the special admission program "Talento + Inclusión" (*Talent + Integration*), irrespective of whether ex-post s/he may have been entitled to be admitted via ordinary admission because of having obtained a standard admission test score higher than the cut-off required for that academic year. Huber-White heteroskedasticity-consistent standard errors are reported between parentheses.

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Appendix A: Original Experimental Design

As mentioned, the "Talento + Inclusión" (*Talent + Integration*) special access program featured three distinct phases: (a) an awareness campaign, intended to disseminate information about the program among target secondary schools; (b) a new special admission process for the Commercial Engineering degree at the university, intended to bypass some of the perceived barriers to the access of students from disadvantaged backgrounds; and (c) additional support provided after enrollment to the students admitted via the program.

The first phase of the program (i.e. the awareness campaign) featured a randomized control trial, intended to compare the impact of using email or phone to communicate information about the program to secondary schools. This experiment was implemented, and is presented more in detail on Appendix B.

Similarly, the original design of the second phase of the program (i.e. the special admission process) also envisioned an experimental evaluation. It was intended to take advantage of the excess demand generated by the awareness campaign in the first phase, in order to evaluate the impact on eligible applicants of being admitted to the Commercial Engineering degree via the special access program. It would have consisted of a random allocation of the 20 available vacancies among all candidates who met the minimum admission requirements, in a similar manner to, for example, the lottery allocation system used by the state of Tennessee in the United States to award financial aid for higher education (see Pallais, 2009, for a detailed description of the Tennessee lottery system, and an analysis of its impact). This would have created two comparable groups differing only along the treatment dimension (i.e. being admitted), thus allowing for a robust estimation of the impact of the program.

In particular, this experimental design consisted of two steps: (i) First, all applicants were screened to verify that they satisfied the eligibility criteria set forth for the special access program (see previous section). (ii) Then, the special access vacancies were to be randomly assigned among all eligible applicants who in the first step were identified as satisfying all the minimum admission criteria. All the admission criteria were purposely "binomial" (i.e. once a candidate satisfies a criterion no further distinction is made), so that a comparable pool of admitted and non-admitted candidates is generated. This has obvious methodological advantages, but it was also considered the "fairest" selection method, since the main concern (and the very *raison d'être* of the special access program) was to avoid existing selection methods which may be biased against talented students from disadvantaged backgrounds.[14]

[14] It is worth noting that quasi-experimental methodologies, such as a regression discontinuity design, could also be used to study the differences between students who applied via the special admission program, but ended up being admitted via ordinary admission. Also, the comparison of special admission students with ordinary admission ones with the lowest scores in the standardized admission test might allow for a better understanding of the test's performance. Moreover, the correlation between the different admission criteria used in the special access program and academic performance (or any other outcomes

Unfortunately, as already mentioned in the end this second experiment could not be implemented, due to the lack of excess demand for admission via the special access program (i.e. admission was offered to all candidates who met the minimum special admission requirements). In view of this, it seems that, as discussed above, in the future it may be advisable to implement a larger and earlier information diffusion campaign, in order to better publicize the special access program and generate enough demand for it. In particular, given that the large majority of applicants to the program originated from the Santiago Metropolitan Region, it seems that it may be advisable to extend the program awareness campaign efforts to other areas of the country. However, it also appears that the demand for special admission among the targeted student population may not be as large as predicted, and/or that the minimum requirements set forth for special admission might have been too stringent. In particular, it seems that in the future it may be advisable to rely more on the results of the additional tests required for special admission, further relaxing the requirement of obtaining a minimum standard admission score (see Díez-Amigo, 2014, for a detailed discussion of the characteristics and impact of the mathematical ability test used as one of the additional criterion for special admission).

Finally, the third and last phase of the access program consisted on providing additional support to students admitted via it. This was both so that they could overcome any formative or knowledge gaps, as well as in order to ease their adaptation to the new environment. Therefore, this meant providing remedial courses and academic training, but also supporting the integration of the special admission students along non-academic dimensions. Also, it was deemed important to provide this additional support in a way which avoided any potential "stigmatization" of special admission students, or a potential substitution effect between the effort devoted to additional support activities and regular academics. In view of this it was decided that the most appropriate would be to organize a two week intensive summer camp, before the start of the regular academic year.

It is worth noting that, in principle, an experimental design would also have been feasible in this phase (for example, by providing additional support only to a randomly selected subset of admitted students, or using an encouragement-to-treat approach).[15] However, since it was reasonable to think that the additional support would likely have a positive impact on students (while being unlikely to have a negative one), it was decided to provide it to all students admitted via the special access program. Therefore, all students

of interest) may also be informative. Finally, it is also worth noting that, if successful, this design would have also allowed to experimentally measure the economic impact of being admitted via the special access program on income, thus allowing us to better understand the value of education.

[15] Note that another experimental methodology suitable to evaluate the impact of the additional support in this context would be to use an "encouragement to treat" approach, e.g. by allowing ordinary admission students to enroll in additional support activities, and encouraging a randomly selected subset of them to apply to do so. Also, a regression discontinuity design may potentially be used to compare candidates admitted via special admission with their peers who applied via the special admission program, but were finally admitted via ordinary admission (or, in general, with ordinary admission students with the lowest admission scores).

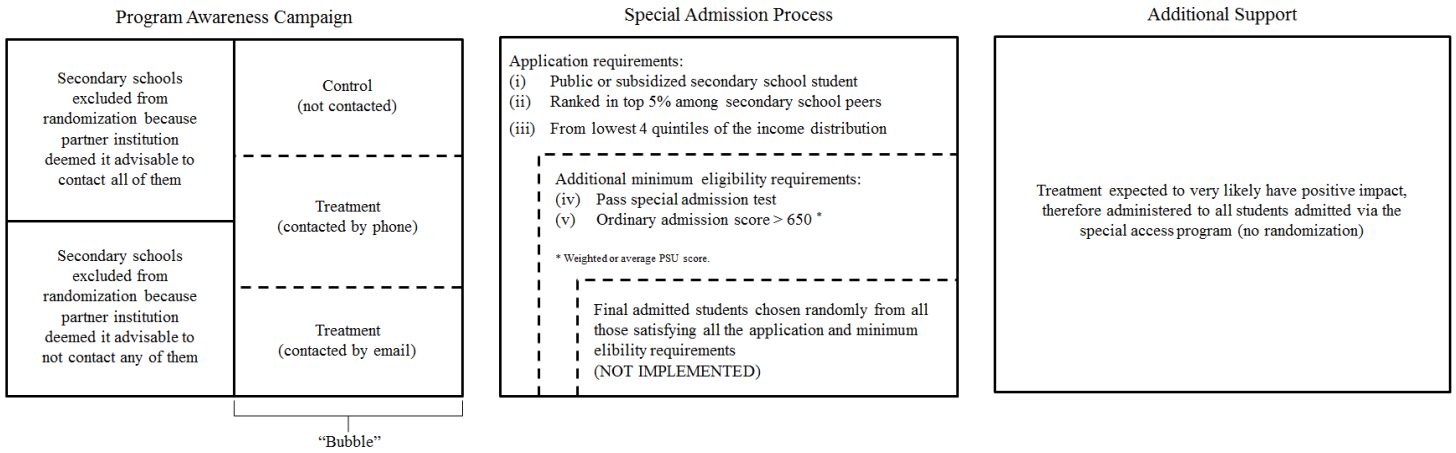
admitted via the special access program underwent the two week intensive summer camp before the start of the regular academic year. Student feedback provided at the end of the camp was very positive, and suggests that in the future it would be advisable to keep this additional support feature (and potentially increase its length).[16]

For illustration purposes the above is summarized in Appendix Figure A.

[16] In general, a negative impact may indeed be a concern (e.g. if there is a substitution effect between the effort devoted to support activities and regular coursework). However, given the characteristics of the additional support for special admission students, this was not considered a concern in this particular context.

APPENDIX FIGURE A

TREATMENTS AND ASSIGNMENT



NOTES. This paper analyzes a special access program, custom-designed for one of the leading Chilean universities, and implemented as a pilot during the 2013 and 2014 admission periods. Its two main features were a program awareness campaign targeting secondary schools, and a special admission process for students from disadvantaged backgrounds (although it also included additional support for all students admitted via the special access program). While this was not the first program of its kind in the country (or even in the university), it was the first to try to incorporate experimental evaluation methodology in its design (which was conceived by the author of this study). This was intended to facilitate the evaluation of the impact of the program, in order to help to not only ensure the efficient use of resources, but to also inform the decision-making processes and the policy debate at the university and national levels. The awareness campaign included a randomized control trial, allowing for a robust comparison of the impact of using email or phone to communicate information about the program to secondary schools. The original design of the special admission process also included another randomized control trial, intended to estimate the differential impact of being admitted into the program. However, it unfortunately could not be implemented due to the lack of excess demand for admission into the program. Additional support was expected to very likely have a positive impact on academic performance, and was therefore provided to all students admitted via the special access program.

Appendix B: Experimental Comparison of Communication Methods

As already mentioned above, the first phase of the program (i.e. the awareness campaign) featured a randomized control trial, intended to compare the impact of using email or phone to communicate information about the program to secondary schools. This experiment was carried out, and is discussed in detail below.[17]

In particular, all the potential secondary schools of interest were divided in three subpopulations. The first subpopulation consisted of schools which the Faculty considered essential, and the awareness campaign was to be rolled out in all of them. The second subpopulation consisted of schools in which the Faculty did not think that it would be efficient to spend resources publicizing the program, and the awareness campaign was therefore not to be rolled out in any of them. The third subpopulation consisted of all other schools, and it was randomly divided in one control and two treatment groups. No further action was taken with respect to the latter, while one of the treatment groups was contacted by phone, and the other by email. In the end, emails were sent out to 93 schools, and a first round of calls was made to 96 schools, while 188 schools were not contacted (it is worth noting that some secondary schools which were successfully contacted by phone asked for a follow-up email with more details about the special access program, which was subsequently provided to them). Information was then gathered for all schools in the evaluation, in order determine which information diffusion method had a greater impact (this is achieved by comparing the average number of complete applications received from secondary schools in each of the treatment groups with those received from secondary schools in the control group).

It is worth noting that out of the 96 schools in the phone call treatment group, only 25 could be successfully contacted in the first round of calls over three days (a successful contact means that the person responsible for career advice at the school, or alternatively its principal or other person of responsibility, could be reached and had time to go through the established informational protocol). Therefore, the rate of success for phone contact was 26 %. Also, as already mentioned it is also worth noting that some secondary schools which were successfully contacted by phone asked for a follow-up email with more details about the special access program, which was later provided to them. And, out of those 25 schools successfully contacted by phone it was observed that 9 (about a third) had already heard about the special access program.

[17] Note that due to a last-minute re-organization, all information diffusion efforts of the several special access programs offered at the different schools and faculties were centralized at the university level. This meant that the planned awareness campaign at the Faculty level, featuring the experimental evaluation of communication methods, had to be implemented in addition to any diffusion efforts at the university level. The latter did not focus on any degree on particular, but anecdotical evidence and application volumes suggest that most of the demand was channeled to the degrees which already had an established access program (such as the above mentioned Engineering degree). This reorganization also resulted in reduced resources, and a delay of several months in the implementation of diffusion efforts at the Faculty level. Therefore, a reduced size experimental awareness campaign was implemented several months later than intended. However, in any case target schools were identified, and subsequently divided in one control and two treatment groups (email and phone contact, respectively) as originally designed.

Appendix Figure B presents the average number of complete applications received from students attending secondary school in each of the control and treatment groups. Only complete applications are reported (i.e. applications which were initiated in the system but never fully completed are not included in this analysis). The total number of initiated applications was 240, with 107 completed before the application period ended, of which 76 corresponded to schools included in the special admission program awareness campaign.[18]

The average number of complete applications received from secondary schools contacted by email was two times the average number received from control secondary schools, which were not contacted (0.30 versus 0.15, respectively). However, as it can be observed on Appendix Table C, this difference is not statistically significant. In any case, it is worth noting that given the relatively small sample size, it cannot be robustly concluded that email contact at the secondary school level does not significantly increase the likelihood of students from those schools applying to the special access program, i.e. the impact may not be sufficiently large to be observed in this experimental context. In particular, given the sample size in this experiment, power calculations suggest that the minimum detectable (non-standardized) effect size would be about 0.34 (fixing confidence and power levels at 90 % and 80 %, respectively). This is, given the sample size in this experiment, and fixing the probability of a false positive at 10 %, a difference of 0.34 (or less) between treatment and control groups in the average number of completed applications received would go undetected with a probability of 20 % (or more). Since the observed difference falls below this threshold, it cannot be concluded that it is not significant, but rather that it might not be observable with the available sample size.

Similarly, the average number of complete applications received from secondary schools contacted by phone was also larger than the average number received from control secondary schools (0.21 versus 0.15, respectively). This difference is smaller than for email contact, but in any case as it can be observed on Appendix Table C it is again not statistically significant. Also, as before given the limited sample size, it cannot be concluded that the different is not significant, but rather that the experiment may not be powered enough to observed.

Finally, despite the fact that no significant differential impact was observed in this experiment, the results of the experiment suggest that email contact is likely the best method of communication (i.e. sending emails

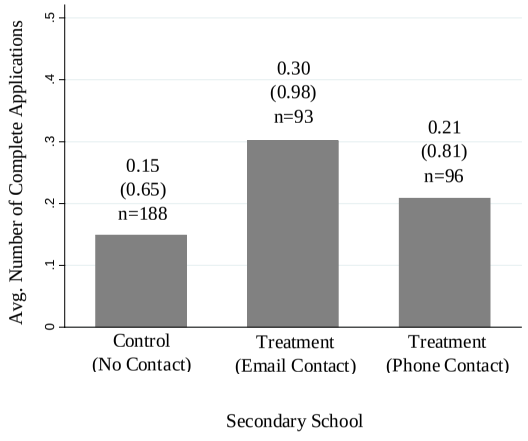
[18] It is worth noting that only applications from schools targeted in the awareness campaign are included, i.e. there were additional applications from students attending other secondary schools which are not reported. Also, note that "email contact" and "phone contact" refers only to targeted contact within the scope of the special admission program awareness campaign carried out by the Faculty of Economic and Administrative Sciences of the Pontificia Universidad Católica de Chile. Moreover, the university organized an earlier awareness campaign of special admission programs at the university level among some secondary schools. For the purpose of this analysis, this earlier contact at the university level in the context of this other campaign was included as a stratum at the time of random assignment. Finally, it is worth noting that that this is an "Intention-to-Treat" approach, i.e. there was no verification that schools had actually read or acted upon the emails sent or calls made, and as already mentioned it was not possible to successfully contact all schools by phone.

is less time-consuming and less expensive than making phone calls, but there is no evidence suggesting that the latter is more effective than the former, and some of the schools initially contacted by phone even asked for follow up emails). Therefore, it seems that in the future it would probably be advisable to just focus on email communication for this type of campaigns.

Also, it seems clear that in general terms the awareness campaign was not successful, in view of the subsequent undersubscription of the program. Therefore, it appears that in the future it would be necessary to start the awareness campaign earlier. Also, it seems that it may be advisable to make it both more extensive and intensive, increasing the intensity of contact, but also the number and type of schools contacted (in particular, given that the large majority of applicants to the program originated from the Santiago Metropolitan Region, it seems that in the future it would be advisable to extend the program awareness campaign efforts to other areas of the country).

APPENDIX FIGURE B

AVERAGE NUMBER OF COMPLETE APPLICATIONS RECEIVED FROM SECONDARY SCHOOLS INCLUDED IN THE SPECIAL ACCESS PROGRAM AWARENESS CAMPAIGN



NOTES. The figure above depicts the average number of complete applications received to the special access program "Talento + Inclusión" (*Talent + Integration*) at the Commercial Engineering degree of the Pontificia Universidad Católica de Chile for the academic year 2013 from students attending secondary schools included in the awareness campaign for the program. Each bar represents one of the three groups in which targeted schools were randomly divided, i.e. control (not contacted), treatment (contacted by email), and treatment (contacted by phone). The height of each bar represents the average number of complete applications received from each group, and is also written over it, with standard deviations reported between parentheses over the total number of schools in each group. It is worth noting that only applications from schools targeted in the awareness campaign are included, i.e. there were additional applications from students attending other secondary schools which are not reported. Also, only complete applications are reported, i.e. applications which were initiated in the system but never fully completed are not included above. The total number of initiated applications was 240, with 107 completed before the application period ended, of which 76 corresponded to schools included in the special admission program awareness campaign. Note that "email contact" and "phone contact" refers only to targeted contact within the scope of the special admission program awareness campaign carried out by the Faculty of Economic and Administrative Sciences of the Pontificia Universidad Católica de Chile, in charge of the Commercial Engineering Degree. Some secondary schools which were successfully contacted by phone asked for a follow-up email with more details about the special access program, which was later provided to them. Also, the university organized an earlier awareness campaign of special admission programs at the university level among some secondary schools. Earlier contact at the university level in the context of this other campaign was included as a stratum at the time of random assignment of secondary schools to control and treatment groups for the purpose of this analysis. Note also that this is an "Intention-to-Treat" approach, i.e. there was no verification that schools had actually read or acted upon the emails sent or calls made, and it was not possible to successfully contact all schools to which a call was made by phone. In particular, out of the 96 schools in the phone call treatment group only 25 could be successfully contacted in the round of calls performed over three days, i.e. the rate of success for phone contact was 26% (a successful contact means that the person responsible for career advice at the school or its principal or other person of responsibility could be reached and had time to go through the established informational protocol).

APPENDIX TABLE C

DIFFERENCES IN NUMBER OF COMPLETE APPLICATIONS RECEIVED FROM SECONDARY SCHOOLS INCLUDED IN THE SPECIAL ACCESS PROGRAM AWARENESS CAMPAIGN

Complete Applications Received from Secondary School	(1.1) Linear	(1.2) Logit	(2) Linear
1 = Treatment (Email Contact)	0.039	0.399	0.152
	(0.041)	(0.401)	(0.111)
1 = Treatment (Phone Contact)	0.035	0.363	0.059
	(0.040)	(0.400)	(0.095)
Constant Term	0.090	-2.308	0.149
	(0.021)***	(0.255)***	(0.047)***
R^2	0.00		0.01
Observations	377	377	377

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

NOTES. The figure above depicts the differences in the number of complete applications received to the special access program "Talento + Inclusión" (*Talent + Integration*) at the Commercial Engineering degree of the Pontificia Universidad Católica de Chile for the academic year 2013 from students attending secondary schools included in the awareness campaign for the program. Columns (1.1.) and (1.2) report the fitted coefficients from the linear and logit regression analysis of the probability that a student from one of the secondary schools included in the program awareness campaign completed an application to the special access program, i.e. the independent variable is an indicator variable which takes a value of 1 if at least one student from that secondary school completed an application to the special access program. Column (2) reports the fitted coefficient from the linear regression analysis of the number of students who applied to the special access program from each secondary school included in the program awareness campaign, i.e. the independent variable is the number of complete applications to the special access program received from students from that secondary school. The independent variable "1 = Treatment (Email Contact)" denotes the indicator variable which takes a value of 1 if the secondary school was randomly assigned to the treatment group which was contacted by email. Analogously, the independent variable "1 = Treatment (Phone Contact)" denotes the indicator variable which takes a value of 1 if the secondary school was randomly assigned to the treatment group which was contacted by phone, so that the base category therefore corresponds to schools randomly assigned to the control group, which were not contacted during the program awareness campaign. It is worth noting that only applications from schools targeted in the awareness campaign are included, i.e. there were additional applications from students attending other secondary schools which are not reported. Also, only complete applications are reported, i.e. applications which were initiated in the system but never fully completed are not included above. The total number of initiated applications was 240, with 107 completed before the application period ended, of which 76 corresponded to schools included in the special admission program awareness campaign. Note that "email contact" and "phone contact" refers only to targeted contact within the scope of the special admission program awareness campaign carried out by the Faculty of Economic and Administrative Sciences of the Pontificia Universidad Católica de Chile, in charge of the Commercial Engineering Degree. Some secondary schools which were successfully contacted by phone asked for a follow-up email with more details about the special access program, which was later provided to them. Also, the university organized an earlier awareness campaign of special admission programs at the university level among some secondary schools. Earlier contact at the university level in the context of this other campaign was included as a stratum at the time of random assignment of secondary schools to control and treatment groups for the purpose of this analysis. Note also that this is an "Intention-to-Treat" approach, i.e. there was no verification that schools had actually read or acted upon the emails sent or calls made, and it was not possible to successfully contact all schools to which a call was made by phone. In particular, out of the 96 schools in the phone call treatment group only 25 could be successfully contacted in the round of calls performed over three days, i.e. the rate of success for phone contact was 26% (a successful contact means that the person responsible for career advice at the school or its principal or other person of responsibility could be reached and had time to go through the established informational protocol). Huber-White heteroskedasticity-consistent standard errors are reported between parentheses.