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Institute for Fiscal Studies

Ryan Cooper
Javier Guevara
James Kinder
Mario Rivera
Antonia Sanhueza
Michela Tincani

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The impacts of preferential college admissions for the disadvantaged: experimental evidence from the PACE programme in Chile

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Ryan Cooper (University of Chicago)

Javier Guevara (MINEDUC)

James Kinder (University College London)

Mario Rivera (MINEDUC)

Antonia Sanhueza (University of Chicago)

Michela Tincani (University College London and Institute for Fiscal Studies and CEPR)

EXECUTIVE SUMMARY

Participation in university is highly unequal across socio-economic lines globally (UNESCO, 2017). This has led many governments and admission officers to introduce preferential college admissions for disadvantaged students. This report studies the impacts that preferential admissions can have on the higher-education admission, enrolment and retention of disadvantaged students.

We answer these research questions in the context of a programme called PACE (*Programa de Acompañamiento y Acceso Efectivo a la Educación Superior*, Programme for the Support and Effective Access to Higher Education) in Chile. PACE targets disadvantaged high schools and guarantees admission to a selective university for students who graduate in the top 15% of their school, waiving the requirement to obtain a sufficiently high score on the standardised entrance exam. Similar programmes, known as percentage plans, have been used in other countries (e.g., California, Florida and Texas have state-wide percentage plans).

Specifically, this report evaluates the impacts of the PACE programme on higher-education admissions and on higher-education enrolment of the disadvantaged students targeted by the programme, up to four years after the end of secondary education. To identify policy impacts, we exploit the randomized expansion of PACE that occurred in 2016. Our main findings are the following.

- Students from schools that were randomly allocated to be in PACE enrolled in the first year of higher education in 2018 at the same rate as students who were randomly allocated to be in the control group, but they were 3 percentage points more likely to enrol in a selective university and 3 percentage points less likely to enrol in professional higher-education institutes.
- The enrolment effects were concentrated among students who belonged to the top 15% of their school in terms of baseline grade point average (i.e., top-performing students) and among students from vocational high-school tracks.
- The effects persisted over time: in 2021, four years after leaving school, top-performing students from vocational schools randomly allocated to PACE were still more likely to be enrolled in a selective university than students from control schools.
- We did not find evidence of mis-match effects: students induced to enrol in more selective institutions by PACE did not drop out at a higher rate than the rate at which they would have dropped out from higher education in the absence of the PACE programme.

But despite the positive and persistent impacts on enrolment in selective universities, the effects on admissions to selective universities were between 33% and 55% below those expected when all PACE admissions are allocated. This raises the question of why some students did not take up PACE opportunities to pursue education in selective universities. Further studies are necessary to understand this phenomenon and to examine whether policy interventions can extend the positive impacts of PACE to more disadvantaged students.

CONTENTS

SECTION 1 – INTRODUCTION

Participation in higher education is starkly unequal across socio-economic lines globally (UNESCO, 2017). This has led many governments and admission officers to introduce preferential university admissions targeted at the disadvantaged. This report evaluates the impacts on disadvantaged students of a preferential admission programme introduced in Chile in 2014. The programme is called PACE (*Programa de Acompañamiento y Acceso Efectivo a la Educación Superior*, Programme for the Support and Effective Access to Higher Education). PACE targets students in schools identified as disadvantaged based on the socio-economic status (SES) of the student body. University admission and enrolment rates are typically low for this group of students (11% and 8%, respectively). The programme guarantees admission to a selective university for students who graduate in the top 15% of their school in terms of their grade point average (GPA), thereby waiving the requirement that students score high enough on the nationally standardised entrance exam (PSU), for which they may be ill-prepared compared with their more advantaged peers.

In this report, we exploit the randomised expansion of the programme, which occurred in 2016, to evaluate the impacts of PACE on the admission, enrolment and retention in higher education of disadvantaged students. Specifically, in 2016, the government identified 220 high schools eligible for PACE based on the SES of the student body, and randomly allocated 64 of them to be part of the programme, with the remaining schools forming a control group. We collected administrative records on the experimental cohort, including students' high school performance and admission and enrolment in higher education up to four years after completing secondary education, thereby constructing a longitudinal dataset. We then used regression analysis to examine the impacts of PACE on the outcomes of interest.

First, we found that students from schools that were randomly allocated to be in PACE enrolled in the first year of higher education in 2018 at the same rate as students who were randomly allocated to be in the control group, but they were 3 percentage points more likely to enrol in a single admission system (*Sistema Único de Admisión*, SUA) institution (i.e., selective university) and 3 percentage points less likely to enrol in an IP (*instituto professional*; i.e., professional institute). Second, we find that these effects were concentrated among students who belonged to the top 15% of their school in terms of baseline GPA (i.e., top-performing students) and among students from vocational high-school tracks. Third, we find that these effects persisted over time: in 2021, four years after leaving school, top-performing students from vocational schools randomly allocated to PACE were still more likely to be enrolled in an SUA university than students from control schools. We did not find evidence of mis-match effects: students induced to enrol in more selective institutions by PACE did not drop out at a higher rate than the rate at which they would have dropped out from higher education in the absence of the PACE programme. While the impacts on wages and labour market outcomes are not yet known, this evidence based on earlier outcomes is consistent with previous findings in the literature that show that low-income students can reap large benefits from attending selective institutions in the United States (Chetty et al., 2020) and in the United Kingdom (Britton et al., 2021). Our findings suggest that these positive impacts may extend to medium-income countries such as Chile, and they may extend also to

disadvantaged students who would not have been admitted to university, due to their typically poor performance on entrance exams, were it not for the preferential admission programme.

Next, given the positive and persistent impacts on enrolment in selective universities, we have examined whether the impacts that PACE had on university admissions were as high as they could have been, that is, as high as mechanically expected based on the number of students graduating in the top 15% of their school who were not already being admitted to university through regular channels. We have found that the effects on admissions to selective universities were between 33% and 55% below these mechanically expected impacts, indicating that not all PACE admissions were allocated. This gap was especially pronounced among high-ability males. Therefore, many students chose not to take up the opportunity of a preferential admission by making choices before the admission stage that affected their eligibility for a preferential admission (in particular, students can choose how much effort to invest, which affects their GPA rank, and they can choose whether to take the entrance exam, which affects eligibility for a preferential admission because taking the exam is a requirement, even though the score does not matter). This raises the question of why some students did not take up PACE opportunities to pursue education in selective universities. This is important to understand, given the potentially large impacts that university can have on the life outcomes of disadvantaged students. Using additional administrative and survey data, Tincani et al. (2022) show that students behave as if they have a disutility from preferential places (e.g. due to stigma), and that students are misinformed about their within-school rank, which can lead some high-ability students to under-provide effort and therefore miss out on preferential admissions. Using simulations from a structural model, Tincani et al. (2022) further show that these informational and social frictions explain around a third of the gap between the mechanical and realised admission effects. This suggests that policies that successfully mitigate the impacts of these frictions could greatly increase the positive impacts of PACE on the university admission, enrolment and retention of disadvantaged students. Further studies are necessary to better understand this phenomenon and to examine whether real-world policy interventions can extend the positive impacts of PACE to more students.

SECTION 2 – PROGRAMME DESCRIPTION

The PACE programme seeks to facilitate access to higher education for young people from sections of society with high economic vulnerability, who tend to perform poorly in the university entry exam. The Ministry of Education (MINEDUC) has partnered with higher education institutions (HEIs) to develop and implement the programme.[1]

PACE is a percentage plan: students who graduate in the top 15% of their high school obtain a guaranteed university admission. In addition, the programme provides cognitive and non-cognitive support during the last two years of high school to all students in PACE schools, as well as during the first year of higher education for those who have entered via PACE.

The main premises that guide the programme are that, through this intervention, students from vulnerable sectors will be able to access higher education and graduate, thanks to the percentage plan and support during university. Additionally, students are expected to be better prepared for college as a result of the programme's support in high school.

2.1 – Institutional Context

The goal of PACE is to promote equity and inclusion of under-represented young people in higher education. According to the 2013 CASEN survey, the proportion of people aged 18–24 enrolled in higher education was 34.4% in the first (lowest) income quintile, whereas it was 89.6% in the fifth (highest) income quintile.

This programme started in 2014 and is inspired by equitable access programmes that emerged across various Chilean universities, such as the *Propedéuticos UNESCO* (UNESCO Preparatory); *Talento e Inclusión* (Talent and Inclusion) of the Pontifical Catholic University of Chile; *Sistema de Ingreso Prioritario de Equidad Educativa* (Priority Entry System for Educational Equity, or SIPEE) of the University of Chile; and the *Programa de Equidad* (Equity Programme) of the Diego Portales University; among others. Internationally, similar programmes have been implemented in Texas, California and Florida.

2.2 – Programme Components

This section describes the components of the policy. For policy costs, please refer to Cooper et al. (2019, p. 16).

Component 1: Preparation in secondary education

Component 1 consists of preparatory activities for students in grades 11 and 12, carried out by HEIs that are participating in PACE. These activities seek to develop cognitive and non-cognitive skills – referred to as 21st century competencies – that will help students to define their post-secondary trajectory according to their interests, needs and motivations.

There are two types of activities: skill development within school hours and skill development outside school hours. The goal is to prepare students for the admissions process; that is, for the application, selection and enrolment in HEIs through the top 15% channel and through the regular channel.

[1] The complete list of HEIs that participate in the PACE programme can be found in Appendix 1. All participating universities also participate in the SUA.

Component 2: Places in higher education

Component 2 refers to the offer of places in HEIs associated with the PACE programme, for the students who:

- graduate from a PACE school in the top 15%, according to their grades, or have obtained grades in the top 15% nationally. This is determined by an algorithm that the Department of Educational Evaluation, Measurement and Registration (DEMRE) applies to each school during the application process. In the 2018 admissions process, belonging to the top 15% nationally was equivalent to a score of at least 703 points;
- take the compulsory University Selection Tests (PSU) of Language and Communication, and Mathematics, in addition to one of the elective tests (History, Geography and Social Sciences, or Science). However, the test scores do not affect admission through the top 15% channel;
- and who attend a PACE school for the last two years of high school and participate in PACE activities.

Component 3: Support in higher education

The purpose of this component is to support students during their first year of higher education, and to facilitate their progress and retention. A student who enrols in higher education through PACE can benefit from a support scheme. The student's academic and psycho-educational needs are first evaluated and then monitored.

To achieve this, HEIs are required to design and implement face-to-face support (such as peer tutoring, mentoring, workshops, or other courses) and remote/online support, in individual or group meetings. This support not only focuses on academic monitoring, but also on prevention, guidance and referral (when needed). The end goal of this support is to promote retention. HEIs must also design and implement a monitoring and early-warning system in order to implement the necessary support promptly, acting proactively in the face of possible drop-out risk.

2.3 – Agreements with HEIs

The programme is implemented, in practice, by teams within HEIs, in direct agreement with the Ministry of Education; the Ministry makes resources available, while the HEIs guarantee places to PACE students and commit to organising the PACE activities.

As of 2021, PACE is being run in 580 schools in 311 municipalities in the country. Additional schools have been added to the programme in most years since 2014, with the breakdown shown in Table 1.

The current agreement includes places on all degree programmes, and the number of places per programme depends on the number of students in the targeted student cohorts. PACE students can apply through the PACE channel to any degree course or institution in the programme. Students are assigned a score that is used to allocate them to specific degree programmes among those they applied to, with this score depending mostly on a student's high school grade (Ministry of Education, 2017).

Table 1: Distribution of new PACE schools by year

Year	New schools	Cumulative total
2014	69	69
2015	287	356
2016	100 (*)	456
2017	0	456
2018	119	574 (**)
2019	0	574
2020	7	581
2021	0	580 (***)

Note: (*) 64 of these schools were randomly selected. (**) One PACE school was closed in 2017. (***) Two PACE schools have been merged.

Source: Own construction based on data from the MINEDUC Study Centre.

SECTION 3: RANDOMISATION DESIGN AND DATA USED

MINEDUC and the United Nations Development Program (UNDP) designed an unstratified randomised experiment to measure the programme's impact. The experimental design randomly selected 64 of 220[2] eligible schools to form the treatment group, all of which entered PACE in 2016. Eligible schools consisted of state schools (i.e. municipal schools and delegated administration corporations) that had a High School Vulnerability Index of at least 80 and had not been beneficiaries of PACE in previous years. The remaining 156 schools made up the control group, who did not enter PACE.[3]

The experimental cohort consisted of students in grade 10 during 2015. By 2017 (grade 12), there were 14,936 students in total, of which 4,956 (33%) belonged to the treatment group and 9,980 (67%) belonged to the control group, as Table 2 shows.

Table 2: Distribution of randomised treatment and control groups

Group	Establishments	Students
PACE (Treatment)	64	4,956
No PACE (Control)	156	9,980
Total	**220**	**14,936**

Source: Own construction based on data from the MINEDUC Study Centre.

As Table 3 shows, there were no statistically significant differences between the baseline characteristics of the two groups prior to entering PACE, except for the percentage of students in the academic high school track and attendance percentage, which are significant at the 5% and 10% levels, respectively.[4] A significant difference between the treatment and control groups is expected for some variables due to random chance, and thus the descriptive statistics indicate that the sample data are balanced overall.

Academic information on students was provided by the performance database of the General Student Information System (SIGE) of the MINEDUC Study Center. This includes GPA in grade 10, attendance

[2] 221 schools were initially selected to participate in PACE based on the students' SES, but the budget was sufficient only for 64. One of the 221 schools was in recess, bringing the final sample to 220.

[3] In 2018, establishments in the control group were able to participate in the programme. However, they were only notified after the cohort used in the experimental design had decided whether to enter higher education.

[4] We add these variables as controls in all regressions.

in grade 10, type of school track attended (academic or vocational), and the age and gender of the students.

The SIMCE databases of the Quality of Education Agency provided data on parental education (years of schooling), average household income for 2015, and students' SIMCE scores in grade 10. Using the *Subvención Escolar Preferencial* (Preferential School Subsidy; SEP) law database, we identified the percentage of very low SES students who were eligible for additional financial aid in 2015.

We obtained information on outcome variables from multiple sources. We used information on entrance exam scores (PSU) in Language and Mathematics from the 2018 admissions process, whereas data on enrolment in higher education were provided by the SUA and the Higher Education Information Service (SIES).

Lastly, the Ministry of Education's *Mi Futuro* (My Future) platform databases were used to obtain the wages of graduates from different degree programmes.

Table 3: Descriptive statistics for the characteristics of students in grade 10 and balancing tests

Variables	Treatment group (PACE)	Control group (No PACE)	Difference	Observations
Baseline Language score	231.39	227.88	3.506	12,300
			(4.354)	
Baseline Mathematics score	232.69	226.44	6.253	12,633
			(5.779)	
Father's education (years)	9.57	9.43	0.141	10,003
			(0.174)	
Mother's education (years)	9.73	9.65	0.0801	10,542
			(0.154)	
Family income (in CLP per month)	303,867	286,704	17,163	10,577
			(10,479)	
Academic track	0.68	0.46	0.2226**	14,936
			(0.0805)	
GPA	5.44	5.43	0.0139	14,705
			(0.033)	
Yearly attendance (percentage)	89.13	90.39	−1.256*	14,705
			(0.655)	
Male	0.52	0.50	0.0186	14,936
			(0.0464)	
Age	15.59	15.56	0.0284	14,936
			(0.0395)	
Very low SES student (*alumno prioritario*)	0.50	0.51	−0.00981	14,936
			(0.0452)	

*Note: Robust standard errors in parentheses clustered at the school level. *p < 0.1, ** p < 0.05, *** p < 0.01.*
Source: Own construction based on data from the MINEDUC Study Centre.

SECTION 4: METHODOLOGY

We estimated the effect of the PACE programme on higher education participation and other outcome variables based on the experimental design outlined in Section 3. The comparability of the treatment and control groups, in terms of having the same *a priori* characteristics, on average, is central to this methodology.

To estimate the effect of the programme on continuous and dummy variables, we constructed the following ordinary least-squares (OLS) model:

Equation 1: $$Y_i = \beta_0 + \beta_1 P_i + \beta_2 X_i + u_i.$$

In this model, Y_i is the student's outcome variable (e.g. quality of the higher education degree programme, enrolment in higher education), P_i is a dummy variable that takes a value of 1 if the student is in a school that was randomly allocated to PACE in 2016, and 0 otherwise, and X_i corresponds to a control vector of characteristics for student i – gender, past attendance, grade 10 GPA, grade 10 standardised test scores, and whether they have a very low SES (i.e. they are designated as *alumno prioritario*) – and the student's high school track (vocational or academic). The parameter of interest is β_1, which represents the causal effect of the PACE programme on the different outcome variables, with u_i representing the error term. When the outcome variable is a dummy variable, this model is a linear probability model.

Randomisation implies that $E[u_i|P_i] = 0$, and therefore our results are not affected by selection bias. In the absence of the PACE programme, any given outcome variable should be identical, on average, between the treatment and control groups of students.

Finally, we constructed models that allow us to estimate the heterogeneous effects of the PACE programme. We clustered standard errors at the school level in all models.

SECTION 5: AVERAGE EFFECTS OF PACE

To assess whether PACE's main objective was achieved, we estimated the effect of the programme on the probability of being admitted to an SUA university and entering higher education. Aside from the volume of students entering higher education, a further question relates to the quality of education accessed by students. We investigated this by estimating the impact of PACE on the expected economic return of the degree programmes in which students enrolled.

In addition to this, we estimated the heterogeneous impact on HEI enrolment by the grade 10 GPA within-school percentile. We look at heterogeneity by within-school rank because PACE links admission to rank.

5.1 – Impacts on admissions to SUA universities

We estimated the effect of the programme on the probability of admission to an SUA-affiliated HEI – these are selective universities, offering longer degree programmes with a typically academic-oriented curriculum. By eliminating the requirement of a high-enough score on the entrance exam to enter SUA universities, PACE facilitated admissions to this kind of institution. Table 4 presents results on the impact of PACE on SUA admissions. PACE increased admissions by 4–6 percentage points,

corresponding to a 33%–52% increase compared to the SUA admission rate in the control group, which is 12.3%.[5]

Table 4: Estimated effect of the PACE programme on the probability of an SUA admission

	(1)	(2)	(3)
	SUA admission	**SUA admission**	**SUA admission**
PACE = 1	0.0635***	0.0524***	0.0407***
	(0.0203)	(0.0121)	(0.0121)
Observations	14,936	11,775	11,775
Control variables			
Student characteristics	No	Yes	Yes
High-school track	No	No	Yes

*Note: Robust standard errors in parentheses clustered at the school level. * p < 0.1, ** p < 0.05, *** p < 0.01. OLS coefficients.*

5.2 – Impacts on first-year enrolment in higher education

Next, we examine PACE impacts on HEI enrolment. Table 5 contains the average marginal effect of the PACE programme on the probability of enrolling in an HEI in 2018, the first year since leaving high school, be it a university, technical training centre (CFT) or an IP. We found that the programme had no statistically significant effect on the probability of enrolment when considering HEIs as a whole, regardless of the control variables included. The point estimates are very close to zero.

Table 5: Estimated effect of the PACE programme on the probability of enrolling in an HEI in 2018

	(1)	(2)	(3)
	HEI enrolment	**HEI enrolment**	**HEI enrolment**
PACE = 1	0.0120	0.0040	−0.0050
	(0.0206)	(0.0180)	(0.0169)
Observations	14,379	11,410	11,410
Control variables			
Student characteristics	No	Yes	Yes
High-school track	No	No	Yes

*Note: Robust standard errors in parentheses clustered at the school level. * p < 0.1, ** p < 0.05, *** p < 0.01. OLS coefficients.*
Source: Own construction based on data from the MINEDUC Study Centre.

Table 6 describes the estimated impact of the PACE programme on the probability of entering higher education by type of HEI. We consider enrolment in vocational HEIs and in selective universities. Among vocational HEIs, we further differentiate between CFTs and IPs.[6] We found a positive and statistically significant effect of 3 percentage points on university enrolment (corresponding to 19%), and a negative and statistically significant effect of 3 percentage points on IP enrolment (corresponding to 18%). There was no statistically significant effect on CFT enrolment. When

[5] Tincani et al. (2021) find similar effects using a subset of this dataset that randomly selected 64 schools from the control group in this report.

[6] CFTs (technical training centres) can only award technical certificates (short programmes lasting five semesters), whereas IPs (professional institutes) can award professional titles that do not require a prior academic degree (along with technical certificates). Universities can award academic degrees (bachelor's, master's or doctoral degrees), along with professional titles (whether or not they require a prior academic degree) and technical certificates.

considering CFTs and IPs together – in other words, vocational HEIs – there is a negative and statistically significant effect of 3 percentage points, driven by the impacts on IP enrolment. Therefore, the evidence suggests that PACE induced some students to enrol in selective SUA institutions instead of vocational IPs, and that PACE worked at the intensive margin of the choice of higher education (*where* to enrol) instead of the extensive margin (*whether* to enrol).

Table 6: Estimated effect of the PACE programme on the probability of enrolment in 2018, by type of HEI

	(1) **CFT enrolment**	(2) **IP enrolment**	(3) **Vocational (CFT/IP) enrolment**	(4) **University enrolment**
PACE = 1	−0.0052	−0.0280*	−0.0332**	0.0294*
	(0.0110)	(0.0146)	(0.0154)	(0.0162)
Observations	11,410	11,410	11,410	11,410
Control variables				
Student characteristics	Yes	Yes	Yes	Yes
High-school track	Yes	Yes	Yes	Yes
Average outcome in control group	0.14043	0.15688	0.29731	0.16040

*Note: Robust standard errors in parentheses clustered at the school level. * p < 0.1, ** p < 0.05, *** p < 001. OLS coefficients.*
Source: Own construction based on data from the MINEDUC Study Centre.

Given that the empirically relevant margin of policy response appears to be the intensive margin of where to enrol, we next analyse the impact of PACE on the characteristics of the degree programme in which students enrol. We focus on the average income of past graduates from the programme.

Table 7 shows the effect of PACE on the logarithm of the average earnings of past graduates from the degree programme in which students enrol.[7] We found a positive effect of around 3% (albeit this effect is not significant in the specification that adds all controls, in column 3). The interpretation of this effect is not that PACE increased students' earnings by 3%. Instead, it is that PACE induced students to enrol in higher-paying degree programmes (based on the earnings of past graduates) compared with the programmes they would have entered in the absence of PACE.

[7] This information corresponds to the average gross monthly income (in September 2017 CLP) received by the 2011, 2012 and 2013 cohorts of graduates in the fourth year after graduation. The fourth year is used because these are the data available on mifuturo.cl, which is the dataset we used for this analysis because it distinguishes by degree course and institution.

Table 7: Estimated effect of the PACE programme on the characteristics of the degree programme in which students enrol: earnings of past graduates

	(1) **Log-earnings**	(2) **Log-earnings**	(3) **Log-earnings**
PACE = 1	0.0448*	0.0354*	0.0308
	(0.0245)	(0.0187)	(0.0192)
Observations	4,524	3,734	3,734
Control variables			
Student characteristics	No	Yes	Yes
High-school track	No	No	Yes

*Note: Robust standard errors in parentheses clustered at the school level. * p < 0.1, ** p < 0.05, *** p < 0.01. OLS estimates.*
Source: Own construction based on data from the MINEDUC Study Centre. Information on earnings of past graduates missing for 23% of CFT students, 22% of IP students, and 42% of SUA students.

5.2 – Impact on enrolment in subsequent years

In this subsection, we show the effects of PACE on HEI enrolment in the calendar years from 2019 to 2021, when our data end. Because PACE affects the type of HEI attended, we examine enrolment in different kinds of HEIs.

Table 8: Estimated effect of the PACE programme on the probability of enrolment by type of HEI, 2019–2021

	(1) **CFT enrolment**	(2) **IP enrolment**	(3) **Vocational (CFT/IP) enrolment**	(4) **University enrolment**
2019				
PACE = 1	−0.0102	−0.0230	−0.0333**	0.0150
	(0.0126)	(0.0164)	(0.0149)	(0.0177)
2020				
PACE = 1	−0.0114	−0.0122	−0.0236	0.0143
	(0.0136)	(0.0157)	(0.0146)	(0.0175)
2021				
PACE = 1	−0.0088	−0.0066	−0.0154	0.0153
	(0.009)	(0.0130)	(0.0122)	(0.0180)
Observations	11,410	11,410	11,410	11,410
Control variables				
Student characteristics	Yes	Yes	Yes	Yes
High-school track	Yes	Yes	Yes	Yes

*Note: We consider a student enrolled in an institution in a given calendar year if he or she enrolled in that institution in either the first or second semester; that is, we do not distinguish by the semester in which the student enrolled. We do not distinguish enrolments by programme-year, for example, 2019 enrolments include all students from our sample who were enrolled in higher education in 2019, be it in the second or first year of the degree programme. Robust standard errors in parentheses clustered at the school level. * p < 0.1, ** p < 0.05, *** p < 0.01. OLS coefficients.*

Source: Own construction based on data from the MINEDUC Study Centre.

Table 8 shows that the positive impacts on SUA enrolment decreased in the second year after leaving high school (2019) and then stabilised. Effects are statistically insignificant. However, because these effects are small as a percentage of the entire sample, we may be unable to detect statistically significant effects in this sample. Therefore, in the next section we examine which students were most affected by PACE and whether the effects were persistent for them.

SECTION 6: HETEROGENEOUS EFFECTS OF PACE

In this section, we investigate whether the PACE programme exhibited any heterogeneous effects across different groups.

6.1 – Impact on first-year enrolment

First, we estimated heterogeneity in the probability of first-year enrolment in 2018 by high-school track (academic or vocational). Table 9 shows the effect of PACE for students who attended an academic track in contrast to those who attended a vocational one. We found that there was a positive and statistically significant effect on the probability of enrolling in a selective university for those who attended a vocational track, but no significant effect for those who attended an academic track.[8]

Table 9: Estimated effect of the PACE programme on the probability of enrolling in different types of HEI in 2018, by high-school track

	(1)	(2)	(3)	(4)
	CFT Enrolment	**IP Enrolment**	**Vocational (CFT / IP) Enrolment**	**University Enrolment**
Vocational				
PACE = 1	−0.0174	−0.0195	−0.0369	0.0428**
	(0.0180)	(0.0234)	(0.0271)	(0.0206)
Observations	5,396	5,396	5,396	5,396
Academic				
PACE = 1	0.0039	−0.0323*	−0.0284*	0.0173
	(0.0127)	(0.0171)	(0.0164)	(0.0185)
Observations	6,014	6,014	6,014	6,014
Control variables				
High-school track	Yes	Yes	Yes	Yes

*Note: Robust standard errors in parentheses clustered at the school level. * p < 0.1, ** p < 0.05, *** p < 0.01. OLS coefficients. High-school track measured in grade 10.*

Because PACE guarantees an admission to students who graduate in the top 15% of their school in terms of the GPA, we next analyse impacts by considering whether students were, at baseline, in the top 15% or in the remaining 85% of the GPA distribution in their school.[9] The results in Table 10 show that PACE had a positive and statistically significant effect on enrolment in selective universities exclusively for students ranked in the top 15% by baseline GPA. We then extended this analysis to examine how impacts on top 15% students varied by high-school track type. Table 11 shows that the magnitude of the effect on university enrolment was greater for top 15% students who attended a vocational high-school track.

[8] We did not find any statistically significant effects on enrolment in HEIs as a whole, for either high-school track (not in Table 9).

[9] We focus on baseline grades as endline grades could have responded to the policy.

Table 10: Estimated effect of the PACE programme on the probability of enrolling in different types of HEI in 2018, by baseline within-school rank

	(1) CFT enrolment	(2) IP enrolment	(3) Vocational (CFT/IP) enrolment	(4) University enrolment
Top 15%				
PACE = 1	−0.0055	−0.0497***	−0.0552*	0.132***
	(0.0194)	(0.0182)	(0.0288)	(0.0304)
Observations	1,626	1,626	1,626	1,626
Remaining 85%				
PACE = 1	−0.0059	−0.0246	−0.0304**	0.0123
	(0.0115)	(0.0155)	(0.0154)	(0.0148)
Observations	9,784	9,784	9,784	9,784
Control variables				
Student characteristics	Yes	Yes	Yes	Yes
High-school track	Yes	Yes	Yes	Yes

*Note: Robust standard errors in parentheses clustered at the school level. * p < 0.1, ** p < 0.05, *** p < 0.01. OLS coefficients.*

Table 11: Estimated effect of the PACE programme on the probability that top 15% students enrol in different types of higher education institutions in 2018, by high-school track

	(1) CFT enrolment	(2) IP enrolment	(3) Vocational (CFT/IP) enrolment	(4) University enrolment
Top 15% vocational track				
PACE = 1	−0.0138	−0.0250	−0.0388	0.180***
	(0.0368)	(0.0320)	(0.0507)	(0.0503)
Observations	780	780	780	780
Top 15% academic track				
PACE = 1	−0.0000	−0.0658***	−0.0659**	0.104***
	(0.0187)	(0.0225)	(0.0313)	(0.0366)
Observations	846	846	846	846
Control variables				
Student characteristics	Yes	Yes	Yes	Yes

*Note: Robust standard errors in parentheses clustered at the school level. * p < 0.1, ** p < 0.05, *** p < 0.01. OLS coefficients.*

In Appendix 3, we show graphically how the PACE effects varied by the grade 10 GPA decile and the type of HEI in which students enrolled. As expected, positive impacts on university enrolment and negative impacts on vocational HEI enrolment are concentrated in the top two deciles. This suggests that the PACE policy induced the students with the best grades in their school to enrol in selective universities instead of vocational HEIs.

6.1 – Impact on enrolment in subsequent years

PACE impacts on enrolment are concentrated among students with a baseline GPA in the top 15% of their school. In this subsection, we examine whether the impacts on these students persisted over time. Table 12 shows that effects persisted over time for top students from vocational track high schools, while Table 13 shows that effects waned for top students from academic track high schools. For vocational track students, the treatment effect on SUA university enrolment decreased between 2018 (0.180, column 4 in Table 11) and 2019 (0.104, column 4 in Table 12), but it then stabilised in subsequent years, and it persisted up to four years after the end of secondary schooling, when our data end. For academic track students, this treatment effect became insignificant after two years from the end of secondary schooling.

These results suggest that PACE had effects on enrolment in higher education that were sustained over time. In particular, PACE induced the highest-performing students within their school to enrol in selective SUA universities instead of vocational higher education institutions. These effects persisted for vocational-track top-students up to four years after the end of secondary schooling.

Table 12: Impacts on enrolments in 2019–2021 of top 15% students from the vocational track

	(1) **CFT enrolment**	(2) **IP enrolment**	(3) **Vocational (CFT/IP) enrolment**	(4) **University enrolment**
2019				
PACE = 1	−0.0535*	−0.0206	−0.0741	0.1040*
	(0.0313)	(0.0384)	(0.0496)	(0.0552)
2020				
PACE = 1	−0.0538**	−0.0468	−0.101**	0.1300**
	(0.0253)	(0.0394)	(0.0488)	(0.0551)
2021				
PACE = 1	−0.0221	−0.0719*	−0.0940**	0.1170*
	(0.0170)	(0.0390)	(0.0385)	(0.0649)
Observations	780	780	780	780
Control variables				
Student characteristics	Yes	Yes	Yes	Yes

*Note: Robust standard errors in brackets clustered at the school level. * p < 0.1, ** p < 0.05, *** p < 0.01. OLS coefficients.*

Table 13: Impacts on enrolments in 2019–2021 of top 15% students from the academic track

	(1) CFT Enrolment	(2) IP Enrolment	(3) Vocational (CFT / IP) Enrolment	(4) University Enrolment
2019				
PACE = 1	−0.0128	−0.0614**	−0.0742**	0.0683*
	(0.0198)	(0.0246)	(0.0302)	(0.0378)
2020				
PACE = 1	0.0041	−0.0453*	−0.0412	0.0172
	(0.0198)	(0.0271)	(0.0346)	(0.0413)
2021				
PACE = 1	−0.0109	−0.0141	−0.0251	−0.0012
	(0.0153)	(0.0301)	(0.0322)	(0.0385)
Observations	846	846	846	846
Control variables				
Student characteristics	Yes	Yes	Yes	Yes

*Note: Robust standard errors in brackets clustered at the school level. * p < 0.1, ** p < 0.05, *** p < 0.01. OLS coefficients.*

SECTION 7: ANALYSIS OF DROP-OUTS FROM HIGHER EDUCATION

The findings so far raise the concern that PACE could increase the likelihood that disadvantaged students drop out from higher education, because PACE led some students from vocational high-schools to attend selective universities at a higher rate and vocational higher-education institutions at a lower rate. If these students are less prepared for selective higher-education programmes than they are for vocational higher-education programmes (a mis-match), they could drop out from higher education at a higher rate.

The previous results are silent on mis-match effects. This is because the results on enrolment by calendar year that we have presented combined the effects of drop-outs with those of delayed enrolments and of re-enrolments, making it difficult to understand whether drop-out patterns varied across treatment groups. In this section, we test whether mis-match effects occurred. To do so, we focus on the students who enrolled in the first year of higher education in 2018, and we analyse their drop-out patterns. We define a drop-out as leaving an HEI without a degree after having been continuously enrolled. Drop-out is set to zero in all other cases (e.g. non-enrolment). This way of defining drop-out allows us to measure the total number of students who enrol and drop out in both the treatment and control groups, as a fraction of the sizes of the two groups. If there are mismatch effects, fraction of drop-outs from higher education should be higher in the treatment group than in the control group.

Table 14 shows that the fraction of students who enrolled in higher education in 2018 and subsequently dropped out is the same in the treatment and control groups. This suggests that the fact that PACE induced some students to enrol in selective institutions instead of vocational ones did not lead them to drop out of higher education at a higher rate.

Table 14: HEI drop-out 2019–21

Variables	(1) HEI drop-out 2019 (second year)	(2) HEI drop-out 2020 (third year)	(3) HEI drop-out 2021 (fourth year)
PACE = 1	0.0024	−0.0000	−0.0032
	(0.0071)	(0.00644)	(0.0058)
Observations	11,775	11,775	11,775
Control variables			
Student characteristics	Yes	Yes	Yes
High-school track	Yes	Yes	Yes
Dep. var. mean without PACE	0.0644	0.0731	0.0591

*Note: The outcome variable drop-out in year t >2018 is equal to 1 if a student who has continuously been enrolled in HEI since 2018 is not enrolled in HE in year t, and has not graduated from HEI in any year prior to t. This variable is equal to zero in all other cases (i.e. if a student enrolled and graduated, enrolled and stayed enrolled, or never enrolled). Robust standard errors in brackets clustered at the school level. * p < 0.1, ** p < 0.05, *** p < 0.01. OLS estimates.*
Source: Own construction based on data from the MINEDUC Study Centre.

SECTION 8: THE ADMISSION EFFECTS GAP

We have seen that PACE increased admissions in SUA universities by 4–6 percentage points, depending on model specification (Table 4). In this section, we ask what the admission effects would be when all PACE admissions are allocated. PACE reserves places in SUA universities for all those who graduate in the top 15% in PACE schools, take the PSU, and attend PACE classes in high school (see Section 2.2). Therefore, the maximum number of admissions through the PACE system would be attained when all those who graduate in the top 15% in PACE schools also take the PSU entrance exam and attend PACE classes. We call this the mechanical admission effect, where the word 'mechanical' refers to the notion that this effect is independent of choices that students make, such as the choice not to take the PSU exam. The mechanical admission effect occurs when all places reserved for PACE students translate into an equal number of PACE admissions.

To calculate the mechanical admission effect, we start with a thought experiment. Imagine that no student who graduated in the top 15% of their PACE school would have been admitted to an SUA university in the absence of PACE. Then, the mechanical treatment effect would be equal to the number of students in PACE schools who graduate in the top 15% of their school, because under mechanical admission effects everybody in this group is admitted to an SUA university. Expressed as a fraction of the treatment sample, this treatment effect is 15 percentage points. However, in reality, we expect that some of these students would have enrolled in a SUA university even in the absence of the PACE programme. Therefore, we expect the mechanical admission effect to be lower than 15 percentage points. To calculate how much lower, we need to know how many students who graduated in the top 15% of their PACE school would have enrolled in an SUA university in the absence of PACE. This number is a counterfactual that is not directly observed in the data, because all students in PACE schools are subject to PACE. But we can exploit the randomized experiment to calculate this counterfactual. To do so, we calculate the number of students who graduate in the top 15% of the control schools and are admitted to an SUA university. Expressed as a fraction of the control group

sample, this number is 6 percentage points.[10] We are now in a position to calculate the mechanical treatment effect on SUA admissions; this is obtained as the difference between 15 percentage points and 6 percentage points. Therefore, the mechanical admission effect is 9 percentage points.

We can now compare the admission effects we estimated to the mechanical admission effect that would have occurred if all places reserved for PACE translated into an admission. The admission effect of 4–6 percentage points is 33%–55% lower than the mechanical admission effect of 9 percentage points. This suggests that students behaved in a way that generated a gap between the mechanical admission effect and the observed one. We call this gap the admission effects gap.

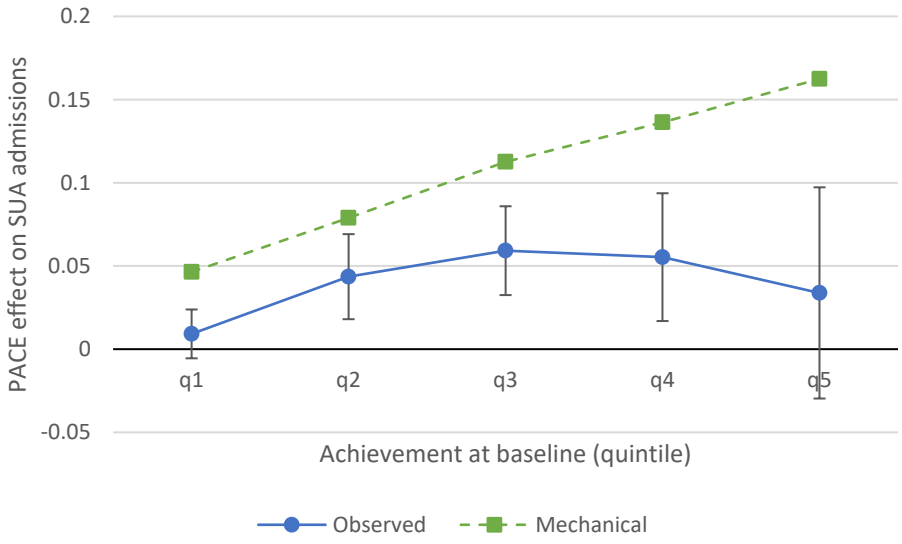
Therefore, PACE had positive impacts on university admissions, which translated into positive impacts on university enrolments, but it could have had much larger impacts. The evidence indicates that not all the university places reserved for PACE admissions transform into PACE admissions. This suggests that the choices of students limited the positive impacts that PACE could have had on SUA admissions.

Next, we analyse how the admission effects gap varies by students' baseline ability, measured by the grade 10 SIMCE score. Figure 1 shows that the gap between mechanical and observed SUA admission effects is more pronounced for students with higher baseline ability.

We further examine differences across genders. Figure 2 shows that while an admission effects gap exists for both male and female students, the widening of the gap by baseline ability is especially pronounced for male students. Therefore, high-ability male students are those relatively most likely to renounce PACE admissions (e.g. by not taking the PSU or by not attending PACE classes).

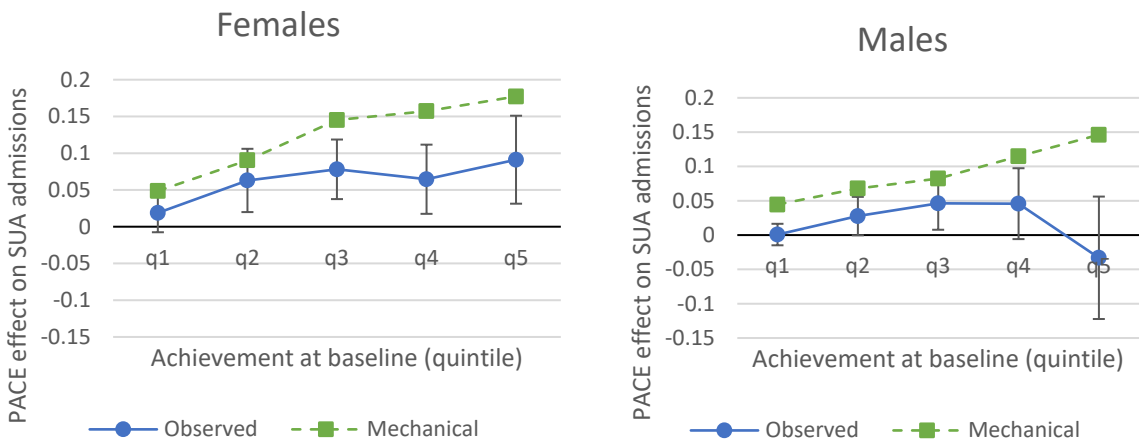
[10] We define a student as graduating in the top 15% if their average GPA over the four years of secondary education is in the top 15% of the school. The central testing authority computes the Puntaje Ranking de Notas (PRN) score by adjusting this raw four-year GPA to account for a student's context. The Pearson's correlation coefficient between the unadjusted four-year GPA and PRN score is 97.44%. Details of how the score is calculated can be found at https://demre.cl/psu/proceso-admision/factores-seleccion/puntaje-ranking.

Figure 1: Admission effects gap



Note: Observed admission effects are obtained from OLS regressions on the five separate subsamples (one per SIMCE quintile). Student and school-track controls are included in all regressions. Error bars represent 95% confidence intervals calculated from standard errors clustered at school level. Mechanical admission effects are obtained as the fraction of control students in each SIMCE quintile who are not admitted to college but graduated in the top 15% of their school.

Figure 2: Admission effects gap by gender



Note: See Figure 1.

SECTION 9: DISCUSSION AND CONCLUSIONS

PACE changed the type of institution that the students with the top grades in their school attended: it increased enrolment in selective universities and decreased enrolment in vocational HEIs. As a result, students from PACE schools enrolled in degree programmes whose graduates earn on average 3% more.

Because the main impact of PACE is to change the type of institution attended, the effect on first-year enrolment in HEIs overall is close to zero and not statistically significant. This is because the positive effect on university enrolment counterbalances the negative effects on enrolment in vocational institutions, on average.

We find that the PACE impacts were concentrated among students in the top 15% of their school in terms of grade 10 GPA and among students from vocational high-school tracks.

Examining impacts on subsequent years, we find that the average impacts of PACE on university enrolment faded over time. But when focusing on the students who experienced the largest impacts (i.e. those from vocational high-school tracks with top grade 10 GPA), we find that the enrolment impacts persist for up to four years after the end of secondary education, when our data end.

A long-standing question in the literature is whether inducing disadvantaged students to enrol in selective institutions, as PACE did, leads them to drop out at a higher rate than the rate at which they would have dropped out from the less selective institution in which they would have enrolled in the absence of the policy. This effect is sometimes referred to as a 'mis-match effect' (Arcidiacono et al., 2011; Arcidiacono and Lovenheim, 2016). If mis-match effects were a feature of our data, we would expect to see more drop-outs from higher education from the treatment group than from the control group. But this is not what we find: the fraction who drop out from higher education is the same across the treatment and control groups. We interpret this finding as evidence against mis-match effects: those who enrol in selective universities because of PACE and then drop out would have dropped out anyway from the institutions in which they would have enrolled in the absence of PACE.

These results complement Chetty et al., (2020), who find that low-income students can reap large benefits from attending selective institutions in the US - in fact, the same benefits high-income students reap. But Chetty et al., (2020) examine disadvantaged students who enrol in university through regular channels. Therefore, these students may be similar to the advantaged students who enter through regular channels. In contrast, we show that there are also potential benefits to enrolling in a selective university for disadvantaged students who would not be able to be admitted through regular channels because of entrance exam scores that are not sufficiently high.

We interpret our findings as evidence that PACE had positive, long-lasting effects on the university enrolment of some high-achieving, disadvantaged students, and it did not increase their dropout likelihood by inducing them to enrol into programmes for which they are ill-prepared.

But we also find that the positive impacts of PACE on university admissions, and therefore on university enrolments, are considerably below the mechanical admission effect. This is the admission effect that we would expect if all students graduating in the top 15% of their school satisfied the other two requirements for a PACE admission (i.e., taking the PSU exam and attending PACE activities). Therefore, not all places reserved for PACE admissions translated into actual admissions. We interpret this as evidence that students made choices that limited the positive impacts of PACE on admissions.

We find that the gap between the mechanical admission effects and the observed admission effect, the admission effects gap, was more pronounced for high ability students, and this was especially true for male students.

There are many reasons why students can decide to renounce a PACE admission. First, students may not feel well prepared for a selective university, or they might simply prefer to go to a vocational programme or to enter the labour market. Second, students may face financial constraints due to their disadvantaged background. Third, students may not like to be admitted preferentially, for example, for fear of stigma or of 'being different' from other students at the university.

Future research should try to disentangle the reasons behind the admission effects gap. If the reason for this gap is not a preference (i.e., the students targeted by PACE do not want to enter SUA institution) but a constraint, such as a financial constraint or a social norm, then the policy could be redesigned to mitigate the effect of such a constraint. Understanding why students made those choices is fundamental to improving the design of the PACE policy and should be a central focus of future PACE evaluations.

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APPENDIX 1: HIGHER EDUCATION INSTITUTIONS ASSIGNED TO THE PACE PROGRAMME IN 2018

Universities:

1) *Universidad de Tarapacá* (University of Tarapacá)
2) *Universidad Arturo Prat* (Arturo Prat University)
3) *Universidad de Antofagasta* (University of Antofagasta)
4) *Universidad Católica del Norte* (Catholic University of the North)
5) *Universidad de Atacama* (University of Atacama)
6) *Universidad de La Serena* (University of La Serena)
7) *Universidad de Valparaíso* (University of Valparaíso)
8) *Universidad de Playa Ancha* (University of Playa Ancha)
9) *Universidad Técnica Federico Santa María* (Federico Santa María Technical University)
10) *Pontificia Universidad Católica de Valparaíso* (Pontifical Catholic University of Valparaíso)
11) *Universidad de Chile* (University of Chile)
12) *Universidad de Santiago de Chile* (University of Santiago, Chile)
13) *Universidad Metropolitana de Ciencias de la Educación* (Metropolitan University of Education Sciences)
14) *Universidad Tecnológica Metropolitana* (Metropolitan Technological University)
15) *Pontificia Universidad Católica de Chile* (Pontifical Catholic University of Chile)
16) *Universidad Católica Silva Henríquez* (Catholic University Silva Henriquez)
17) *Universidad Alberto Hurtado* (Alberto Hurtado University)
18) *Universidad de Talca* (University of Talca)
19) *Universidad Católica del Maule* (Catholic University of Maule)
20) *Universidad del Bio-bío* (University of Bio-bío)
21) *Universidad de Concepción* (University of Concepción)
22) *Universidad Católica de la Santísima Concepción* (Catholic University of the Holy Conception)
23) *Universidad de La Frontera* (University of La Frontera)
24) *Universidad Católica de Temuco* (Catholic University of Temuco)
25) *Universidad Austral de Chile* (Austral University of Chile)
26) *Universidad de Los Lagos* (University of Los Lagos)
27) *Universidad de Magallanes* (University of Magallanes)
28) *Universidad de Aysén* (University of Aysén)
29) *Universidad de O'Higgins* (University of O'Higgins)

IP/CFT:

30) *Centro de Formación Técnica CEDUC UCN* (CEDUC UCN Technical Training Centre)
31) *Instituto Profesional DUOC UC* (DUOC UC Professional Institute)

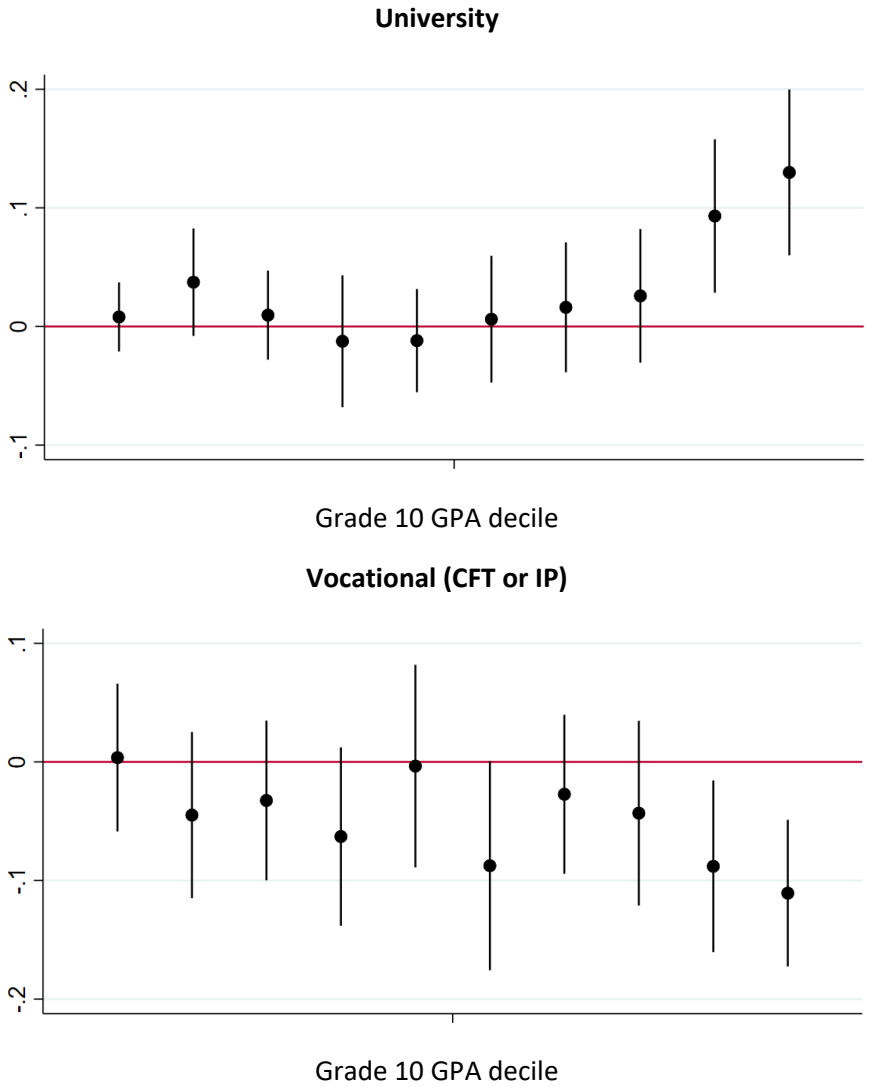
APPENDIX 2: HIGHER EDUCATION INSTITUTIONS ASSIGNED TO THE SINGLE ADMISSION SYSTEM IN 2019

1) *Universidad Arturo Prat* (Arturo Prat University)
2) *Universidad de Antofagasta* (University of Antofagasta)
3) *Universidad de Atacama* (University of Atacama)
4) *Universidad de Aysén* (University of Aysén)
5) *Universidad de Chile* (University of Chile)
6) *Universidad de la Frontera* (University of the Frontier)
7) *Universidad de La Serena* (University of La Serena)
8) *Universidad de Los Lagos* (University of Los Lagos)
9) *Universidad de Magallanes* (University of Magallanes)
10) *Universidad de O'Higgins* (University of O'Higgins)
11) *Universidad de Playa Ancha de Ciencias de la Educación* (Playa Ancha University of Education Sciences)
12) *Universidad de Santiago de Chile* (University of Santiago, Chile)
13) *Universidad de Talca* (University of Talca)
14) *Universidad de Tarapacá* (University of Tarapacá)
15) *Universidad de Valparaíso* (University of Valparaíso)
16) *Universidad del Bio-bío* (University of Bio-bío)
17) *Universidad Metropolitana de Ciencias de la Educación* (Metropolitan University of Education Sciences)
18) *Universidad Tecnológica Metropolitana* (Metropolitan Technological University)
19) *Pontificia Universidad Católica de Chile* (Pontifical Catholic University of Chile)
20) *Pontificia Universidad Católica de Valparaíso* (Pontifical Catholic University of Valparaíso)
21) *Universidad Austral de Chile* (Austral University of Chile)
22) *Universidad Católica de la Santísima Concepción* (Catholic University of the Holy Conception)
23) *Universidad Católica de Temuco* (Catholic University of Temuco)
24) *Universidad Católica del Maule* (Catholic University of Maule)
25) *Universidad Católica del Norte* (Catholic University of the North)
26) *Universidad de Concepción* (University of Concepción)
27) *Universidad Técnica Federico Santa María* (Federico Santa María Technical University)
28) *Universidad Academia de Humanismo Cristiano* (Academy of Christian Humanism University)
29) *Universidad Adolfo Ibáñez* (Adolfo Ibáñez University)
30) *Universidad Alberto Hurtado* (Alberto Hurtado University)
31) *Universidad Andrés Bello* (Andrés Bello University)
32) *Universidad Autónoma de Chile* (Autonomous University of Chile)
33) *Universidad Bernardo O´Higgins* (Bernardo O'Higgins University)
34) *Universidad Católica Silva Henríquez* (Silva Henríquez Catholic University)
35) *Universidad Central* (Central University)
36) *Universidad de los Andes* (University of the Andes)
37) *Universidad del Desarrollo* (University of Development)
38) *Universidad Diego Portales* (Diego Portales University)
39) *Universidad Mayor* (Mayor University)
40) *Universidad Finis Terrae* (Finis Terrae University)
41) *Universidad San Sebastián* (San Sebastián University)

APPENDIX 3: IMPACT OF PACE ON CALENDAR YEAR ENROLMENT IN 2018 BY GRADE 10 GPA DECILE

We analysed whether the effect of the programme varied by grade 10 GPA decile and the type of HEI in which students enrolled. Figure A1 shows the average marginal effect of PACE by GPA decile, using enrolment in a university or a vocational institution (CFT or IP) as the dependent variable, and a 95% confidence interval. For vocational institutions, we found that there was a negative and statistically significant effect for the sixth, ninth and tenth deciles, and that the effect was insignificant for all other deciles. Conversely, for universities, we found that the effect was insignificant for all except the ninth and tenth deciles, where there was a positive and statistically significant effect on the probability of enrolment. This suggests that the impact of PACE was driven primarily by students in the highest GPA deciles at baseline.

Figure A1: Estimated effect of the PACE programme on the probability of entry to higher education in 2018, by grade 10 GPA decile and HEI type (average marginal effects, confidence intervals at 95%)



Source: Own construction based on data from the MINEDUC Study Centre.