



The effect of the pandemic on the transition to tertiary education in Chile: A focus on students with disabilities[☆]

M. Ignacia Contreras^a, Suzanne Duryea^b, Claudia Martínez A.^{c,*}

^a First Impact, Chile

^b Inter-American Development Bank

^c Pontifical Catholic University of Chile

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ABSTRACT

Using a rich set of administrative data, we study the effect of the COVID-19 pandemic on the transition to tertiary education for students with disabilities in Chile. Enrollment rates in primary and secondary education in Chile differ by less than 2 percentage points for students with or without disabilities, but there is an approximately 17 percentage point gap in enrollment in tertiary education. Our difference in differences analysis finds that the pandemic significantly decreased the probability of students with disabilities taking the admission test to tertiary education and enrolling in high-quality tertiary institutions, increasing the inequality in tertiary education. While the pandemic affected the transition to higher education for all students in Chile, students with disabilities were more adversely affected. Understanding how the pandemic has affected opportunities for students with disabilities is critical for informing policies of inclusion.

1. Introduction

The transition to adulthood for youth with disabilities can pose many challenges across high and low-income countries, as young people with disabilities enter the labor market with fewer skills than their peers, receive lower wages, and often struggle to exercise decision-making power despite having reached adulthood (World Bank 2021, Rowe et al., 2020). Promoting the transition to post-secondary education provides students with disabilities the opportunity to acquire skills that yield economic and social returns. Analyzing the transition to tertiary education in Chile in the context of the pandemic is of interest for numerous reasons. First, Chile is one of a larger set of countries in the region that has made important gains in the mainstreaming of students with disabilities in basic education; approximately 80% of students with disabilities complete secondary school. Second, the main program promoting inclusive education in Chile, which provides resources to assess student needs and support inclusion in mainstream schools, was altered fundamentally by the closing of schools in the pandemic. Schools being

closed for in-person instruction prevented the team members from meeting face-to-face with students and providing transition information about tertiary education opportunities and processes.

In this paper, we study the effect of the COVID-19 pandemic on the post-secondary educational trajectory of students with disabilities in Chile. Approximately 18% of students in preschool, primary and secondary education have a disability, and two-thirds of students with disabilities attend mainstream schools in Chile through the School Integration Program (PIE for Programa de Integración Escolar), while one-third attend segregated special education schools.¹ We focus on students in publicly funded secondary schools over the period 2014–2021, comparing trends that occurred over the pandemic with pre-pandemic trends, for students with and without disabilities. The analysis is based on the Ministry of Education flagship school inclusion program (PIE) that defines disability according to functional limitations, but relies heavily on assessing impairments to determine needs. The program defines some disabilities as transitory, such as specific language impairment and attention deficit hyperactivity disorder, and other

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* Corresponding author.

E-mail address: clmartineza@uc.cl (C. Martínez A.).

¹ Own calculations using data provided by the Ministry of Education, considering public schools and voucher private schools. There is no information available for private schools. Private schools which comprise approximately 12.8% of total enrollment of basic education, are not included in the analysis.

disabilities as permanent, such as autism spectrum disorder and blindness.

Education is the first stage of a broader inclusion process, and a key aspect to further inclusion in the labor market and society (Tamayo et al., 2017). Education reduces the probability of individuals with disabilities being in poverty in Chile, with post-secondary schooling having a larger impact than secondary school (12.0 pp reduction vs. 5.6 pp reduction).² For both types of schooling attainment, the impacts on poverty reduction is 3 percentage points less than for individuals without disabilities, suggesting that there may be differences in the articulation process of skills with jobs. The transition away from segregated education is a gradual process and within Latin America and the Caribbean, Chile is one of the countries furthest along in the process of transforming toward inclusive schools (Duryea et al., 2019, García Mora et al., 2021). The expansion of the PIE program in Chile is widely credited with making Chile a reference for inclusive education in basic education as well as serving as a gateway for inclusion in tertiary education. In this context it is important to study whether the pandemic has generated setbacks to inclusion. Understanding how the pandemic has affected the educational trajectories of students with disabilities is critical for informing policies of inclusion, not only for Chile but also for the rest of the region.

This paper contributes to a broader set of studies that rigorously analyze inclusive education in Latin America and elsewhere. Using the education census of Brazil, Vidigal (2019) finds that access to resource rooms equipped with assistive technology and pedagogical material improves the enrollment and academic performance of students with disabilities. Studies in the US and Norway find positive impacts of interventions that promote mainstreaming over segregation on the academic performance and trajectories of students with disabilities (Hanushek 2002, Setren 2021, Myklebust 2007) with studies, including in Chile, finding no evidence of negative spillovers to the learning of students without disabilities if inclusion is accompanied with resources (Kalambouka et al., 2007, Contreras et al., 2020). Whereas the deleterious effects of the pandemic have been widely studied with respect to learning and educational outcomes, with Betthäuser et al. (2023) synthesizing the meta-results from 42 countries, to our knowledge, this is the first paper that quantitatively identifies effects of the pandemic on students with disabilities.

This document is structured as follows. Section 2 describes the Chilean educational system for students with disabilities. Section 3 provides an overview of the effects of COVID-19 on students' educational performance worldwide, and a brief discussion about the expected impact on a more vulnerable population, such as students with disabilities. Section 4 describes the data used for the study and its limitations, and reports summary statistics of students with disabilities. Section 5 describes the empirical strategy and results of estimating the impact of the pandemic on the transition to tertiary. Finally, Section 6 concludes and discusses policy implications.

2. Background

2.1. Inclusion in schools

The Chilean educational system consists of preschool, primary, secondary, and tertiary education.³ Preschool education includes nursery, and two years of preschool, with only the last one compulsory. Primary

and secondary education comprises eight and four years respectively of compulsory education.⁴ Secondary education (ISCED 3) has a general core of two years (grades 9 and 10) and then splits between academic and vocational education⁵ (grades 11 and 12). In terms of funding sources and administration, primary and secondary institutions are classified as public schools (41.5% of schools in 2021), voucher private schools (45.7% of schools) and private schools (12.8% of schools). Voucher schools are publicly funded and privately administered.⁶

While many countries in Latin America continue to exhibit considerable gaps in school attendance in basic education, particularly secondary education, Chile has largely closed the gap in the extensive margin for children with and without disabilities. The difference in net secondary attendance by disability status was lower than 2 percentage points in Chile and lower than in any other country in the region using household survey data (Hincapié et al., 2019). In Latin America as a whole, the average gap in net secondary attendance is 10.7 percentage points, with the gap being substantially higher in Bolivia, Costa Rica and Mexico than in Chile. (Hincapié et al., 2019).

Students with disabilities in Chile attend three types of schools: special schools, schools in hospitals, and mainstream schools. Special schools offer segregated education for individuals younger than 26; 32% of students with disabilities were enrolled in this type of school in 2021.⁷ School attendance in hospitals is not a frequent arrangement and is available only for specific medical situations.⁸ The remaining 68% of students with disabilities are enrolled in mainstream schools throughout the School Integration Program that we will detail below. On average only half of children with disabilities in Latin America and Caribbean attend regular schools for basic education. With two-thirds of students with disabilities attending mainstream schools rather than segregated institutions, Chile is among the three countries in the region with the highest rates of disability inclusion at the internal margin. A wide range exists in the region; Brazil and Mexico send over 70% of students with disabilities to mainstream schools, whereas less than 10% attend mainstream schools in Paraguay (Regional Office of Education for Latin America and the Caribbean, 2013).

2.1.1. The school integration program (PIE)

Launched in the 1990s and updated in 2009, Chile's flagship program to promote the inclusion of students with disabilities in mainstream schools (PIE) provides support to the assessment processes of disabilities⁹ and resources for inclusion. Offered in primary and secondary education, the PIE program serves as a gateway to tertiary

⁴ Chilean primary education (Enseñanza Básica) considers six years of primary education according to ISCED 1, and two years of lower secondary education (ISCED 2). Chilean secondary education consists of four years, and it is equivalent to upper secondary education (ISCED 3).

⁵ "Ciéntifico Humanista" and "Técnico Profesional" in Spanish.

⁶ Public (municipal schools) and voucher schools are mostly financed through a voucher that depends on students' attendance, the level and the modality of teaching. The financing is transitioning to a system where block grants will be provided to public schools. Private schools do not receive any public funding. Public schools can also receive private donations and transfers from other government entities (mostly municipalities). These resources can be freely spent by schools, according to the Ministry of Education guidelines, and they have to be reported to the government yearly.

⁷ In 2021, 79% of students enrolled in special schools attend special schools for language and speech impairment. These schools are for children between 3 and 5 years old.

⁸ Both special schools and schools in hospitals receive public subsidies. If these schools have less than 8 enrolled students, they receive a fixed amount per year. If schools have more than 8 enrolled students they receive an individual voucher per student depending on attendance. In addition, they receive school supplies such as books and teaching materials.

⁹ Students with learning difficulties are included in the assessment and are referred to in the paper as students with disabilities.

² The term percentage point is abbreviated as pp when referred to in parentheses. These calculations are based on a regression controlling for age, urban residence, disability status and type of schooling completed using a sample of individuals ages 25–55 in the 2017 Living Standards Measurement Survey for Chile. Results available from authors.

³ In Spanish: Educación Preescolar o Parvularia, Enseñanza Básica, Enseñanza Media, and Educación Superior.

Table 1

Frequency of assessment required by impairment of PIE students.

	Type of Impairment	Classification of impairment	Frequency of assessment
Permanent	Deafness	Other	36 months
	Blindness	Other	36 months
	Moderate, Severe and Profound Intellectual Disability	Intellectual	24 months
	Autistic Spectrum Disorder (ASD)	Intellectual	12 months
	Dysphasia	Language	12 months
	Multiple disabilities	Other	12 months
Transitory	Mild Intellectual Disability (FIL)	Intellectual	24 months
	Attention Deficit Hyperactivity Disorder (ADHD)	Intellectual	12 months
	Specific Language Impairment (SLI)	Language	12 months
	Specific Learning Disability	Intellectual	12 months

Note: PIE program requires students to undergo assessments by specialists (doctors, psychologist, physical therapist, etc) to determine students' needs. The minimum frequency of assessments range between 12 and 36 months, depending on the type of impairment students present. Once assessment is validated by specialists, the school is eligible to receive the corresponding funding.

Source: Created by the author based on intervention manual of PIE program. https://especial.mineduc.cl/wp-content/uploads/sites/31/2016/09/Manual-PIE.leyOK_web_-1.pdf

education for students with disabilities. Mainstream schools participating in the voluntary PIE program receive greater financial support linked with enrolling students with disabilities than for students without disabilities. For example, in 2019, the monthly voucher for students with permanent or transitory needs was US\$333 and US\$285 respectively whereas the non-differentiated subsidy per student in primary school was US\$113.¹⁰ Vouchers for students with disabilities represent 8.8% of all vouchers in 2020 (Hernández, 2021). Over half of public and voucher schools participated in PIE in 2019.

Program resources must be directed to students with disabilities through hiring specialized support staff such as psychologists or speech therapists, training teachers, or providing materials or equipment to support learning or disability assessments (Mineduc, 2016).¹¹ These modifications are known as reasonable accommodations, or adjustments made to the environment or process that enable students with disabilities to enjoy the same educational opportunities as other students.¹² Examples of assistive devices range from technology such as screen-reading software to pencil grips. PIE requires full-day schools to have at least ten hours per week of professional support per classroom, with at least eight hours in the classroom. The school must prepare an Annual Report with the activities, progress and expenses. Schools must also raise awareness in the educational community about the value of diversity and PIE. All teachers and professionals hired to support students with disabilities (PIE teams) must be registered by the schools in the Ministry of Education system.

All schools with public funding (voucher and public) can apply to PIE on a voluntary basis. Participating schools are required to sign an agreement with the Ministry of Education every year agreeing to incorporate inclusive education as part of their educational program. The administration of PIE permits a maximum amount of funding

(voucher) equivalent to two students with permanent difficulties and five with transitory difficulties per class.¹³ To obtain the special voucher per student, the student must be assessed according to the procedure defined in Decree 170 by professional members of a national registry¹⁴ of the Chilean Ministry of Education and the Ministry of Health. According to these criteria and procedures¹⁵ for identifying students with disabilities, students with certain impairments are eligible to participate in PIE based on an assessment that also considers barriers that impede their learning or participation in the education process. Students with disabilities are characterized as requiring permanent or transitory support (Lobos, 2016). Impairments of a more transitory nature are more likely to require support for a limited period while permanent difficulties are more likely to require sustained support (Mineduc, 2016; Bas, 2021).¹⁶ The frequency of the assessment depends on the student's impairment as reported in Table 1. For example, students who are deaf, would be reassessed every 36 months, whereas students with attention deficit hyperactivity disorder (ADHD), would be reassessed every 12 months.¹⁷ Students require a new assessment to remain in PIE not only if their assessment period has expired, but also if they change schools, or if the severity of the impairment changes over time (Mineduc, 2019).

Tamayo et al. (2017) surveyed PIE school coordinators in urban and rural schools in 2014 to evaluate the implementation of PIE. The authors found that 76–96% of school coordinators agreed that needs of students with disabilities were considered in the planning, implementation, and evaluation of educational activities, with no significant differences found across urban and rural schools. However, both urban and rural schools reported low levels of compliance with accessibility plans for students with mobility impairments (approximately half of the schools), and even lower availability of adapted furniture. Some reasonable

¹⁰ Values of educational vouchers, March 2019, Ministry of Education of Chile. https://www.comunidadescol.cl/wp-content/uploads/2019/07/valor-subservenciones-MARZO-2019Ley21126Reajuste3_5Ley20903.pdf. Exchange rate: 700 Chilean pesos = 1 US dollar.

¹¹ It is not compulsory for schools to hire teachers and professionals for the program, schools can train regular teachers, or assign hours of their own professionals to the program. Thus, the composition of teams varies across schools participating in PIE.

¹² Article 8 of Chilean Law No. 20.422 defines reasonable accommodation as “physical, social and attitudinal adaptations to the environment with respect to the specific impairments of people with disabilities that, effectively and without disproportionate burden, facilitate the accessibility or participation of a person with disabilities on equal terms with the rest of the citizens”.

¹³ The average class size in regular schools with PIE agreement is 31.7 students, and the average class size in school without PIE agreement is 35.2 students.

¹⁴ Registro de Profesionales para la Evaluación y Diagnóstico.

¹⁵ Or Decreto N° 170/2009 corresponds to the regulation of the Law N° 20201 and sets the standards to determine which children are eligible to receive financial and non-financial support, including the participation in PIE.

¹⁶ While decree 170 explicitly requires the assessment to consider functional limitations, rather than exclusive medical diagnosis, much of the criteria depend solely on impairments. For example impairments considered to be of a more transitory nature in PIE are Specific Language Impairment (SLI), Specific Learning Disability (SLD), Attention Deficit Hyperactivity Disorder (ADHD) and Mild Intellectual Disability (FIL). Impairments considered to be of a more permanent nature in PIE are Autistic Spectrum Disorder (ASD), moderate, severe, and profound intellectual disability, blindness, deafness, and multiple disabilities.

¹⁷ For more detail see Table 1.

accommodations (audiobooks, Braille materials, and teachers trained in sign language) were provided to only one-fifth or less of schools – slightly lower in rural schools – with the authors concluding that the Chilean school system was not providing sufficient conditions for inclusion.

2.2. Inclusion in tertiary education

Tertiary education is not compulsory and is delivered by Vocational Education Institutions (CFT), Professional Institutes (IP) and Universities. CFTs offer two-year technical programs (ISCED 5), IPs offer four-year professional non-degree (ISCED 6), but also two-year technical programs (ISCED 5) as CFTs, and Universities offers five-years professional degrees (ISCED 6) and post-graduate degrees (ISCED 7). Both IPs and CFTs in contrast to most universities have open-enrollment policies, meaning no admission test is required. The only academic requirement is to possess a high school diploma, either in academic or vocational secondary education. Universities have admission requirements, assessing high school grades and the results of a general admission test. Public tertiary institutions receive direct public funding but can charge tuition fees to students.¹⁸ Vulnerable students can apply for tuition-free tertiary education in both private and public institutions that satisfy certain quality requirements.¹⁹

Universities, professional institutes, and vocational education institutions undergo mandatory institutional certification by the National Commission of Education of Chile since 2020. Accreditation is essential in terms of student aid, since new tertiary education students will only be able to access state financing or resources that have a guarantee from the State if they enroll in an accredited institution. This certification allows an evaluation of the degree of compliance and quality of education on dimensions such as teaching, strategic management and institutional resources, internal quality assurance and relationship with the environment, research, creation and/or innovation. Tertiary education institutions are assessed at the level of the institution or individual programs. In this paper we use the institutional level certification. The number of years of certification is a proxy for the quality of the institution. We define the quality as high if the institution has 5–7 years of certification, medium for 2–4 years of certification, and low quality if not certified.

Generally, the application process to universities in Chile starts with taking the general admission test at the end of an academic year and finishes with application and enrolment into tertiary education at the beginning of the following year. The test can be taken by students who finished secondary education. The admission test has had several changes in recent years, including the topics covered. In this paper we focus on the 2020 student cohort, that graduated secondary school in 2020, took the general admission test in 2020 and started tertiary education in 2021. The general admission test in 2020 was called the Transitory University Test (Prueba de Transición Universitaria) and had four different modules: mathematics, spanish, history and science. Each university and undergraduate degree requires a different weighted

average of these 4 modules, in addition to the average secondary school grade and ranking. Students apply to a specific program and institution through a centralized process of the more prestigious institutions or apply directly to institutions that do not participate in the process. Applicants with the highest weighted averages are admitted to each degree program until the available openings are filled. Students with disabilities can request accommodations in the general admission test (extra time, individual rooms, sign language interpreter, etc), but the accommodation depends on the institution that administers the test (Victoriano and Treviño, 2022).

Attendance gaps are more pronounced in higher education. While 31.9% of the adult population has completed some post-secondary education according to the 2017 data, the figure is only 14.7% for people with disabilities (CASEN, 2017). Although a national inclusion program such as PIE is not implemented in post-secondary schooling, some tertiary institutions have programs designed to accommodate students with disabilities.

3. COVID-19 and education

The potential effect of the pandemic on student learning and student motivation is widely recognized, but studies have not focused on students with disabilities or the differential effect on transitions to different schooling levels. The evidence shows Latin America and the Caribbean region was the most affected by the pandemic in terms of school closures, with an average of 158 days closed between March 2020 and February 2021. Worldwide, countries with the longest duration of school closures were also shown to have very low shares of school-age children with access to fixed internet connection in the home, suggesting that technology was not meeting learning needs (UNICEF, 2021). Even in countries as Netherlands, where quality of education is more equitable, where internet access is widespread, and where lockdown was relatively short (8 weeks) during 2020, results reveal learning losses in school performance, and larger negative effects among students from less-educated backgrounds (Engzell et al., 2021). These results also appear in Belgium (Maldonado et al., 2021).

While some research has already revealed the potential for dramatic setbacks in learning, and future earnings among the generation of school-age children in Latin America (Azevedo et al., 2020; Betthäuser et al., 2023), little to no research has examined impacts on vulnerable populations such as immigrant students or students with disabilities. Dorn et al. (2021) found that learning losses from the pandemic, measured as months lost of learning and performance, disproportionately affected students of color and low-income students, which then increased historical inequities in opportunities and achievements. Qualitative studies (Couper-Kenney and Riddell, 2021) show that the provision of differential education services for students with disabilities were suddenly interrupted by lockdowns, severely affecting their educational progress and well-being.

3.1. The pandemic and education in Chile

In mid-March of 2020, with the onset of the pandemic, schools all over Chile closed due to lockdown. 71% of schools remained closed until June 2021, meaning most students did not have in-person classes for one and a half years (Claro et al., 2021a). Moreover, UNESCO's report shows Chile, as well as most Latin American countries, had among the longest durations of school closures worldwide (full and partial), with 77 weeks until November 2021 (UNESCO, 2021). In August 2021, the status of school openings varied across schools in Chile, with 61% of public schools, 93% of voucher private schools and 97% of private schools open (Claro et al., 2021b).²⁰ Only by October 2021 were 98% of schools open.

¹⁸ Public institutions are publicly funded through the Direct Fiscal Contribution (DFC). The block grant is available to universities belonging to the Council of Rectors (CRUCH) that brings together 18 public and 12 historic private institutions, existing since 1983. The DFC is assigned 95% according to historic criteria and 5% based on annual efficiency indicators that considers the number of undergraduate students, full time professors with postgraduate students, research projects and indexed populations.

¹⁹ There are requirements for the institutions and for the individuals. Among other requirements, institutions must be non-profit and must meet accreditation criteria. The institutions must apply policies of equal access for students, and have support programs for vulnerable students to promote their retention, and ensure that at least 20% of enrollees are from the lowest four income deciles. The family income of students must be in the lowest 60% per national capita household income.

²⁰ Claro et al., (2021c) use national representative surveys to principals to estimate school's status in Chile during 2020 and 2021.

Table 2
Enrollment of students with disabilities.

	(1) 2014	(2) 2015	(3) 2016	(4) 2017	(5) 2018	(6) 2019	(7) 2020	(8) 2021
Panel A: Primary and secondary education								
Students with disabilities	420,645	454,637	487,947	505,353	535,956	550,381	500,702	549,539
Special Education Students	176,772	182,113	182,782	182,034	183,328	185,451	181,667	175,740
PIE Students	243,873	272,524	305,165	323,319	352,628	364,930	319,035	373,799
Transitory PIE	189,339	216,938	240,441	258,060	274,769	286,881	244,057	288,479
Permanent PIE	54,534	55,586	64,724	65,259	77,859	78,049	74,978	85,320
Students with disabilities as % of total	13.6%	14.7%	15.8%	16.4%	17.4%	17.7%	16.0%	17.6%
PIE as % of students in regular schools	8.4%	9.4%	10.5%	11.2%	12.2%	12.5%	10.9%	12.7%
Average PIE class concentration	7.9%	8.8%	9.9%	10.5%	11.5%	11.7%	10.2%	12%
Panel B: Tertiary education								
Number of PIE students at the last grade of secondary education	4400	6147	8115	9819	11,853	13,164	13,831	-
Number of total students at the last grade of secondary education	167,891	170,199	166,065	166,610	170,183	170,302	179,626	-
Number of PIE students who (per cohort [†]):								
Take general admission test	2966	4319	5989	7636	9264	10,767	9516	-
Enrolled to tertiary education	1250	1848	2667	3421	4248	4722	4595	-
Enrolled to high quality institution	838	1293	1951	2561	3274	3710	3571	-
Enrolled to medium quality institution	269	407	588	769	828	835	855	-
Enrolled to low quality institution [‡]	74	76	107	91	146	177	169	-
Enrolled to a certified institution	1107	1700	2539	3330	4102	4545	4426	-
Certified vocational education	404	524	790	987	1255	1446	1292	-
Certified Professional Institute	467	763	1188	1507	1905	2013	1926	-
Certified University	236	413	561	836	942	1086	1208	-

Notes: Panel A includes information of all students of public and publicly funded private voucher schools of primary and secondary students for cohorts 2014–2021 and excludes those enrolled in adult education and private schools.

[†]A cohort corresponds to the year when students finished secondary education. For example, cohort 2014 corresponds to students who finished in 2014, took the general admission test at the end of 2014 and enrolled or not to tertiary education at the beginning of year 2015. Panel B includes information of all students of public and publicly funded private voucher schools who complete secondary education for cohorts 2014 – 2021.

[‡]In 2014, 2015 and 2016 there are some observations missing information on the certification of the institution. These observations (69, 72 and 21 respectively) are not included in the quality analysis.

Source: Authors' calculation using Students Enrollment dataset 2014–2021, Study Department, Chilean Ministry of Education.

In response to lockdowns, the Ministry of Education provided guidelines to support remote learning (Mineduc, 2020b).²¹ Online materials (books, guides, videos, etc) were developed to support teachers in online classes, however not all students had access.²² Claro et al. (2021c) estimated that approximately 5% of school students did not attend any kind of school activity during the observed period, either remote or in-person. Estimates from the Ministry of Education of Chile indicate the pandemic widened learning gaps, affecting mainly students of poorest quintiles and public education (Mineduc, 2020a, 2021).

There were also important changes in educational procedures related to the pandemic conditions. School enrollment in primary and secondary was automatic from 2020 to 2021, per capita subsidies were delinked to student attendance, and recording protocols for student attendance were changed (Mineduc, 2020d).²³ Grading protocols in primary and secondary were altered such that only certain classes were mandated graded (Mineduc, 2020d).²⁴ These changes in procedures made it infeasible to address the impact of the pandemic on short term enrollment, attendance and grades. Assessments of new students with disabilities within PIE schools were delayed, both for students entering school and for those changing schools, particularly in 2020, as the procedures largely required in-person assessments (Mineduc, 2020c).

Each tertiary education institution defined their instructional mode in 2020 and 2021 based on the lockdowns in their location (which

differed by municipality) and the required social distancing. This implied that most institutions did not provide in-person instruction in 2020, and there was a gradual movement to in-person instruction in the second term of 2021 mostly in teaching that had a practical application, and it only became fully in-person in the first term of 2022. The 2020 admission exam was implemented in person with COVID-19 protocols (social distancing, masks) and included fewer subjects than previous years. PIE students could request additional accommodation as related to the pandemic conditions, such as additional social distance (on top of the accommodation otherwise requested) in 2020 and 2021 process.²⁵ The Ministry of Education provided guidance to tertiary education institutions about how to provide virtual education and how to evaluate students' academic performance in a pandemic context (Mineduc, 2020e, 2020f).

4. Data

4.1. Data sources

We use administrative data from the Ministry of Education in Chile for 2014–2021.²⁶ Tertiary education data are available at the individual level. It includes information for students who took the national general entrance test to university and enrollment in tertiary education (type of institutions and degree program to which admitted) from students who completed secondary education from cohort 2014 (admission to tertiary education in 2015) to cohort 2020 (admission in 2021). The available data also includes information about institutional certification of tertiary education assessed by the National Commission of Education (Comisión Nacional de Acreditación - CNA), which allows to classify the

²¹ In Chile, the academic year starts at the beginning of March and ends in mid-December.

²² In cases where students did not have internet access, the school should have contacted them via telephone, or in person to provide the educational material, which made follow-up by teachers more challenging.

²³ Given these changes in reporting, verified through the observed reduction in the variance of these variables, we do not use this information in our analysis.

²⁴ Schools could include any other assessed subject depending on the capacity of school teams during the pandemic.

²⁵ <https://demre.cl/inclusion/>

²⁶ <https://datosabiertos.mineduc.cl/> Comparable data for PIE students and schools is available from 2014.

degree of compliance and quality of tertiary degrees across institutions.

The primary and secondary education level data are available at the student level²⁷ and at the school level for each year of analysis. Available data at student level includes student enrollment to preschool, primary and secondary education from 2014 to 2021; and information per year if students participate in the School Integration Program (PIE) from 2014 to 2021. For students in PIE, there is information about the type of disability (intellectual, language, auditive, visual, physical, psychological, or multiple disabilities) and if the difficulty is permanent or transitory. School level data includes schools participating in the School Integration Program (PIE) from 2014 to 2021.

We identify students with disabilities as those participating in PIE at a regular school with a PIE agreement. In consideration of the reported difficulties of in-person disability assessments associated with the pandemic, we define an indicator of previous participation in PIE, we identify students that have ever participated in the program from 2014 to 2020 (historical PIE student). This includes students that have been in PIE at any year between 2014 and 2021. The analysis includes information on public schools and private voucher schools. Private schools, representing 12.8% of schools in 2020, were excluded from the study because there is no standardized data available for students with disabilities. When considering tertiary education outcomes, we include all institutions (private and public) where students have matriculated after completing secondary school at public and publicly funded private voucher schools.

When analyzing tertiary education outcomes, we study the cohort of students that completed secondary school in 2020.²⁸ This is the first generation of students for which the transition to tertiary education has been potentially affected by the pandemic.²⁹

4.2. Summary statistics

This section describes the evolution of participation in the School Integration Program (PIE), as well as individual and school characteristics such as gender, vulnerability, and outcomes variables such as enrollment in tertiary education.

4.2.1. School level education

Table 2, Panel A shows the enrollment of students with disabilities in primary and secondary education in Chile from 2014–2021, and the composition in terms of type of difficulty (transitory or permanent). In 2021, 549,539 students with disabilities were enrolled in formal education at the school level, which represents 17.6% of the total of students of preschool, primary and secondary education. Of the total of students with disabilities, 175,740 (32%) were students enrolled in special education (EE) and 373,799 (68%) were students enrolled in regular schools through the School Integration Program (PIE). 77% of PIE students (288,479 students) were assessed as having transitory difficulty, and the remaining 23% (85,320 students) were assessed as having permanent difficulty.

There has been a significant increase in the number of students with disabilities enrolled over time (30.6% between 2014 and 2021) and in the share of the student population they represent. Particularly, the number of students who participate in PIE increased 53% during this

period, from 243,873 students in 2014 to 373,799 students in 2021.³⁰ In 2014 students participating in PIE represented 8.4% of total students at regular schools, and in 2021 this percentage increased to 12.7%. The average concentration of PIE students in classrooms also increased from 7.9% in 2014 to 12% in 2021.³¹ This increase reflects both, an increase in assessments, and the number of schools participating in the program over time. On the other hand, the number of students in special education (EE) remained constant over the same period.

The number of PIE students increased steadily through 2019. In 2020, with the pandemic, there was a 12.6% decrease in the number of PIE students and a 2.1% decrease in the number of students in special schools. In contrast, the enrollment of students without disabilities increased by 2.3% in the same period. Then, in 2021 there was a recovery in the number of students in PIE, with a 17.2% increase. The observed decrease across 2019–2020 was less pronounced for students assessed as having permanent needs as compared with transitory needs. The number of students with transitory needs fell from 286,881 in 2019 to 244,057 in 2020, a decline of 14.9%, and the number of students with permanent needs fell from 78,049 to 74,978 in the same period, decreasing only 3.9%. In 2021, the number of students with both PIE transitory and permanent needs increased, maintaining the fraction of both groups similar to the 2018 level. The decrease of students with transitory needs could be related to the more frequent assessment required to retain PIE, as defined in the technical guidelines of PIE (Mineduc, 2013, 2016), which in most cases is once a year.

Regarding characteristics of PIE students, on average PIE students are more economically vulnerable than students without disabilities. For the 2016–2020 cohorts, between 63.9% and 66.7% of PIE students belong to the 33.3% more vulnerable families³² of the population compared to 48.7–49.4% of students without disabilities. Girls comprise approximately 40% of PIE students compared to 50% of students with no disabilities, and this proportion has remained constant over time.

4.2.2. Tertiary education

Table 2, Panel B shows the enrollment of students from PIE in tertiary education. The number of students at the last grade of secondary education that were part of the PIE program has tripled from 4400 students in 2014 to 13,831 students in 2020, paving the way for inclusion of students with disabilities in higher education.³³ In 2014, 2966 PIE students took the general admission test to apply to tertiary education (representing the 67.4% of PIE students of this cohort), which increased to 10,767 (81.8% of PIE students) in 2019 and then decreased to 9516 (68.8%) in 2020. There has also been a steady increase in enrollment in tertiary education of PIE students until 2019, from 1250 in 2014 (28.4% of PIE students) to 4722 in 2019 (35.9%). This enrollment decreased to 4595 in 2020 (33.2%).

For all cohorts, most PIE students who enrolled in tertiary education have enrolled in a certified institution (more than 88% in 2014 and 96% in 2020). Regarding the type of tertiary institution, the proportion of PIE students who enrolled in vocational education has diminished over time, from 36.5% for cohort 2014 (404 PIE students) to 29.2% for cohort 2020 (1292 PIE students). On the other hand, the proportion of PIE students enrolled at professional institutions and universities has increased from 42.2% for cohort 2014 (467) to 43.5% for cohort 2020 (1926), and from

²⁷ The data is anonymized to protect confidentiality. The research design was approved by the Research Ethics Committee of the Pontifical Catholic University of Chile (ID 210930001) on December 21, 2021.

²⁸ Students who attended the last year of secondary education in 2020 and applied to tertiary education in 2021's admission period.

²⁹ The application process of students who finished secondary education at the end of 2019 was not affected by the pandemic.

³⁰ As a reference point, the total number of students in regular schools increased by 1.3% between 2014 and 2021, and the number of students within special education decreased by 0.6% during the same period.

³¹ Percentage of PIE students over total students in a classroom.

³² Vulnerable population is defined by the Ministry of Education as "Priority students" when students are part of the 33.3% more vulnerable population, and defined as "Preferential students" when students are part of the 80% more vulnerable population.

³³ The proportion of PIE students out of the total number of students in the last grade of secondary school increased from 2.6% to 7.7%.

Table 3

Average tertiary education outcomes for students with disabilities (historic PIE) and students without disabilities (non-PIE) for cohort 2019 and 2020.

	(1) Cohort 2019	(2)	(3)	(4)	(5)	(6) Cohort 2020	(7)	(8)	(9)	(10)
<i>Tertiary education Outcomes</i>	Total students average	PIE students average	Students w/o disabilities	Difference	p-value	Total students average	PIE students average	Students w/o disabilities	Difference	p-value
Take general admission test	91.2%	82.7%	92.8%	-10.1%	0.00	83.2%	69.9%	86.1%	-16.2%	0
Enrolled to tertiary education	51.1%	38.0%	53.6%	-15.6%	0.00	47.9%	35.0%	50.7%	-15.7%	0
Enrolled to high quality institution	40.0%	30.2%	41.8%	-11.7%	0	37.6%	27.4%	39.9%	-12.5%	0
Enrolled to medium quality institution	9.8%	6.5%	10.4%	-3.9%	0	9.0%	6.3%	9.6%	-3.3%	0
Enrolled to low quality institution	1.3%	1.3%	1.3%	0.0%	0.946	1.2%	1.3%	1.2%	0.1%	0.03
Certified vocational education (CFT)	7.2%	10.7%	6.6%	4.1%	0	6.0%	9.0%	5.3%	3.7%	0
Certified Professional Institute (IP)	13.3%	15.9%	12.8%	3.1%	0	12.3%	14.1%	11.9%	2.2%	0
Certified University	29.2%	10.0%	32.8%	-22.8%	0	28.3%	10.5%	32.2%	-21.7%	0

Note: Table includes information of all students of public and publicly funded private voucher schools who complete secondary education in 2019 and 2020. N 2019 = 170,302, N 2020 = 179,626.

Source: Authors' calculation using Students enrollment 2019–2020, student performance 2014–2020, Chilean Ministry of Education.

21.3% (236) to 27.3% (1208) respectively.

Regarding tertiary education outcomes, we first report the probability of taking the general admission test, which is required for applying to universities. Table 3 also shows if the students enroll in any institution, by institution quality, and the type of institution vocational education (CFT), professional institute (IP) or university. Before the pandemic (columns 1–5), 91.2% of students of the 2019 cohort (students who finished school at the end of 2019) took the general admission test. The figure is 82.7% for historical PIE students and 92.8% for students without disabilities. In the same cohort, 51.1% of students that finished secondary education in 2019 (corresponding to 170,302 students) were enrolled in tertiary education. This fraction is significantly smaller for students with PIE, reaching 38%.³⁴ Regarding the quality of education, the fraction of students enrolled in high, medium, and low-quality education are 40%, 9.8%, and 1.3% respectively (as a percentage of the total number of students who finished secondary education in 2019). Students with disabilities are less likely to enroll in high and medium-quality institutions than students without disabilities, with 30.2% in high-quality in comparison with 41.8% for students without disabilities, and 6.5% in medium-quality in comparison with 10.4% for students without disabilities. There are no statistically significant differences on the proportion of PIE and non-PIE students that enter low-quality education. Finally, 7.2% of students study in vocational studies, 13.3% in professional institutes, and 29.2% in a university. PIE students are more likely to study vocational education and are to study in professional institutes than students without disabilities. The fraction of PIE students in universities is substantially smaller, reaching 10% in comparison with 32.8% of students without disabilities. Therefore, we see that before the pandemic, students with disabilities were less likely to take the entry exam, to enroll in tertiary education, to enroll in high and medium-quality institutions and to enroll in a university than their peers.

Columns 6–10 of Table 3 show average tertiary education outcomes for the 2020 student (those students who completed secondary school at the end of 2020, and were potentially affected by the pandemic). First, a

lower proportion of students took the general admission test, and enrolled in tertiary education than the 2019 cohort. Similarly to the comparisons for the 2019 cohort, students with disabilities were less likely to take the entry exam, to enroll in tertiary education, to enroll in high and medium-quality institutions and to enroll in a university than students without disabilities. Moreover, differences across disability status increased for the more recent cohort with respect to taking the entrance exam and enrolling in high quality institutions.

5. Empirical strategy and results

Comparing educational outcomes across disability status, as shown in the previous section, highlights long standing differences in opportunities for post-secondary education. In this section we study if the pandemic had a differential impact on these outcomes for students with disabilities. A simple comparison of the outcomes of students with and without disabilities after the pandemic would not provide an accurate estimate of the impact of the pandemic as there are pre-existing differences between these groups. Examining the change in educational outcomes before and after the pandemic only for students with disabilities would confound the pandemic effect on all students with the specific effects on students with disabilities. Our analysis uses a difference in difference strategy that compares the changes in outcomes of students with disabilities with the changes in outcomes of students without disabilities, and can thus show the differential impact of the pandemic on students with disabilities.

5.1. Empirical strategy

We use a difference in difference analysis to study the impact of the pandemic on tertiary education outcomes (general admission test, enrollment) for students with disabilities in Chile. The main estimation equation will be:

$$Y_{it} = \beta_0 + \beta_1 PIE_i + \beta_2 Post_t + \beta_3 PIE_i * Post_t + \beta_4 X_{it} + \xi_{it}$$

where i represents each student and t each academic year. Y_{it} is any educational outcome variable, such as enrollment to tertiary education. PIE_i is an indicator variable that takes the value of one if individual i participates in the PIE program and zero otherwise. $Post_t$ is a dummy variable to indicate the academic year t . It takes the value of one if the year is 2020 (during the pandemic) and the value of zero if the year is

³⁴ PIE students of cohort 2019 of students finishing secondary education (and for all cohorts of PIE students) who enrolled to tertiary education at the beginning of 2020 were less likely to live in rural areas (5% in comparison with 7%), to be a vulnerable student (priority student) (56% in comparison with 60%), and to study at a public school (59% in comparison with 63%) than PIE students who did not continue tertiary education after finishing school.

Table 4

Entrance to tertiary education of cohort 2020: Probit Average Marginal Effects.

Variable	(1) General Admission Test	(2) Enrolled in tertiary education	(3) High quality institution	(4) Medium quality institution	(5) Low quality institution
Disability (Historic PIE)	-0.0339 *** (0.00198)	-0.0951 *** (0.00366)	-0.0756 *** (0.00360)	-0.0220 *** (0.00223)	0.000494 (0.000780)
Pandemic	-0.0747 *** (0.00115)	-0.0317 *** (0.00187)	-0.0216 *** (0.00181)	-0.00778 *** (0.00104)	-0.00114 *** (0.000411)
Disability (Historic PIE) * Pandemic	-0.00993 *** (0.00238)	-0.00597 (0.00465)	-0.0142 *** (0.00458)	0.00381 (0.00285)	0.00141 (0.000985)
Disability HP Permanent	-0.0545 *** (0.00240)	-0.0711 *** (0.00540)	-0.0638 *** (0.00540)	-0.0141 *** (0.00347)	-0.00144 (0.00113)
Women	0.0498 *** (0.000995)	-0.00729 *** (0.00171)	-0.0367 *** (0.00166)	0.0256 *** (0.000973)	0.00406 *** (0.000376)
Public School	-0.0320 *** (0.00106)	-0.0127 *** (0.00192)	-0.00114 (0.00187)	-0.0143 *** (0.00111)	0.00279 *** (0.000410)
Vocational secondary education	-0.114 *** (0.00115)	-0.105 *** (0.00209)	-0.0801 *** (0.00204)	-0.0269 *** (0.00122)	0.000469 (0.000453)
Preferential student	0.0426 *** (0.00161)	0.0362 *** (0.00258)	0.0244 *** (0.00249)	0.0109 *** (0.00142)	-0.000900 (0.000569)
Priority student	0.0275 *** (0.00159)	0.0368 *** (0.00265)	0.0290 *** (0.00257)	0.00770 *** (0.00148)	-0.00166 *** (0.000581)
PIE class concentration	-0.0497 *** (0.00490)	-0.145 *** (0.00949)	-0.106 *** (0.00929)	-0.0261 *** (0.00567)	-0.0149 *** (0.00209)
Preferential class concentration	0.0929 *** (0.00495)	-0.00380 (0.00802)	0.0119 (0.00775)	-0.00171 (0.00445)	-0.00379 ** (0.00179)
Priority class concentration	-0.0842 *** (0.00374)	-0.114 *** (0.00612)	-0.0689 *** (0.00591)	-0.0462 *** (0.00340)	0.00680 *** (0.00135)
Observations	349,928	349,928	349,928	349,928	349,928

Note: The sample consists of students who have completed secondary education in public and publicly funded private voucher schools in 2020 and applied to tertiary education in 2021's admission period. Data excludes those students enrolled in adult education and private schools. Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: Authors' calculation using Students enrollment to tertiary 2018–2021, Chilean Ministry of Education.

2019 (previous the pandemic). The coefficient on the interaction term, β_3 , estimates the difference in difference effect. X_{it} includes dummy variables for permanent disability, public school, women, priority and preferential students, and the concentration of students (PIE, preferential, and priority) in the student's class. We include these controls to consider students and school characteristics that can affect their students' outcomes.

In addition, we present false experiments using data of years prior to the pandemic as robustness checks. These false experiments consider the treatment variable *PIE* as an indicator that takes the value one if individuals participate historically in PIE, and zero otherwise. Then, in the first experiment, the *Post* variable takes the value one if the year is 2019 to represent the false experiment of a pandemic in 2019, and the value of zero if the year is 2018. The second and third experiments explore the thought experiment of the pandemic in 2018 and 2017 respectively. Hence, these placebo models explore whether the differential effect of the 2020 pandemic on students with disabilities is measured robustly.

5.2. Results

Table 4 displays the average marginal effect of a probit model estimating five outcomes related to the transition to tertiary education for cohort 2020 – taking the national general admission test (column 1), enrollment on tertiary education (column 2), and enrollment to tertiary education by quality of institution (columns 3, 4 and 5). Being a student with a disability decreases the probability of taking the national general admission test and the probability of enrollment in tertiary education (column 1 and 2) by 3.4 and 9.5 percentage points respectively. For all students, the pandemic had a negative and significant effect on the probability of taking the test (–7.5 pp) and on the probability of enrollment in tertiary education (–3.2 pp). The negative and statistically significant interaction term (Historic PIE x Pandemic) implies that students with disabilities were even more affected by the pandemic in terms of taking the admissions test. Compared to the years without the pandemic, the pandemic decreased the probability that students with

disabilities took the general admissions test by 8.5 percentage points. Compared with students without disabilities, the pandemic did not have a statistically significant additional effect on the probability of enrollment in tertiary education.

Examining the quality of institutions (column 3, 4 and 5) reveals interesting patterns. In all years, students with disabilities are less likely to enroll in high quality and medium quality institutions than their peers. The *pandemic* term shows the decrease in overall enrollment for all types of institutions, particularly high-quality institutions with a decline of 2.16 percentage points. The interaction term shows a statistically significant decrease in enrollment of students with disabilities in high-quality institutions during the pandemic, with an effect of 1.4 percentage points. Compared to years before the pandemic, for students with disabilities the pandemic decreased enrollment in high-quality institutions by 3.5 percentage points. There are no statistically significant differences on the probability of students with disabilities enrolling in medium quality institutions and low-quality institutions.

Therefore, the pandemic disproportionately affected the probability of PIE students taking the tertiary admissions test as well as to enrolling in high-quality tertiary institutions. These results are consistent with students with disabilities not receiving the support needed in their last year of secondary school due to the pandemic, related to the availability of reasonable accommodations to take the exam, or other barriers related to the pandemic that disproportionately affected the access of students with disabilities to the exam.³⁵

³⁵ The general admission test for cohort 2020 was carried out in person between January 4th and January 8th of 2021. By that date, the second wave of COVID was starting, meaning the rate of positivity (7%) and the number of people getting the virus (3,500–4,000 individuals per day) was starting to increase after months of 1,500–2,000 infected individuals per day. Regarding vaccination, national population was not having access to COVID vaccination until March 2021. During this period, lockdowns were reduced because of the end of year holidays and summer season.

Table 5

Enrollment in certified tertiary education of cohort 2020 by type of institution: Probit Average Marginal Effects.

Variable	(1) Vocational education (CFT)	(2) Professional Institute (IP)	(3) University
Disability (Historic PIE)	0.0175 *** (0.00148)	0.0269 *** (0.00224)	-0.195 *** (0.00391)
Pandemic	-0.0124 *** (0.000897)	-0.0108 *** (0.00124)	-0.00697 *** (0.00162)
Disability (Historic PIE) * Pandemic	0.00193 (0.00192)	-0.00743 *** (0.00288)	0.0118 ** (0.00502)
Disability HP Permanent	-0.00985 *** (0.00213)	-0.0342 *** (0.00338)	-0.0508 *** (0.00638)
Women	-0.00465 *** (0.000794)	-0.0230 *** (0.00112)	0.0186 *** (0.00154)
Public School	0.00432 *** (0.000866)	-0.0154 *** (0.00125)	-0.00386 ** (0.00174)
Vocational secondary education	0.0202 *** (0.000920)	0.0463 *** (0.00132)	-0.202 *** (0.00195)
Preferential student	0.0120 *** (0.00134)	0.0256 *** (0.00176)	0.00448 ** (0.00221)
Priority student	0.0159 *** (0.00135)	0.0289 *** (0.00180)	-0.00246 (0.00231)
PIE class concentration	0.00697 * (0.00403)	-0.0245 *** (0.00608)	-0.132 *** (0.00913)
Preferential class concentration	0.0550 *** (0.00420)	0.141 *** (0.00551)	-0.112 *** (0.00698)
Priority class concentration	0.0931 *** (0.00313)	0.0451 ** (0.00420)	-0.205 *** (0.00532)
Observations	349,928	349,928	349,928

Note: Data considers students completing the final year of secondary education in public and publicly funded private voucher schools in 2020, and applied to tertiary education in 2021's admission period. Students completing secondary school in adult education or in private schools are excluded from the analysis. (Standard errors in parentheses), ***p < 0.01, **p < 0.05, *p < 0.1
Source: Authors' calculation using Students enrollment to tertiary 2018–2021, Chilean Ministry of Education.

Table 5 shows the effects of the pandemic on enrollment in specific types of certified tertiary institutions (vocational, professional, and traditional). Students with disabilities have a higher probability of being enrolled in vocational or professional education, and are 19.5 percentage points less likely to enroll in a university. The pandemic resulted in a decrease in enrollment in all certified institutions for students in general (*pandemic* coefficient), with vocational education the most affected. Students with disabilities decreased their enrollment in certified professional institutes compared with peers and increased enrollment in certified universities by 0.7 and 1.2 percentagepoints respectively. While the results in Table 4 reveal disproportionate impacts of the pandemic on students with disabilities with respect to taking the general admission exam and enrollment in high quality tertiary institutions as defined by the years of certification, COVID-19 had a more nuanced effect on the relative enrollment of students with disabilities across the different types of educational institutions. Overall, this suggests that students with disabilities had more difficulties accessing the well-established institutions during the pandemic.

5.2.1. False experiments

As robustness checks, Table 6 shows the results of false experiments carried out with three cohorts that completed secondary school before the pandemic hit (2017, 2018 and 2019 cohorts). Each column represents a different dependent variable for a different cohort, and only the coefficient of the interaction term is shown.³⁶ The objective is to check whether the negative interaction measured for the true pandemic affecting the 2020 cohort is an artifact driven by underlying differential trends for students with and without disabilities. If an artifact, the interaction would be similarly negative with the result indicating the trend rather than the true pandemic. Panel A shows the results for taking the general admission test and enrollment in tertiary education, panel B entrance to tertiary education by quality of institution and panel C by type of institution. Regarding the admission test and enrollment, before the pandemic there was an upward trend for PIE students, which implies that the negative impact of the pandemic on the 2020 cohort as shown in Table 4 is not driven by underlying trends in the data. We also find a positive trend in enrollment in high quality institutions and a negative trend in enrollment in low quality institutions, whereas Table 4 shows a decline of enrollment in tertiary education after the pandemic for PIE students. Finally, the effect by type of institution (Panel C), it is unclear as the coefficient signs change or are not significant in most cases.

These robustness results show that the pre pandemic differential trends in the data are not driving the results, lending more weight to the findings that the pandemic has disproportionately affected students with disabilities with respect to taking the general tertiary admission exam and in enrolling in high quality tertiary institutions.

6. Discussion and policy recommendation

The lengthy closure of in-person schooling associated with the pandemic in Chile interrupted the assessment of student needs and disrupted the delivery of a program that provides differentiated services and resources to support the inclusion and learning of students with disabilities (PIE), putting students with disabilities at particular risk of adverse effects from the pandemic.

Using a difference in difference analysis, we find that the pandemic significantly reduced the probability that students with disabilities took the general admission test for entrance to tertiary education and significantly reduced the probability of enrolling in high-quality tertiary institutions. While the pandemic affected the transition to tertiary schooling for all students, our findings suggest that students with disabilities were disproportionately affected. Compared with students without disabilities, the pandemic had an additional negative impact on taking the exam of 1 percentage point and on enrolling in a high-quality institution of 1.4 percentage points for students with disabilities. The overall impact of the pandemic on students with disabilities was thus an 8.5 percentage point decline in the probability of taking the tertiary admission test and a 3.5 percentage point decline in the probability of enrolling in a high-quality institution. These results highlight the importance of considering barriers to learning and participation for students with disabilities which may be exacerbated in a crisis, even in the presence of a strong program for inclusion.

The PIE program provides support to students with disabilities through mainstream public schools in Chile, one of the countries in the region with the highest rates of disability inclusion at the school level. However, there is no national program focused on the inclusion of students with disabilities in tertiary education. While students with and without disabilities attend primary and secondary school at similar

³⁶ For columns 1, 4 and 7 of Table 6, Post coefficient takes the value of one if the year is 2017 and the value of zero if the year is 2016. For columns 2, 5 and 8, Post coefficient takes the value of one if the year is 2018 and the value of zero if the year is 2017. And for columns 3, 6 and 9, Post coefficient takes the value of one if the year is 2019 and the value of zero if the year is 2018.

Table 6

False experiments: Enrollment in tertiary education of cohort 2017, 2018 and 2019.

<i>Panel A: Admission Test and Enrollment</i>	(1) General Admission Test Cohort 2017	(2) General Admission Test Cohort 2018	(3) General Admission Test Cohort 2019	(4) Enrolled in tertiary education Cohort 2017	(5) Enrolled in tertiary education Cohort 2018	(6) Enrolled in tertiary education Cohort 2019			
Disability (Historic PIE) * Post	0.00722 *** (0.00258)	0.00135 (0.00226)	0.0104 *** (0.00205)	0.0127 * (0.00666)	0.0162 *** (0.00571)	0.0129 ** (0.00503)			
<i>Panel B: Enrollment by Institution Quality</i>	(1) High quality institution Cohort 2017	(2) High quality institution Cohort 2018	(3) High quality institution Cohort 2019	(4) Medium quality institution Cohort 2017	(5) Medium quality institution Cohort 2018	(6) Medium quality institution Cohort 2019	(7) Low quality institution Cohort 2017	(8) Low quality institution Cohort 2018	(9) Low quality institution Cohort 2019
Disability (Historic PIE) * Post	0.0176 *** (0.00671)	0.0120 ** (0.00573)	0.0159 *** (0.00502)	0.00500 (0.00458)	-0.000478 (0.00381)	-0.00329 (0.00323)	-0.00381 *** (0.00137)	0.00341 *** (0.00119)	-0.00128 (0.00106)
<i>Panel C: Enrollment by Type of Institution</i>	(1) Certified Vocational education (CFT) Cohort 2017	(2) Certified Vocational education (CFT) Cohort 2018	(3) Certified Vocational education (CFT) Cohort 2019	(4) Certified Professional Institute (IP) Cohort 2017	(5) Certified Professional Institute (IP) Cohort 2018	(6) Certified Professional Institute (IP) Cohort 2019	(7) Certified University Cohort 2017	(8) Certified University Cohort 2018	(9) Certified University Cohort 2019
Disability (Historic PIE) * Post	0.00191 (0.00284)	0.00688 *** (0.00243)	0.000785 (0.00216)	0.0110 *** (0.00418)	0.00309 (0.00359)	0.00277 (0.00317)	0.0228 *** (0.00800)	-0.00179 (0.00664)	0.0173 *** (0.00568)

Note: Data considers students completing secondary school in public schools in each year, including publicly funded private voucher schools. (Standard errors in parentheses) ***p < 0.01, **p < 0.05, *p < 0.1

Source: Authors' calculation using Students enrollment to tertiary 2016–2019, Chilean Ministry of Education.

rates, students with disabilities are 15.7% less likely to transition to post-secondary education. Moreover, our results show that the gap has widened with the pandemic. The transition to tertiary education is crucial in a context of high returns to education, and where access to quality jobs is highly correlated with post-secondary education. These results suggest the need for policies that more generally support the transition of students with disabilities from basic schooling to next steps in education, training programs or internships where they can acquire capacities that facilitate personal and financial autonomy. Whereas PIE is available nationally at the basic schooling level, the support for students post-secondary is much more fragmented. Tertiary students with disabilities can apply to a government program for funding to purchase assistive technology, or accommodation services such as sign-language interpretation or personal assistance, but this program does not require coordination on the part of universities. Given the growing pipeline of talent, addressing the transition to post-secondary education more holistically for students with disabilities is warranted.

One limitation of the study is that we only have data for the years immediately after the pandemic, and therefore we cannot address if there are long term impacts. Another limitation is that changes made in 2020–2021 in the way teachers report student grades and attendance in basic schooling reduced the variation in these outcomes, making it infeasible to explore the differential impact of the pandemic on these outcomes in elementary and secondary school. There is a large knowledge gap regarding the impacts of the disruptions in the assessments of student needs and the provision of differential services in basic schooling. As the reporting of student performance returns to previous standards, it will be possible to assess the heterogeneous impacts of the pandemic for these earlier levels of education and draw conclusions about where to focus remedial interventions so that the pandemic does not leave disproportionate long-term impacts on learning and inclusion of students with disabilities.

CRediT authorship contribution statement

M. Ignacia Contreras: Software. **Suzanne Duryea:** Conceptualization, Methodology, Formal analysis. **Claudia Martínez A.:** Conceptualization, Methodology, Formal analysis.

References

- Azevedo, J.P., Hasan, A., Goldemberg, D., Geven, K., Iqbal, S.A., 2020. Simulating the potential impacts of covid-19 school closures on schooling and learning outcomes a set of global estimates. *Policy Research Working Paper 9284*. Education Global Practice. World Bank Group.
- Bas, P. (2021). Ecosistemas educativos de apoyo a alumnos con necesidades especiales. *Tesis Magister en Economía Aplicada Pontificia Universidad Católica de Chile*, Mimeo.
- Bethäuser, B.A., Bach-Mortensen, A.M., Engzell, P., 2023. A systematic review and meta-analysis of the evidence on learning during the COVID-19 pandemic. *Nat. Hum. Behav.* <https://doi.org/10.1038/s41562-022-01506-4>.
- CASEN (2017) Encuesta de Caracterización Socioeconómica Nacional, Resultados Personas con Discapacidad, Ministerio de Desarrollo Social. (http://observatorio.ministeriodesarrollosocial.gob.cl/storage/docs/casen/2017/Casen_2017_Discapacidad.pdf).
- Claro, S., Valenzuela, J.P., Undurraga, E.A., Canales, A., and Kuzmanic, D. (2021c). Seminario concurso de políticas públicas de CPP UC. Encuesta de monitoreo nacional del sistema educacional en pandemia.
- Claro, S., Valenzuela, J.P., Undurraga, E.A., Canales, A., and Kuzmanic, D. (2021a). Análisis de resultados de encuesta nacional de monitoreo de establecimientos escolares en pandemia: Aprendiendo desde la realidad nacional. reporte 5: Semana del 14 al 18 de junio, 2021.
- Claro, S., Valenzuela, J.P., Undurraga, E.A., Canales, A., and Kuzmanic, D. (2021b). Análisis de resultados de encuesta nacional de monitoreo de establecimientos escolares en pandemia: Aprendiendo desde la realidad nacional. reporte 6: Semana del 9 al 13 de agosto, 2021.
- Contreras, D., Brante, M., Espinoza, S., Zuñiga, I., 2020. The effect of the integration of students with special educational needs: Evidence from Chile. *International Journal of Educational Development*.
- Couper-Kennedy, F. and Riddell, S. (2021). The impact of covid-19 on children with additional support needs and disabilities in Scotland. *European Journal of Special Needs Education*, Vol. 36, NO. 1, 20–34, Centre for Research in Education Inclusion and Diversity, University of Edinburgh, UK.
- Dorn, E., Hancock, B., Sarakatsannis, J., and Viruleg, E. (2021). Covid-19 and education: The lingering effects of unfinished learning. *McKinsey Company, Public Social Sector Practice*.
- Duryea, S., Salazar, J.P., and Pinzon, M. (2019). We the people: Inclusion of people with disabilities in Latin America and the Caribbean. *Inter-American Development Bank*.

- Engzell, P., Frey, A., Verhagen, M.D., 2021. Learning loss due to school closures during the covid-19 pandemic. *Proc. Natl. Acad. Sci.* 118 (17). e2022376118.
- García Mora, M.E., Orellana, S.S., and Freire, G. (2021). Disability inclusion in Latin America and the Caribbean: A path to sustainable development. *World Bank*.
- Hernández, V. (2021). Análisis multiproducto: Caso del programa de integración escolar en Chile. *Tesis Magister en Economía Aplicada, Pontificia Universidad Católica de Chile*.
- Hincapié, D., Duryea, S., and Hincapié, I. (2019). Advancing disability inclusion in Latin America and the Caribbean. *Policy Brief 299, Inter-American Development Bank*.
- Kalambouka, A., Farrell, P., Dyson, A., Kaplan, I., 2007. The impact of Placing Pupils with Special Educational Needs in Mainstream Schools on the Achievement of their Peers. *Educational Research*.
- Maldonado, Joana Elisa, Kristof De Witte (2021). The effect of school closures on standardized student test outcomes. *British educational Research Journal*.
- Mineduc (2013). Orientaciones técnicas para programas de integración escolar (PIE). *Ministerio de Educación, Gobierno de Chile*.
- Mineduc (2016). Manual de apoyo a la inclusión escolar en el marco de la reforma educacional. programa de integración escolar pie, ley de inclusión 20.845. *Ministerio de Educación, Gobierno de Chile*.
- Mineduc (2019). Documento preguntas frecuentes incorporación de estudiantes a programa de integración escolar (PIE). *Ministerio de Educación, Gobierno de Chile*.
- Mineduc (2020b). Orientaciones Mineduc covid-19. *Ministerio de Educación, Gobierno de Chile*.
- Mineduc (2020c). Orientaciones para evaluaciones diagnósticas PIE y escuelas especiales en contexto de la pandemia por covid-19. *Ministerio de Educación, Gobierno de Chile*.
- Mineduc (2020d). Orientaciones para la implementación de la priorización curricular en forma remota y presencial. *Unidad de Currículum y Evaluación, Ministerio de Educación, Gobierno de Chile*.
- Mineduc (2020e). Orientaciones generales para la educación a distancia: Orientaciones generales para el desarrollo de evaluaciones activas a distancia. *Ministerio de Educación, Gobierno de Chile*.
- Mineduc (2020f). Orientaciones generales para guiar el aprendizaje de los estudiantes a distancia en instituciones de educación superior. *Ministerio de Educación, Gobierno de Chile*.
- Mineduc (2020a). Impacto del covid-19 en los resultados de aprendizaje y escolaridad en Chile. Documento de trabajo 21, Centro de Estudios, Ministerio de Educación, Gobierno de Chile.
- Mineduc (2021). Efectos de la suspensión de clases presenciales en contexto de pandemia por COVID-19. Evidencias 52, Centro de Estudios, Ministerio de Educación, Gobierno de Chile.
- Tamayo, M., Rebolledo, J., Besoain-Saldaña, A., 2017. Monitoring inclusive education in Chile: differences between urban and rural areas. *Int. J. Educ. Dev.* 53, 110–116.
- UNESCO (2021). Education: From disruption to recovery. UNESCO global dataset on the duration of school closures.
- UNICEF (2021). Covid-19 and school closures: One year of education disruption.
- Victoriano, Eugenia and Ernesto Treviño (2022). "University access policies for persons with disabilities: Lessons from two Chilean universities". *International Journal of Educational Development* 91.