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# ABSTRACT

## School Choice and Higher Education Attainment*

We analyze how school vouchers affect post-secondary attainment by exploiting the universal voucher program implemented in Chile in 1981. The program allowed students to choose which primary and secondary schools to attend. The government covered tuition independently of whether the chosen school was private or public. We find that vouchers increased the probability of attending PSE by 2-4 percentage points and the probability of PSE graduation by 1-3 percentage points. Students from low socio economic backgrounds benefited the most. Further, we study whether the impacts of vouchers depend on when school choice becomes available in a student's educational path. We find that the impacts of vouchers on PSE outcomes are maximized if vouchers are introduced before students start middle school.

**JEL Classification:** H43, I21, J31
**Keywords:** vouchers, school choice, higher education attendance

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# 1 Introduction

An important question in education is whether vouchers and school choice can improve education quality and students' outcomes. Vouchers allow economically-disadvantaged students to afford private, potentially better, schools. In addition, the introduction of vouchers typically increases competition between private and public schools leading to an increase in the quality of education offered by public schools.[1] However, critics of voucher programs argue that the private sector may "cream skim" the most talented students or wealthiest students generating negative impacts on who remains enrolled in the public school system.[2]

The impact of vouchers on students' outcomes has generated great interest in the literature and several studies investigated the effects on students' test scores during primary or secondary school.[3] However, little is known regarding the long-term effects of vouchers on educational attainment, in particular post-secondary educational attainment. We study one of the largest voucher programs in the world, instituted in

[1] Vouchers have been shown to increase public schools' performance measured by standardized test scores and public students' GPA. Evidence of this effect has been found in the US (Hoxby, 2003; Chakrabarti, 2008, 2013; Figlio & Hart, 2014; Figlio & Rouse, 2006; Figlio & Karbownik, 2016), Canada (Chan & McMillan, 2009; Card et al., 2010), Chile (Gallego, 2013) and Sweden (Sandström & Bergström, 2005; Böhlmark & Lindahl, 2015).

[2] Hsieh & Urquiola (2006) show that, in Chile, vouchers encouraged middle-class students to leave public schools in favor of private schools. A similar effect was also found in Sweden, although the magnitude is smaller compared to Chile (Böhlmark & Lindahl, 2015). The evidence from the US is less conclusive. Vouchers lead to nonrandom reallocation of students from public to private schools but which group of students reallocates across schools strongly depends on the design of the voucher program (Epple et al., 2017).

[3] Overall, vouchers have been shown to increase test scores among students who take advantage of the voucher system (Shakeel et al., 2021). However, the size of the impact varies greatly by voucher program and country. In the US, the empirical evidence comes from small scale voucher programs and points at heterogeneous effects. Vouchers have a positive impact on test scores among African Americans (Mayer et al., 2002; Peterson et al., 2007) but do not generate robust effects on test scores among other voucher students. Wolf et al. (2010) finds no effect on the average student; Rouse (1998) and Witte et al. (2012) find some positive effects, while Abdulkadiroglu et al. (2015); Figlio & Karbownik (2016) find negative test score effects on the average student. In India, Muralidharan & Sundararaman (2015) show that vouchers increased test scores with respect to one subject, Hindi, but had no impact on other test scores. In Colombia, vouchers generated large positive effects on achievement tests and completion rates of secondary school (Angrist et al., 2002, 2006).

Chile in 1981 for both primary and secondary school students, and investigate whether the introduction of vouchers has had any impact on post-secondary education (PSE) outcomes.

Program impacts are identified using a cross-cohort regression analysis, exploring the fact that exposure to the voucher program is determined by students' birth year. When the voucher program was introduced in 1981, four cohorts were already in secondary school (grades 9-12), four cohorts were in middle school (grades 5-8) and an additional four were in elementary school (grades 1-4). We compare these cohorts to students not affected by the program who graduated from secondary school before 1981 and to students who entered primary school after 1981 and were exposed to vouchers since the start of their schooling years. This is an exceptional opportunity to tackle three important questions:

1. Do vouchers affect PSE outcomes in Chile?
2. In light of the evidence on cream skimming, do the effects on PSE outcomes differ by students' socioeconomic background?
3. When is the best time in terms of PSE outcomes to introduce a voucher (and therefore school choice) in a student's educational path? Should the government introduce vouchers since the beginning of primary school or would vouchers have equal effects if introduced later on?

Our results indicate that the Chilean voucher program has increased both PSE attendance and graduation among cohorts who received vouchers before the beginning of high school. In particular, we find that vouchers distributed before high school helped students from low socio economic backgrounds (measured by parental education) and significantly improved their likelihood of completing PSE. We find smaller but still positive effects on students from higher socio economic status. Further, the benefits of

vouchers in terms of PSE outcomes are maximized if vouchers are distributed before middle school starts in grade 5. That is, if policymakers are interested in using vouchers to maximize PSE attainment, then school choice should become available by the end of elementary school. The benefits of school choice, in terms of PSE outcomes, decrease if vouchers are introduced later on.

Our findings contribute to the extensive literature on vouchers. The closest papers to ours are Chingos & Peterson (2015) and Böhlmark & Lindahl (2015) who investigate the impact of vouchers on PSE attendance and graduation in New York and Sweden, respectively. Chingos & Peterson (2015) study the long term effects of the New York School Choice Scholarship Foundation program providing scholarships to low-income families with children in elementary school. The scholarship allowed students to attend any private school within New York City. Using weighted least squares and probit estimators, the authors find that the program had a positive effect on college enrollment and attainment among African American students, but no effect on other students. Böhlmark & Lindahl (2015) exploit a voucher reform implemented in Sweden in 1992 allowing students free choice between public and independent schools, i.e. publicly funded but independently run schools. Using a difference-in-differences approach the authors find that the introduction of vouchers in 1992 led to the expansion of independent schools. In turn, this expansion is shown to increase the fraction of students attending university and students' total years of schooling.

With respect to these studies, our contribution is threefold. First, we are the first ones to investigate whether the effects of vouchers differ depending on when vouchers are introduced in someone's educational path. This question is highly relevant for policymakers and has not been investigated in the literature yet. Second, we analyze for the first time whether the effects on PSE outcomes differ depending on students' socioeconomic background. Finally, we use evidence from Chile, whose voucher pro-

gram and education context differ substantially from those in New York or Sweden. As indicated by Epple et al. (2017), the success of a voucher program greatly depends on its setup and on country-specific characteristics.

The Chilean voucher system is of particular interest because of its large scale. The distribution of vouchers is unrestricted and all children are eligible to receive a voucher. Since the program is not targeting a specific group of students, it has the potential to generate large effects on students and schools. In addition, the voucher program has been shown to increase student segregation by school (Hsieh & Urquiola, 2006). Therefore, it is important to assess whether vouchers can improve PSE outcomes for everyone.

A number of early studies of the Chilean voucher system, such as Mizala & Romaguera (2000), employ OLS regressions of test scores on school type (private versus public) and include student demographic characteristics in an effort to control for selection. An alternative approach, employed in Sapelli & Vial (2002), uses a Roy-style selection model to estimate test score gains associated with public versus private schooling. They find no consistent differences between the two sectors. More recently, researchers have sought out plausibly exogenous variation in the degree of market competition across Chilean municipalities. Hsieh & Urquiola (2006) discuss the challenges of evaluating the school choice as the result of the voucher program due to school selectivity. For this reason they conduct a municipality-level analysis, and find that the voucher program contributed to a higher segregation of students across schools with gains to middle and high income students, but with no gains in students' academic progress measured by test scores and years of schooling. In contrast, Gallego (2013) uses the historical distribution of Catholic priests to instrument the ratio of voucher to public schools and find that an increase in competition led to increased test scores in both public and private schools. Farias & McIntosh (2019) uses a similar method-

ology to Gallego (2013), but measure competition as the number of private-voucher or public schools, separately, within a distance from the reference school, rather than as a ratio. They find that a higher local concentration of private voucher schools hurts the other schools due to student sorting, but a higher local concentration of public schools increases the scores in both types of school.

In this paper, we follow a different approach in evaluating the Chilean universal voucher program. When implemented in 1981, the program affected differently the students that were already in school compared to those that had not started school yet. This is because the former could only use the voucher for part of their schooling years. Their birth year determines the exposure to the voucher program. More specifically, cohorts born between 1963–1975, which were in grades 1–12 in 1981, could use the voucher over only part of their schooling, whereas those born after 1975 could use vouchers during the entire duration of their schooling. Students born before 1963 were unaffected. By exploiting when students were exposed to the voucher program, we are able to determine at what stage in education a voucher would be more effective in boosting students' educational attainment.

The paper proceeds as follows. The next section describes the education system in Chile and the voucher program. In Section 3 we explain the empirical strategy. Section 4 describes the data. In Section 5 we present the results and discuss the robustness analysis. Section 6 concludes.

# 2 The Chilean Contex

## 2.1 Education system

The school system in Chile is organized in three sequential levels: pre-school education for children up to 5 years of age, primary education for children aged 6 to 13 years, and secondary education for ages 14 to 17. Primary education has been compulsory

since 1965 and is divided in two main stages. Grades 1–4 (or elementary school) are taught by a single teacher while grades 5–8 (or middle school) are taught by multiple teachers, one for each subject. Children must turn 6 years old by May 31 to enroll in first grade in September. Secondary education, or otherwise known as high school, has been compulsory since 2003. The first two years are dedicated to general training and are the same for all students. During the final two years, instead, students choose among three tracks: humanistic-scientific, technical-professional and artistic (Santiago et al., 2013).

In terms of financing, there are three types of schools that teach both at the primary and secondary levels: (i) Municipal-subsidized schools are state-subsidized schools run by municipalities and are part of the voucher program; (ii) Private-subsidized schools are privately run and accept voucher students; (iii) Private-unsubsidized are privately run schools that do not accept vouchers.

After graduating from high school, students who wish to continue to higher education can choose between a university program or a program at a Professional Institute or Technical Center. All post-secondary institutions charge tuition fees. When applying for university, students select their program and field of study at the time of application. University students study for four to seven years; those studying for four or five years usually obtain the equivalent of a bachelor's degree. Degrees in engineering, medicine and law are granted after six or seven years of university.

Chilean traditional universities (i.e. established before 1981) are the most prestigious in the country and are members of the Consejo de Rectores de las Universidades de Chile (CRUCH, Council of Rectors of the Chilean Universities) (Kaufmann et al., 2013). Admission to CRUCH universities is administred centrally by DEMRE, an office within the Universidad de Chile that acts on behalf of all CRUCH members. CRUCH consists of all public universities as well as some private universities, such as

the prestigious Pontificia Universidad Catolica de Chile and other Catholic universities. Admission to CRUCH universities is based on students' high-school grades and scores from a standardized admission test called Prueba Selección Universitaria (PSU).

## 2.2 Education Reforms

During the early 1980s, the Chilean education system underwent decentralization and privatization. The management of public schools was decentralized and transferred from the National Ministry of Education to local municipalities. Further, privately owned schools and public schools started to receive funding in the form of vouchers, therefore funding levels became contingent on enrollment and retention. To this day, vouchers allow students of any economic background to apply to any public or private-subsidized school in any municipality. The goal is to create competition among schools in order to increase education quality. At the same time, the voucher program seeks to remove financial barriers faced by poor students and help them access better schools. However, all students are entitled to a voucher irrespective of their family income. Effectively, the program provides tuition-free education for everyone at a private-subsidized or public school.

Private schools are regarded as providing higher quality of instruction compared to public schools, and hence it would be the rational choice of any parent to choose private schools. However, private schools do not enroll on a first-come first-serve fashion. The majority operate as for-profit enterprises.[4] Contreras et al. (2010) documents that private schools consistently select their students based on ability and family socioeconomic status. Mizala & Torche (2012) report that 44% of private schools ask students to write admission exams and 36% require parental interviews before enrollment.

[4]In fact 70% of private-subsidized schools are for-profit (Elacqua, 2009), and even those schools with a not-for-profit status can distribute dividends to principals and school board members (Urquiola & Verhoogen, 2009).

Moreover, private-subsidized schools can further select students by dismissing and expelling them if disruptive.

Until the 1990s, the government had almost no regulatory role with respect to how the voucher system worked. However, starting with the first mandate of the democratic party in 1991, several changes to the voucher program were implemented. Initially, vouchers covered tuition fees fully but, in 1993, a shared-financing program was introduced. This change allowed private schools to charge tuition fees to students to complement the voucher. This is thought to have exacerbated the segregation of students across schools since tuition fees could be used to select students based on their socio-economic status and ability to pay.

The education market has seen many changes since the introduction of vouchers and many new private-subsidized schools opened. In 1981 private-subsidized schools enrolled 15% of students. Instead, public schools educated almost 80% of the student population. Following the reform, the market shares changed quickly within only five years. The enrollment of private-subsidized schools doubled and that of public schools decreased to 60%. By 2009 these shares changed further to 51% and 42%, with private-subsidized schools having the largest share. The share of private-unsubsidized schools has remained generally unchanged between 5.5–9.5% since 1981 (see Bravo et al., 2010, fig.1).

In addition to the voucher program, the government implemented other education reforms that are of interest to our paper since the birth cohorts who entered school under the voucher system might have been affected by some of these succeeding reforms.

The *Programa 900 Escuelas* (P900) was introduced in 1990 and is still in operation. This program supports the worst performing schools to ensure that students achieve basic skills with respect to reading, writing and math. The program supplies teaching materials to primary schools, conducts workshops for teachers and for students with

learning disabilities, ensures that all primary-school students have access to textbooks, and provides resources to improve schools' infrastructure.

Between 1992 and 1997, the Chilean government launched additional programs to further improve the quality of its education system. The *Programa de Mejoramiento de la Calidad y Equidad de la Educación Básica* (MECE Básica) enhanced the coverage and quality of pre-school education, expanded access to elementary-school textbooks, provided teaching materials, improved infrastructure, and supplied classroom technology. The *Programa de Mejoramiento de la Equidad y Calidad en la Educación Superior* (MECESUP) funded infrastructure projects at 25 CRUCH universities, introduced an accreditation process for degree programs and instituted accountability measures. Funds were allocated to universities based on their performance. In 2010, the MECESUP program was expanded, which led to the redesign of the undergraduate curriculum, doctoral programs and vocational education.[5]

In 1996, the government introduced performance-based bonuses for teachers in primary and secondary schools under the *Sistema Nacional de Evaluación del Desempeño de los Establecimentos Educacionales* (SNED) program. The financial reward depends on schools' performance evaluated based on standardized test scores administered biennially. Schools whose students fall in the top 25% within each region receive the financial award; 90% of the amount is then distributed to all teachers proportional to worked hours while the rest is distributed to exceptional teachers at the discretion of the school principal (Manzi et al., 2007).

Another important reform to the Chilean education system took place in 1997 when the length of the school day increased by 1.4 hours for children in grades 3-12 at publicly funded schools. The reform increased instruction time by 35% with the purpose of improving education quality. This change was implemented gradually and

[5]https://archive.revista.drclas.harvard.edu/book/mecesup-program-chile

the majority of schools complied by 2003 (Berthelon & Kruger, 2011). Finally, in 2003, a constitutional reform was approved that made high school education compulsory for all individuals born after 1985.

As we discuss in the next section, all of the above policies will be controlled for in our model specification in order to ensure that our results are not confounded by educational reforms implemented in addition to the voucher program.

Also note that, in 2008, the government introduced the *Subvencion Escolar Preferencial* (SEP), a targeted voucher program supporting the most vulnerable students. Vulnerable students, also called priority students, are identified based on their socioeconomic background and participation in social welfare programs. Schools that (voluntarily) choose to participate in this program receive an additional subsidy for each vulnerable student enrolled and further resources if the school is able to improve the academic perfomance of priority students. Participating schools cannot charge tuition fees to priority students, must admit all priority students irrespective of their past academic perfomance or socioeconomic status, and must retain all students. All individuals in our sample completed high school before this targeted voucher program was implemented. Thus, our analysis focuses on the main voucher program in Chile, which applies to all students independently of their socioeconomic status.[6]

# 3 Methodology

The goal of the paper is to estimate the vector of coefficients $\beta$ in the following equation:

$$Y_i = \alpha + \beta VAC_i + f(X_i) + \epsilon_i \tag{1}$$

where $Y_i$ is the outcome of interest for individual $i$, $VAC_i$ is a vector of dummy variables indicating the voucher-affected cohorts based on their birth year, $X_i$ is a vector of

[6]For an analysis of the SEP program see Correa et al. (2014).

controls entering through function $f(.)$, $\epsilon_i$ is an idiosyncratic error term. We study two outcomes ($Y_i$): the probability of attending PSE and the probability of graduating from a PSE program. PSE programs include technical and professional degrees and also graduate degrees.

Since exposure to the voucher program is determined by birth year, it is possible to assess the impacts of vouchers by exploring variation across cohorts. More specifically, we estimate the following vector $\beta = (\beta_{HS}, \beta_{MS}, \beta_{ES}, \beta_{FA})^\top$ that corresponds to the impact of vouchers on individuals exposed to the program when in high school ($\beta_{HS}$), middle school ($\beta_{MS}$), elementary school ($\beta_{ES}$), as well as those fully affected because they are exposed to the program from the start of their schooling years ($\beta_{FA}$). The omitted category consists of cohorts who completed schooling before the voucher program started (i.e. birth years 1953–1962). Students enrolled in secondary school in 1981 (when the voucher program was introduced) were born between 1963–1967, those in grades 5–8 were born between 1968–1971, and those in grades 1–4 were born between 1972–1975. The fully exposed cohorts are those born between 1976–1986. These individuals had not yet started schooling in 1981.

The paper tests two main hypotheses. First, the voucher program offered the choice of being educated in better schools to all students. All else equal, under this hypothesis the affected cohorts should have a higher educational attainment on average. Note that the voucher system might increase educational attainment among students through several channels. Thanks to vouchers, the schooling market may become more efficient as a result of a better school-student match and increased competition among schools. Vouchers may also enhance teacher effectiveness by increasing school resources. Further, the program may affect the composition of peer groups and may change students' aspirations.

Second, we can test whether providing vouchers at the beginning of primary school

has a stronger impact compared to providing vouchers in middle school or high school. School switching is very common in Chile. About 17% of students switch each year (Feigenberg, 2014). The two key switching points are when students progress to middle school (between grades 4 and 5), and when they enter high school (between grades 8 and 9) (Bravo et al., 2010). We test whether (i) $\beta_{FA} = \beta_{ES}$, (ii) $\beta_{MS} = \beta_{ES}$. If the coefficients are statistically significant, then failing to reject (i) suggests that vouchers have the same impact on PSE outcomes whether they are available since grade 1 or are introduced in grades 2-4. Similarly, failing to reject (ii) suggests that offering the voucher during middle school has the same effect as offering vouchers during elementary school.

Our identifying assumption is that, beside the voucher program and factors accounted for by our controls, no other concurrent change happened that could have affected students' educational choices. To ensure this condition is met, vector $X_i$ includes the following variables.

To start, we control for economic conditions at the time of PSE application as well as educational reforms that affected our cohorts. A large literature provides evidence that in bad economic times individuals are more likely to enroll in higher education to delay entrance in the labour market (e.g. Dellas & Sakellaris, 2003; Méndez & Sepúlveda, 2012; Alessandrini, 2018). For this reason we include GDP per capita growth when the individual was 17 (i.e. at the time of PSE application). Similarly, we control for dummy variables equal to one if the individual was 17 during key historical events: i.e. coup d'etat of 1973, Recession of 1975, Recession of 1982, Recession of 1998. To control for educational reforms, we use a set of binary variables indicating whether the individual was in primary/secondary school when the following reforms were implemented: the P900 and MECE program introduced in 1990, the introduction of add-on tuition fee for private-voucher and secondary municipal schools in 1993, the introduction of the

SNED program in 1996, the increase in school day length in 1997, secondary school compulsory since 2003. These binary variables equal one if the individual was 17 years old or younger at the time the policy was implemented (and thus was affected by the policy during primary or secondary school), and zero if the individual was older than age 17.

In addition, we control for the expansion of the PSE sector. Along with the voucher program, the educational reform of 1981 allowed the number of private post-secondary institutions to increase. Appendix Figure A.1 plots educational attainment by cohort. The proportion of individuals with some PSE is almost flat for birth cohorts 1953–1968 but displays an upward trend among younger cohorts, which is consistent with the historical increase in PSE enrollment experienced by several countries. The upward trend in attendance and completion is likely a result of both the voucher policy and the expansion in higher education as private for-profit PSE institutions opened across the country. In order to control for this expansion in the post-secondary education market, vector $X_i$ includes the number of PSE graduates when the individual was finishing high school (age 17). Note that this variable is linked to the year when the respondent was 17 years old, rather than to the survey year, to capture the number of available seats in the year the respondents would be preparing to apply for PSE. Figure A.3 in the Appendix depicts the time series for the number of PSE graduates as well as GDP per capita growth.

Finally, we control for survey year dummies, gender, age, urban residence dummy, marital status dummies, region dummies and a time trend on birth year. Survey years 2009 and 2011 contain additional information on indigenous status, mother and father education levels (no high school, high school diploma, PSE) and a set of dummy variables indicating which parent raised the individual during their first 15 years of

life.[7] We include these variables in addition to the previously mentioned variables in a separate set of results.

# 4 Data

The analysis in this paper is based on the Chilean National Socio-Economic Survey (Encuesta de Caracterizacion Socioeconomica Nacional, Encuesta de CASEN). The survey contains detailed information on students' demographics, education, health and labor market outcomes. CASEN is representative at the national and regional level. We pool together all cross-sectional surveys from the following years: 1990, 1992, 1994, 1996, 1998, 2000, 2003, 2006, 2009 and 2011. For each cross-section, we restrict the sample to individuals who are 25–64 years old. The resulting sample consists of individuals born between 1953–1986. Appendix Figure A.2 shows the distribution of observations by birth year. Descriptive statistics are reported in Appendix Table A.1.

# 5 Results

In this section we present the results of our analysis for the overall sample, as well as a sub-group analysis by gender and socio-economic status.

We estimate equation (1) using a logit regression and report marginal effects in Table 1. Since primary and secondary education in Chile fall under municipal jurisdiction, the standard errors in the analysis are clustered by municipality. We examine two outcomes: the probability of attending PSE (labeled "Attended") and the probability of graduating from a PSE program (labeled "Graduated"). For both outcomes, the first column reports the results excluding the number of PSE graduates in Chile when the individual was 17 years old and indicators for the educational reforms implemented

[7] The question in the survey is: "During your first 15 years of life, you lived most of the time with which of your parents?". The possible responses are: Only mother/father, both parents, mother/father and their partner, neither of your parents.

beside the voucher program. The next two columns progressively add these covariates.

The comparison between columns 1 and 2 reveals that controlling for the number of PSE graduates when the individual was 17 has a significant effect on our coefficients of interest. Higher aggregate educational attainment can encourage or discourage individual-level enrollment. On the one hand, students may feel the need to pursue PSE to be more competitive in the labour market. On the other hand, if universities are not able to increase class sizes because of financial constraints, higher aggregate PSE attainment could result in increased competition to be admitted to university leading to a reduction in individual-level enrollment. The latter appears to prevail among birth cohorts 1963-1975. Hence, omitting PSE graduation rates at the municipal level reduces our coefficients of interest for cohorts 1963-1975. For younger cohorts born after 1975, instead, controlling for the number of PSE graduates does not have a significant impact on the estimated coefficient $\hat{\beta_{FA}}$. Further, column 3 shows that adding policy indicators for education reforms (other than vouchers) does not have a significant effect on the estimated coefficients.

Our main results of interest are reported in columns (3) and (6). These specifications include all control variables. The voucher program has increased PSE enrollment for all cohorts (see column 3) and PSE graduation for cohorts who received vouchers in middle school at the latest (see column 6). Among students who were affected by the program since grade 1, vouchers increased PSE attendance by 4 percentage points and graduation probability by 3 percentage points. The tests of equality between coefficients reported in the bottom panel of the table indicate that the fully exposed students and those exposed to vouchers during elementary school were equally affected by the program. In other words, the impact on PSE outcomes is the same whether vouchers cover schooling costs for all grades starting from grade 1 or if vouchers are introduced in grades 2-4.

The effect of the vouchers decreases if they are introduced after grade 4. For example, those who were already in high school when the voucher program was introduced experienced a 1 percentage point increase in the likelihood of attending PSE and no increase in the likelihood of graduating from PSE. This is consistent with the fact that students are less likely to switch school during their high school years. Also, while vouchers have been shown to increase competition among schools in Chile (Gallego, 2013), this effect likely took time to appear. Hence, students who were already in high school at the time the voucher program started would not have been able to reap the benefits from a more competitive education market.

Our findings suggest that, if policymakers' goal is to maximize post-secondary attainment, the best time to offer a voucher would be during elementary school so that students can use vouchers to freely choose which middle school and then high school to attend. Providing choice once students have already started middle school reduces the positive effect of vouchers on PSE outcomes by approximately 50%.

In Table 2, we test the robustness of these results to the inclusion of additional control variables capturing family characteristics. The last two survey years, 2009 and 2011, provide data on parental education, family structure of the individual until age 15, and indigenous status. We re-estimate equation 1 adding these additional controls and report marginal effects in Table 2. For comparison, columns (1) and (3) report the results using the control variables included in our baseline specification, i.e. equivalent to columns (3) and (6) in Table 1. Columns (2) and (4) add indigenous status, maternal and paternal education level dummies,[8] and a set of indicator dummy variable indicating the parent(s) that raised the individual until age 15. Controlling for family characteristics does not significantly affect the coefficients of interest. That is, there is no significant difference between the coefficients in columns (1)-(2), or in

[8]These are binary indicators corresponding to no high school, high school diploma and PSE

columns (3)-(4), of Table 2.

In Table 3 we conduct a sub-group analysis by gender (columns 1–4) and socioeconomic status (columns 5–8). We proxy the socioeconomic status with mother's education available in survey years 2009–2011. Columns 1–4 show that the voucher program has benefited both men and women. However, the impacts are larger in magnitude among males. Columns 5–8 indicate that individuals with low maternal education have been positively affected by the voucher program. Among those who received vouchers from grade 1, the program increased the likelihood of attending PSE by 5 percentage points and the likelihood of graduating from PSE by 4 percentage points. These are significant increases considering that students with low maternal education are on average less likely to attend and complete PSE. For example, the increase in PSE attendance by 5 percentage points corresponds to a 52% increase from the mean value of the dependent variable. Also individuals with high SES (mother's education equal to high school or above) benefited from the program but proportionally less. For example, among individuals who received vouchers since grade 1, the program increased PSE attendance by 9.7 percentage points, i.e. a 36% increase from the mean value.

Table 1: Voucher impact on PSE outcomes, CASEN surveys 1990–2011

| | Attended | Attended | Attended | Graduated | Graduated | Graduated |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Born 1963–1967 ($\beta_{HS}$) | -0.010*** | 0.012*** | 0.012*** | -0.002 | 0.003 | 0.003 |
| | (0.003) | (0.003) | (0.003) | (0.002) | (0.002) | (0.002) |
| Born 1968–1971 ($\beta_{MS}$) | 0.004 | 0.025*** | 0.023*** | 0.010*** | 0.014*** | 0.014*** |
| | (0.003) | (0.003) | (0.004) | (0.002) | (0.002) | (0.003) |
| Born 1972–1975 ($\beta_{ES}$) | 0.025*** | 0.045*** | 0.044*** | 0.024*** | 0.027*** | 0.029*** |
| | (0.004) | (0.004) | (0.005) | (0.003) | (0.003) | (0.004) |
| Born after 1975 ($\beta_{FA}$) | 0.052*** | 0.043*** | 0.038*** | 0.038*** | 0.034*** | 0.034*** |
| | (0.006) | (0.005) | (0.007) | (0.005) | (0.005) | (0.007) |
| Baseline controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| PSE graduates | | ✓ | ✓ | | ✓ | ✓ |
| Policy indicators | | | ✓ | | | ✓ |
| Observations | 657655 | 657655 | 657655 | 646162 | 646162 | 646162 |
| Pseudo-$R^2$ | 0.082 | 0.083 | 0.083 | 0.062 | 0.062 | 0.062 |
| Mean Y | 0.149 | | | 0.104 | | |
| $H_0 : \beta_{FA} = \beta_{ES}$ | | | 0.158 | | | 0.153 |
| $H_0 : \beta_{FA} = \beta_{MS}$ | | | 0.004 | | | 0.000 |
| $H_0 : \beta_{ES} = \beta_{MS}$ | | | 0.000 | | | 0.000 |

*Note:* The table displays marginal effects from logit regressions. Standard errors are in parenthesis, clustered by municipality. Data source: CASEN surveys 1990–2011. $FA$: Fully Affected;$MS$: Middle School; $ES$: Elementary School; $HS$: High School. Birth year cohorts included in the sample are 1953–1986 and individuals 25–64 years old in each survey. **Baseline controls** include female dummy, age, urban residence dummy, marital status dummies, region dummies, a time trend on birth year, survey year dummies, dummy variables indicating being 17 years old during key historical events (i.e. Revolution of 1973, Recession of 1975, Recession of 1982, Recession of 1998), GDP per capita growth at age 17. **PSE graduates** is the number of PSE Graduates at the time the individual was 17 years old. **Policy indicators** include dummy variables indicating being 17 years old or younger when each of the following educational reforms were implemented: the P900 and MECE program introduced in 1990, the introduction of add-on tuition fee for private-voucher and secondary municipal schools in 1993, the introduction of the SNED program in 1996, the increase in school day length in 1997, secondary school compulsory since 2003.

Table 2: Voucher impact on PSE outcomes, CASEN surveys 2009–2011

| | (1) Attended | (2) Attended | (3) Graduated | (4) Graduated |
|---|---|---|---|---|
| Born 1963–1967 ($\beta_{HS}$) | 0.012** | 0.012** | 0.004 | 0.003 |
| | (0.006) | (0.006) | (0.006) | (0.005) |
| Born 1968–1971 ($\beta_{MS}$) | 0.032*** | 0.034*** | 0.022*** | 0.023*** |
| | (0.008) | (0.008) | (0.007) | (0.007) |
| Born 1972–1975 ($\beta_{ES}$) | 0.063*** | 0.062*** | 0.046*** | 0.046*** |
| | (0.010) | (0.009) | (0.008) | (0.008) |
| Born after 1975 ($\beta_{FA}$) | 0.075*** | 0.073*** | 0.057*** | 0.054*** |
| | (0.014) | (0.013) | (0.012) | (0.011) |
| Baseline controls | ✓ | ✓ | ✓ | ✓ |
| PSE graduates | ✓ | ✓ | ✓ | ✓ |
| Policy indicators | ✓ | ✓ | ✓ | ✓ |
| Family variables | | ✓ | | ✓ |
| Observations | 129158 | 129158 | 127691 | 127691 |
| Pseudo-$R^2$ | 0.085 | 0.197 | 0.072 | 0.177 |
| Mean Y | 0.163 | | 0.124 | |
| $H_0 : \beta_{FA} = \beta_{ES}$ | 0.094 | 0.152 | 0.076 | 0.175 |
| $H_0 : \beta_{FA} = \beta_{MS}$ | 0.000 | 0.000 | 0.000 | 0.000 |
| $H_0 : \beta_{ES} = \beta_{MS}$ | 0.000 | 0.000 | 0.000 | 0.000 |

*Note:* Data source: CASEN surveys 2009–2011. $FA$: Fully Affected;$MS$: Middle School; $ES$: Elementary School; $HS$: High School. Birth year cohorts included in the sample are 1953–1986 and individuals 25–64 years old in the survey year. For a description of **Baseline controls, PSE graduates and Policy indicators** see footnote of Table 1. **Family variables** includes a dummy variable for indigenous status, dummy variables for mother and father education levels (no high school, high school diploma, PSE), and a set of dummy variables indicating whether the individual was raised by one or both parents until 15 years of age.

Table 3: Voucher impact on educational outcomes by gender and SES, CASEN surveys 2009–2011

| | (1) Attended | (2) Attended | (3) Graduated | (4) Graduated | (5) Attended | (6) Attended | (7) Graduated | (8) Graduated |
|---|---|---|---|---|---|---|---|---|
| | Women | Men | Women | Men | Mother's educ <HS | Mother's educ HS or PSE | Mother's educ <HS | Mother's educ HS or PSE |
| Born 1963–1967 ($\beta_{HS}$) | 0.009 | 0.013 | 0.002 | 0.004 | 0.013** | 0.011 | 0.006 | 0.000 |
| | (0.008) | (0.008) | (0.007) | (0.007) | (0.005) | (0.012) | (0.004) | (0.010) |
| Born 1968–1971 ($\beta_{MS}$) | 0.027** | 0.041*** | 0.019** | 0.027*** | 0.026*** | 0.045*** | 0.019*** | 0.029** |
| | (0.011) | (0.011) | (0.009) | (0.010) | (0.008) | (0.015) | (0.007) | (0.013) |
| Born 1972–1975 ($\beta_{ES}$) | 0.056*** | 0.069*** | 0.042*** | 0.049*** | 0.047*** | 0.084*** | 0.036*** | 0.061*** |
| | (0.012) | (0.014) | (0.011) | (0.012) | (0.010) | (0.018) | (0.009) | (0.016) |
| Born after 1975 ($\beta_{FA}$) | 0.063*** | 0.085*** | 0.048*** | 0.062*** | 0.050*** | 0.097*** | 0.037*** | 0.074*** |
| | (0.017) | (0.020) | (0.015) | (0.017) | (0.015) | (0.024) | (0.013) | (0.021) |
| Baseline controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| PSE gradutes | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Policy indicators | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Family variables | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Observations | 73652 | 55504 | 72740 | 54949 | 78855 | 50301 | 78368 | 49321 |
| Pseudo-$R^2$ | 0.186 | 0.215 | 0.165 | 0.197 | 0.208 | 0.124 | 0.195 | 0.109 |
| Mean Y | 0.162 | 0.165 | 0.124 | 0.124 | 0.096 | 0.268 | 0.073 | 0.206 |
| $H_0 : \beta_{FA} = \beta_{ES}$ | 0.451 | 0.117 | 0.440 | 0.173 | 0.706 | 0.312 | 0.804 | 0.279 |
| $H_0 : \beta_{FA} = \beta_{MS}$ | 0.004 | 0.006 | 0.005 | 0.012 | 0.021 | 0.004 | 0.046 | 0.006 |
| $H_0 : \beta_{ES} = \beta_{MS}$ | 0.000 | 0.003 | 0.000 | 0.009 | 0.000 | 0.000 | 0.002 | 0.003 |

*Note:* Data source: CASEN surveys 2009–2011. $FA$: Fully Affected;$MS$: Middle School; $ES$: Elementary School; $HS$: High School. Birth year cohorts included in the sample are 1953–1986 and individuals 25–64 years old in the survey year. For a description of **Baseline controls, PSE graduates and Policy indicators** see footnote of Table 1. **Family variables** includes a dummy variable for indigenous status, dummy variables for mother and father education levels (no high school, high school diploma, PSE) and a set of dummy variables indicating whether the individual was raised by one or both parents until 15 years of age.

# 6 Conclusion

This paper studies the Chilean universal voucher program instituted in Chile in 1981 and still operating to this date. Vouchers allow students to freely choose which school to attend, whether public or private. The program intends to provide equality of opportunity in accessing high quality primary and secondary education. In addition, the Chilean voucher system has the potential to increase competition among schools leading to an overall increase in education quality in all schools.

This paper estimates the impact of the voucher system on post-secondary attainment by using a cross-cohort comparison and exploiting the fact that different cohorts were affected by the voucher program differently. Some cohorts were impacted by the program since the beginning of elementary school, while others were affected during middle school or high school. This allows us to investigate the differential impacts of the reform.

Among those who received vouchers before the beginning of high school, we find that the voucher program increased the likelihood of attending PSE by almost 4 percentage points and PSE graduation by 3 percentage points. Receiving vouchers during high school increases PSE attendance by 1 percentage point but has no effect on PSE graduation. Our results also indicate that the program helped low SES students proportionally more compared to high SES students.

Finally, we find that the impact of the voucher program is statistically equal for the students who were offered vouchers from the beginning of their schooling years and for those who had already started elementary school. Given that students tend to switch schools mainly at the end of the elementary and middle school, the results suggest that offering vouchers just before students start middle school would lead to the same effect on PSE attainment compared to providing vouchers from the start of elementary

school. These findings suggests that, in Chile, school choice is more important for middle school and high school education rather than elementary school education.

Our paper contributes to the vast literature on school choice and the sparse literature on its effects on higher educational attainment. Exploiting the differential exposure to the voucher policy introduction, we use this variation across the different cohorts to answer the question of when it is most effective to introduce school choice. This is an unanswered question in the literature, and has obvious benefits to policy makers across the world.

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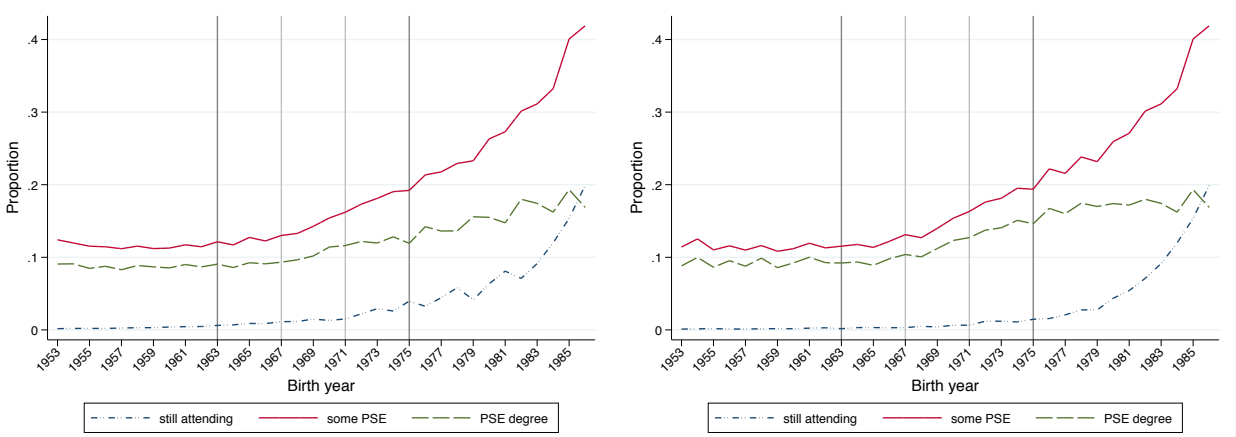
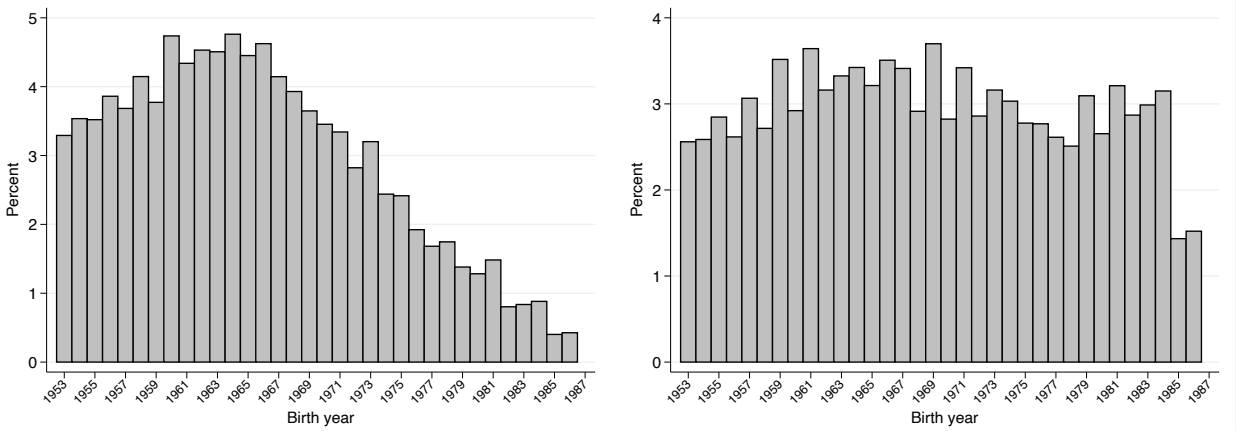



(a) CASEN surveys 1990–2011

(b) CASEN surveys 2009–2011

Figure A.1: Educational attainment by birth year

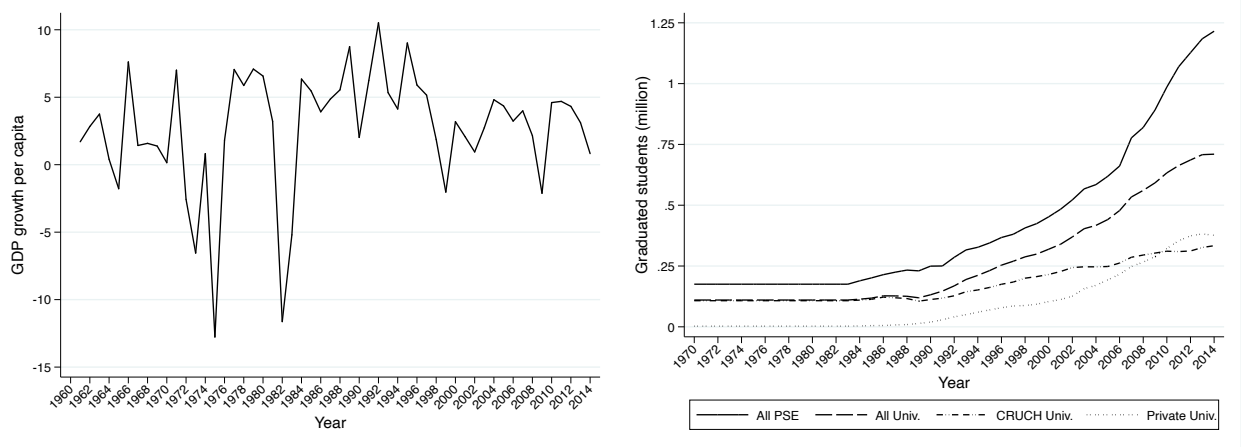
# A Appendix




(a) CASEN 1990–2011

(b) CASEN 2009–2011

Figure A.2: Distribution of observations by birth year
Note: Each bar shows the percent of observations that fall in each birth year. The sum of height of the bars equals 100. Sample includes individuals aged 25–64 years old.




(a) GDP growth in Chile

(b) Graduation by institution type

Figure A.3: Country level variables by calendar year
Note: (a) Plot of the GPD growth per capita in Chile. Data source: World Bank. (b) Plots the total number of graduated students in post secondary education (PSE). All PSE plots any PSE program and includes university and non-university programs. CRUCH Univ. is the graph for the CRUCH universities and the Private Univ. is the graph for private universities. All Univ. is the graph of CRUCH and private universities together. Data source: Servicio de Información de Educación Superior (SIES) of MINEDUC (Chilean Ministry of Education).

Table A.1: Summary statistics: mean (standard deviation)

| | All | | Born after 1975 | | Born 1972–1975 (ES) | | Born 1968–1971 (MS) | | Born 1963–1967(HS) | | Born before 1963 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Less than High School | 0.40 | (0.49) | 0.22 | (0.41) | 0.32 | (0.47) | 0.37 | (0.48) | 0.42 | (0.49) | 0.48 | (0.50) |
| High School Diploma | 0.30 | (0.46) | 0.39 | (0.49) | 0.34 | (0.47) | 0.33 | (0.47) | 0.29 | (0.46) | 0.24 | (0.43) |
| High School dropout | 0.16 | (0.37) | 0.13 | (0.33) | 0.16 | (0.37) | 0.17 | (0.37) | 0.17 | (0.37) | 0.17 | (0.38) |
| Attended PSE | 0.15 | (0.36) | 0.26 | (0.44) | 0.18 | (0.39) | 0.15 | (0.36) | 0.13 | (0.33) | 0.12 | (0.32) |
| PSE degree | 0.10 | (0.31) | 0.15 | (0.36) | 0.12 | (0.33) | 0.11 | (0.31) | 0.09 | (0.29) | 0.09 | (0.28) |
| Currently attending PSE | 0.02 | (0.13) | 0.07 | (0.25) | 0.03 | (0.17) | 0.02 | (0.13) | 0.01 | (0.09) | 0.00 | (0.06) |
| Born 1963–1967 | 0.22 | (0.42) | 0.00 | (0.00) | 0.00 | (0.00) | 0.00 | (0.00) | 1.00 | (0.00) | 0.00 | (0.00) |
| Born 1968–1971 | 0.14 | (0.35) | 0.00 | (0.00) | 0.00 | (0.00) | 1.00 | (0.00) | 0.00 | (0.00) | 0.00 | (0.00) |
| Born 1972–1975 | 0.11 | (0.31) | 0.00 | (0.00) | 1.00 | (0.00) | 0.00 | (0.00) | 0.00 | (0.00) | 0.00 | (0.00) |
| Born after 1975 | 0.13 | (0.34) | 1.00 | (0.00) | 0.00 | (0.00) | 0.00 | (0.00) | 0.00 | (0.00) | 0.00 | (0.00) |
| GDP growth per capita | 2.32 | (5.95) | 4.26 | (2.76) | 6.60 | (3.29) | 4.95 | (0.65) | -0.20 | (7.11) | 0.99 | (6.43) |
| Revolution of 1973 | 0.04 | (0.18) | 0.00 | (0.00) | 0.00 | (0.00) | 0.00 | (0.00) | 0.00 | (0.00) | 0.09 | (0.29) |
| Depression of 1975 | 0.08 | (0.27) | 0.00 | (0.00) | 0.00 | (0.00) | 0.00 | (0.00) | 0.00 | (0.00) | 0.20 | (0.40) |
| Depression of 1982 | 0.09 | (0.29) | 0.00 | (0.00) | 0.00 | (0.00) | 0.00 | (0.00) | 0.41 | (0.49) | 0.00 | (0.00) |
| Depression of 1998 | 0.03 | (0.16) | 0.21 | (0.41) | 0.00 | (0.00) | 0.00 | (0.00) | 0.00 | (0.00) | 0.00 | (0.00) |
| P900 and MECE program since 1990 | 0.18 | (0.38) | 1.00 | (0.00) | 0.45 | (0.50) | 0.00 | (0.00) | 0.00 | (0.00) | 0.00 | (0.00) |
| Shared-financing since 1993 | 0.11 | (0.31) | 0.85 | (0.36) | 0.00 | (0.00) | 0.00 | (0.00) | 0.00 | (0.00) | 0.00 | (0.00) |
| SNED programme since 1996 | 0.08 | (0.27) | 0.59 | (0.49) | 0.00 | (0.00) | 0.00 | (0.00) | 0.00 | (0.00) | 0.00 | (0.00) |
| School-day lengthened since 1997 | 0.03 | (0.18) | 0.26 | (0.44) | 0.00 | (0.00) | 0.00 | (0.00) | 0.00 | (0.00) | 0.00 | (0.00) |
| Secondary school compulsory in 2003 | 0.01 | (0.09) | 0.07 | (0.25) | 0.00 | (0.00) | 0.00 | (0.00) | 0.00 | (0.00) | 0.00 | (0.00) |
| PSE graduates, millions | 0.22 | (0.07) | 0.39 | (0.07) | 0.25 | (0.02) | 0.22 | (0.01) | 0.18 | (0.01) | 0.18 | (0.00) |
| Female dummy | 0.51 | (0.50) | 0.51 | (0.50) | 0.51 | (0.50) | 0.52 | (0.50) | 0.51 | (0.50) | 0.51 | (0.50) |
| Age | 37.00 | (8.13) | 28.47 | (2.78) | 31.23 | (4.28) | 33.49 | (5.27) | 36.23 | (6.43) | 43.13 | (7.14) |
| Urban area residence dummy | 0.67 | (0.47) | 0.71 | (0.45) | 0.66 | (0.47) | 0.66 | (0.47) | 0.66 | (0.47) | 0.67 | (0.47) |
| Indigenous status | 0.09 | (0.29) | 0.11 | (0.31) | 0.10 | (0.30) | 0.10 | (0.30) | 0.09 | (0.28) | 0.08 | (0.28) |
| Civil status: | | | | | | | | | | | | |
| Married | 0.54 | (0.50) | 0.27 | (0.44) | 0.42 | (0.49) | 0.50 | (0.50) | 0.58 | (0.49) | 0.65 | (0.48) |
| Living together | 0.15 | (0.36) | 0.24 | (0.43) | 0.19 | (0.39) | 0.16 | (0.37) | 0.13 | (0.34) | 0.12 | (0.32) |
| Separated | 0.04 | (0.21) | 0.03 | (0.17) | 0.04 | (0.19) | 0.04 | (0.20) | 0.04 | (0.21) | 0.05 | (0.22) |
| Divorced | 0.01 | (0.11) | 0.00 | (0.06) | 0.01 | (0.11) | 0.01 | (0.11) | 0.01 | (0.11) | 0.01 | (0.12) |
| Widow(er) | 0.06 | (0.24) | 0.00 | (0.04) | 0.00 | (0.06) | 0.07 | (0.25) | 0.10 | (0.30) | 0.07 | (0.26) |
| Single | 0.19 | (0.39) | 0.46 | (0.50) | 0.34 | (0.47) | 0.21 | (0.41) | 0.13 | (0.33) | 0.09 | (0.29) |
| Mother: Less than High School Diploma | 0.41 | (0.49) | 0.31 | (0.46) | 0.39 | (0.49) | 0.42 | (0.49) | 0.45 | (0.50) | 0.47 | (0.50) |
| Mother: High School Diploma | 0.31 | (0.46) | 0.35 | (0.48) | 0.34 | (0.47) | 0.32 | (0.47) | 0.30 | (0.46) | 0.28 | (0.45) |
| Mother: Post-secondary education | 0.06 | (0.24) | 0.14 | (0.35) | 0.07 | (0.25) | 0.05 | (0.21) | 0.03 | (0.17) | 0.02 | (0.16) |
| Father: Less than High School Diploma | 0.58 | (0.49) | 0.50 | (0.50) | 0.57 | (0.50) | 0.59 | (0.49) | 0.60 | (0.49) | 0.62 | (0.49) |
| Father: High School Diploma | 0.16 | (0.37) | 0.23 | (0.42) | 0.18 | (0.38) | 0.16 | (0.36) | 0.14 | (0.35) | 0.11 | (0.32) |

Table A.1: Summary statistics : mean (standard deviation) (cont.'d)

| | All | | Born after 1975 | | Born 1972–1975 (ES) | | Born 1968–1971 (MS) | | Born 1963–1967(HS) | | Born before 1963 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Father: Post-secondary education | 0.03 | (0.17) | 0.06 | (0.23) | 0.04 | (0.19) | 0.03 | (0.17) | 0.02 | (0.14) | 0.02 | (0.14) |
| Lived with until age 15: | | | | | | | | | | | | |
| Father only | 0.03 | (0.18) | 0.03 | (0.17) | 0.03 | (0.17) | 0.03 | (0.17) | 0.03 | (0.18) | 0.03 | (0.18) |
| Mother only | 0.13 | (0.34) | 0.16 | (0.36) | 0.14 | (0.35) | 0.13 | (0.34) | 0.13 | (0.33) | 0.12 | (0.33) |
| Both parents | 0.73 | (0.44) | 0.72 | (0.45) | 0.73 | (0.44) | 0.74 | (0.44) | 0.74 | (0.44) | 0.74 | (0.44) |
| Father and his wife | 0.00 | (0.06) | 0.00 | (0.05) | 0.00 | (0.05) | 0.00 | (0.06) | 0.00 | (0.05) | 0.00 | (0.06) |
| Mother and her husband | 0.01 | (0.09) | 0.01 | (0.10) | 0.01 | (0.09) | 0.01 | (0.08) | 0.01 | (0.08) | 0.01 | (0.08) |
| None of the parents | 0.09 | (0.29) | 0.08 | (0.28) | 0.09 | (0.29) | 0.09 | (0.29) | 0.09 | (0.28) | 0.10 | (0.30) |
| Region(geo division): | | | | | | | | | | | | |
| Tarapacá | 0.03 | (0.18) | 0.04 | (0.20) | 0.03 | (0.18) | 0.03 | (0.18) | 0.03 | (0.17) | 0.03 | (0.17) |
| Antofagasta | 0.04 | (0.19) | 0.05 | (0.21) | 0.04 | (0.19) | 0.03 | (0.18) | 0.04 | (0.18) | 0.04 | (0.19) |
| Atacama | 0.03 | (0.18) | 0.03 | (0.18) | 0.03 | (0.17) | 0.03 | (0.18) | 0.03 | (0.18) | 0.03 | (0.18) |
| Coquimbo | 0.05 | (0.21) | 0.04 | (0.20) | 0.05 | (0.21) | 0.05 | (0.21) | 0.05 | (0.21) | 0.05 | (0.21) |
| Valparaíso | 0.10 | (0.31) | 0.10 | (0.30) | 0.10 | (0.30) | 0.11 | (0.31) | 0.11 | (0.31) | 0.11 | (0.31) |
| Libertador General Bernardo O'Higgins | 0.07 | (0.26) | 0.08 | (0.27) | 0.08 | (0.26) | 0.07 | (0.26) | 0.07 | (0.26) | 0.07 | (0.25) |
| Maule | 0.09 | (0.28) | 0.08 | (0.28) | 0.09 | (0.28) | 0.09 | (0.28) | 0.09 | (0.28) | 0.09 | (0.28) |
| Bío Bío | 0.16 | (0.36) | 0.14 | (0.35) | 0.15 | (0.36) | 0.15 | (0.36) | 0.16 | (0.37) | 0.16 | (0.37) |
| La Araucanía | 0.08 | (0.27) | 0.08 | (0.26) | 0.09 | (0.28) | 0.08 | (0.27) | 0.08 | (0.26) | 0.07 | (0.26) |
| Los Lagos | 0.08 | (0.27) | 0.08 | (0.28) | 0.09 | (0.29) | 0.09 | (0.28) | 0.08 | (0.27) | 0.08 | (0.26) |
| Aysén del General Carlos Ibáñez del Campo | 0.02 | (0.14) | 0.02 | (0.15) | 0.02 | (0.13) | 0.02 | (0.14) | 0.02 | (0.14) | 0.02 | (0.14) |
| Magallanes y de la Antártica Chilena | 0.02 | (0.12) | 0.02 | (0.12) | 0.01 | (0.11) | 0.01 | (0.11) | 0.01 | (0.12) | 0.02 | (0.13) |
| Region Metropolitana de Santiago | 0.22 | (0.41) | 0.19 | (0.40) | 0.21 | (0.41) | 0.21 | (0.41) | 0.23 | (0.42) | 0.23 | (0.42) |
| Los Ríos | 0.01 | (0.12) | 0.03 | (0.17) | 0.01 | (0.12) | 0.01 | (0.11) | 0.01 | (0.10) | 0.01 | (0.10) |
| Arica y Parinacota | 0.01 | (0.08) | 0.02 | (0.13) | 0.01 | (0.09) | 0.01 | (0.08) | 0.00 | (0.06) | 0.00 | (0.07) |
| Observations | 665213 | | 86381 | | 72441 | | 95524 | | 149243 | | 261604 | |