Market-based school reforms and educational inequality: the case of Chile





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Abstract

This thesis aims to contribute more empirical evidence to the discussion on the effects of market-based school reforms in Chile. The most important of these reforms are the 1981 national voucher school plan and the introduction of a shared school financing scheme in 1993. The first established school choice and competition between all public schools and those private schools that wanted to be part of the new funding scheme consisting of a flat-rate per-student voucher provided by the state; this reform also gave private voucher schools the ability to select students and make a profit. The new financing scheme introduced in 1993 allowed private voucher schools to charge parents tuition fees on top of the state voucher.

Using data from the longitudinal Chilean Social Protection Survey - including hitherto unpublished data exclusively retrieved from individual questionnaires for the purposes of this thesis - and three waves of the Chilean National Socioeconomic Survey (CASEN), the first part of my thesis examines how school-type choice has been mediated by socioeconomic characteristics of students in Chile for almost six decades. My empirical findings indicate that, although socioeconomic stratification of students across school types existed in Chile long before 1981, the stratification between those who attended public and private voucher schools increased after 1981, mainly mediated by parental education. My findings also suggest that after 1993 the link between socioeconomic background and the preference for a private voucher school became more pronounced, and this change was mostly mediated by parental education and parental social status.

The second empirical part of my thesis aims to determine whether having attended a private voucher school rather than a public voucher school in the post-1981 period made a difference to students' educational attainment and labour market outcomes at the age of 25. Based on data from the longitudinal Chilean Social Protection Survey and using potential outcome models under the assumption of selection on observable individual characteristics, I estimated positive and significant effects of having attended a private rather than a public voucher school on the access and completion of post-secondary studies by the age of 25. Although I could not find any effect of school type on the employment situation of individuals at that age, I did find positive effects of having attended a subsidised-private rather than a public school on hourly earnings at the age of 25. Although not causal, I did not find evidence that private voucher schools increased their effectiveness relative to public schools after the former started charging co-payments in 1993.

I conclude that the Chilean voucher school system that provided different guarantees to public and private schools between 1981 and 2015 has probably acted as a vehicle for the reproduction of educational and economic inequalities. Since Chile is the only country in the world that has combined vouchers with for-profit educational institutions and the permission given to subsidised-private schools both to apply their own criteria in selecting students and to charge tuition fees on top of the vouchers, the Chilean experience provides useful policy lessons for any country considering marked-based school reforms.

Dedicated to my grandmother Amanda

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1. Introduction

1.1. The Chilean voucher school system in context

In 2011, a large and influential student movement emerged in Chile. For seven months, university and high-school students organised marches, took over their schools and universities, convened assemblies and, in extreme cases, went on hunger strikes to protest against educational inequalities (Bellei, Cabelin and Orellana, 2014). This social mobilisation, which is considered the first of major importance since the end of Augusto Pinochet's dictatorship in 1990 (Segovia and Gamboa, 2012), was also supported by 89% of the Chilean population, who shared the demands and sentiments of the students (CERC, 2011).

The student movement was the result of a general discontent with the Chilean educational system and, more particularly, with the systematic increase in the private provision of education at the expenses of a neglected public school system. The expansion of private education in Chile, which occurred predominantly over the 1990s and 2000s, coincided with a significant increase in the net and gross enrolment rates, especially at the secondary and tertiary level (MINEDUC, 2008, MDS 2012). However, the general public's opinion was that this progress occurred alongside the development of a highly unequal educational system, which was considered to be very expensive and highly reliant on individual families' pocket expense and increasing levels of private debt (Pousadela, 2013).

Far from being only a misguided perception of the student movement and their supporters, international indicators corroborated the reliance of the Chilean educational system on private funding. According to the OECD Report 'Education at a Glance 2014', by 2011, Chile was the OECD country with the highest private expenditure on educational institutions at all levels (40%), which was far higher than the average of all OCED countries (16%). In the specific case of primary and secondary education, 22% of the total spending on education in Chile was provided by private sources, while the average private spending observed for all OECD countries was less than 9% (OECD, 2014, p.245).

The Chilean school system is based on three main pillars: public schools, private schools that receive state support - the so-called subsidised-private schools - and fully-paid private schools. By 2015, schools belonging to these three categories accounted for 98.7% of the national school enrolment in Chile.[1] The participation of private education providers started to become increasingly important in Chile in 1981, when the military dictatorship undertook a sweeping educational reform based on neoliberal principles. One of the most important aspects of this reform was the establishment of a national state-funded voucher system (fixed subvention per pupil) that would transfer funds from the central government to all primary and secondary public schools, according to their enrolment numbers. Moreover, any private school that was willing to fulfil some basic infrastructure and attendance requirements[2], and did not charge tuition fees, also became eligible for governmental vouchers (Almonacid, 2008). As a consequence, all students at primary and secondary level in Chile, regardless of their socioeconomic background, were given the right to decide whether they wished to attend a public or a private voucher school with no location restrictions (Tokman, 2002). Competition in a free market was expected to produce efficiency by promoting the emergence of new schools and the disappearance of low-quality schools (Elacqua and González, 2013).

At their inception, private voucher schools had very distinctive features that were shared at both the primary and secondary levels.[3] First, the value of the per-capita voucher that they received from the government was exactly equal to the one given to public schools (Tokman, 2002). Second, despite being publicly funded, subsidised-private schools were allowed to select their students by using their own entry criteria, such as previous academic performance, family attributes, and also by applying admission tests (Arenas, 2004; McEwan, Urquiola and Vegas 2008; Contreras, Sepulveda and Bustos, 2010). These selection criteria and admission procedures were not standardised and depended exclusively on the preferences of each school. Third, the majority of subsidised-private schools were for-profit institutions (Peirano and Vargas, 2005;

[1] The remaining 1.3% of the total enrolment rate corresponds to a fourth type of school in Chile that comprises all schools run by 'Delegated Administration Corporations' ('Corporaciones de Adiministracion Delegada', in Spanish). These corporations are legal private persons that manage non-profit secondary state-owned vocational schools. It is important to mention that I report the figures for 2015 here because, as will be presented later in this chapter, Law 21,040 enacted in that year would change some core aspects of the organisation of the school system in Chile.

[2] The requirements for a private school to receive state vouchers, which have been heavily criticised for being too lax and permissive, are presented in detail in Chapter 3.

[3] It is important to note that, in terms of the level of education provided, Chilean schools may be classified in three groups: primary schools, secondary schools, and schools that offer both levels of education. The 1981 reform affected these three types of school in the same way.

Elacqua 2006). Finally, since 1993, these schools were authorised to charge a fee to parents on top of the voucher, under a new co-payment modality known as the 'Shared Financing Scheme' (Gauri, 1998: 89). All these subsidised-private schools' features were fully in place in Chile until 2015. In that year, after intense parliamentary debate, the enactment of a new law known as the 'School Inclusion Act' removed the special guarantees provided to these schools; however, the gradual application of this law has meant that some of these guarantees are still in operation at the time of writing this thesis.

Possibly due to their special characteristics, subsidised-private schools became the largest providers of school education in Chile. In 1981, just before the reform was enacted, only 15% of students at primary and secondary level were attending private schools funded by the state and 78% attended public ones (Maldonado, 2003:50). In contrast, by 2011 when the student movement erupted, 52% of all students in Chile were enrolled in subsidised-private schools while only 40% were still enrolled in public ones (MINEDUC 2013:34). Enrolment at fully-paid private schools remained relatively constant over the same period, at around 8%. Thus, the rapid proliferation of subsidised-private schools occurred mostly at the expense of public schools (Elacqua, Schneider & Buckley, 2006).

Although, in theory, the proliferation of subsidised-private schools would make them more accessible to low-income students over time, the choice between public and subsidised-private education in Chile has largely depended on the socioeconomic status of the students' families. According to the information provided by the National Socioeconomic Survey (CASEN) - the largest cross-sectional and nationally representative household study periodically conducted in Chile - by 2015, 39% of students who attended a public school came from the bottom quintile and 3% from the top income quintile. For students attending a subsidised-private school, the figures were 26% and 8% respectively. The school segregation by socioeconomic background of students across publicly funded schools could be the result of either self-selection by parents (who cannot afford tuition fees, or fear that their children would not fit in), or of admission procedures imposed by subsidised-private schools. The socioeconomic status of the student body in the two types of state funded schools contrasts sharply with the student body at fully-paid private

schools, where – unsurprisingly – only 5% of students came from the bottom income quintile, and 62% from the top income quintile in 2015.[4]

1.2. Current knowledge on the effects of voucher schools in Chile

A number of studies have sought to find the determinants of the choice of school in the Chilean voucher school system. Most of these studies have been conducted with the purpose of exploring whether families choose schools based on their quality, which was one of the main assumptions of the 1981 reform. One part of this literature is based on school attributes mentioned by parents and families as relevant when they choose their children's schools (CEP, 1997; Blanco *et al.* 2014) and another part is based on the actual selection of a certain school type (Chumacero, Gomez and Paredes, 2011; Gomez, Chumacero and Paredes, 2012; Farias, 2014; Alves *et al.* 2015). Although these studies have come up with different findings regarding the importance of the quality of schools in school selection (Chumacero and Paredes, 2012), most of them show that the socioeconomic status of families is significant in explaining school choice over and above school characteristics.

Since the reestablishment of democracy in Chile in 1990, a series of academic articles have studied the effects of some aspects of the 1981 reform on a few educational outcomes. Some have focused on the consequences of school competition on school segregation or stratification[5] (Valenzuela, Bellei and de los Rios, 2014; Elacqua, 2012; Hsieh and Urquiola 2006; Elacqua 2006). Another set of studies has aimed to determine the effects of competition on student achievement in standardised test scores (Auguste and Valenzuela, 2006; Gallego, 2006; Hsieh and Urquiola 2003 and 2006). These two group of studies use the number of voucher schools in a district, or the proportion of private schools as main explanatory variables. This literature in general finds that schools in Chile have become somewhat stratified as a result of

[4] Figures estimated by the author using the official database of the 2015 version of the CASEN Survey. It is important to note that it may be the case that the degree of stratification reported by these numbers is underestimated. In fact, the percentage of students who report that they do not know the type of school in which they are studying decreases from the bottom to the top of the income distribution, and children and adolescents from the bottom quintiles typically study in public schools.

[5] These sorts of studies use as a dependent (or explained) variable a measure of the uneven distribution of children with different socioeconomic characteristics across schools, such as the Duncan dissimilarity index (Duncan and Duncan, 1955). Therefore, school segregation is defined in a broad way.

competition, with children and adolescents that are very similar in terms of their social background being concentrated in the same schools. In contrast, regarding the effect of the increased competition on students test scores, these studies have been inconclusive (Sahlgren, 2013; Allen and Burgess, 2010), with key papers finding positive (Auguste and Valenzuela, 2006), negative (Carnoy and McEwan, 2003), or even no effect (Hsieh and Urquiola, 2006).

Undoubtedly, most of the literature on the consequences of the 1981 reform in Chile has focused on the effect of school type on student achievement in cognitive-ability standardised tests, controlling for several characteristics of the students. Assessing the performance of public and subsidised-private schools in comparison has been considered a key policy issue in Chile, especially since the establishment of the 'Shared Financing Scheme'. As that policy change meant that a large number of both for-profit and non-profit subsidised-private schools started to charge fees to parents, it was expected that they would provide a better quality of education than public schools. The results of this literature tend to suggest that the socioeconomic background of students, introduced as a control variable, is a significant determinant of school achievement across different school types (Anand, Mizala and Repetto, 2009). Nevertheless, these studies have not been entirely conclusive when it comes to comparing the achievement of subsidised-private schools with public schools. Depending on the data, its aggregation level, its date of collection, the models used, and the control variables included, attending a subsidised-private school rather than a public one has been shown to have no effect (Bellei, 2008; Contreras, Sepulveda and Bustos 2010), a small positive effect (Sapelli and Vial, 2002; Mizala, Romaguera and Ostoic, 2004; García and Paredes, 2010; Lara, Mizala and Repetto, 2011), a significant positive effect (González *et al.*, 2002 Anand, Mizala and Repetto, 2009), or even a negative effect (McEwan, 2001; Manzi *et al.*, 2008) on test scores[6].

A common characteristic of the literature that analyses the effect of school type on standardised test scores is the extended use of fourth, eight and tenth graders' SIMCE test scores – the official instrument to

[6] As pointed out by Drago and Paredes (2011) there are two generations of studies about the effect of school type on tests scores in Chile. Until 2000, the lack of information at individual level meant that only research at school level could be conducted. However, from 2000 this literature has been based on individual observations.

measure student's performance in Chile[7] – as the dependent variables. Although these studies implicitly or explicitly assume that these scores are a good proxy for quality of school education, there are good reasons to question this assumption. Since Chilean schools use the average SIMCE test scores to advertise themselves in a competitive school market (Taut *et al.*, 2009), they have strong incentives to teach for the test, which does not necessarily translate into more substantial student learning. Therefore, I argue that it is necessary to evaluate the role of school type on school performance based on a wider set of students' outcomes rather than exclusively relying on indicators of students' achievement based on a single standardised test.

An alternative way of assessing the relative effectiveness of subsidised-private vs. public schools is to explore their role in student educational transitions, or in terms of the highest level of education attained in the life course. However, the extensive literature on the influence of school type on educational achievement in Chile highly contrasts with the small amount of attention given to the effect of school type on educational attainment. In fact, most of the literature intended to find the determinants of educational attainment in Chile has only included people's social background as the main explanatory variable and disregarded school choice at primary and secondary level (Zubizarreta, 2009; Celhay *et al.*, 2010, Torche, 2010, Marteleto *et al.*, 2012). To the best of my knowledge, there is only one study that includes school type as a mediator variable in models analysing the role of social background on educational transitions (Torche, 2005a). This study finds that students in subsidised-private and fully-paid private schools do significantly better in educational transitions than do public school students.

When studying the effects of the 1981 reform, relatively few economics papers have looked beyond educational outcomes and investigated the role of the reform on people's employment and earnings (Patrinos and Sakellariou, 2008 and 2011; Bravo *et al.*, 2010). In particular, these studies analyse how the monetary returns to schooling have changed over time by comparing a sample of people who attended primary and secondary school before and after the reform; however, only one of them (Bravo *et al.*, 2010)

[7] More details about this test are provided in the third section of this document.

also includes the type of school that people attended as an explanatory variable. To date, I have not found any other articles that explicitly analyse the role of school type on any other individuals' outcomes in Chile.

Therefore, a review of the literature regarding the effects of the 1981 reform in Chile makes it possible to observe the following. First, school choice has been studied predominantly with a focus on the school attributes that make schools more attractive for students and their families. In contrast, not much has been written to address the specific role of socioeconomic background on school-type choice and how it has changed over time. Second, the socioeconomic stratification of students in the Chilean voucher school system has been mostly researched through the effect of compounded measures of school competition on aggregated indicators of segregation over the period of expansion of the private school sector. However, very few of these studies have analysed this issue at an individual level and, to the best of my knowledge, no study has compared the levels of socioeconomic segregation of students by school type before and after the 1981 reform. Third, the influence of school type on educational achievement, measured as scores reached by students in the SIMCE test, has been extensively studied obtaining very different and contested results and the meta analyses and systematic reviews of all of them have suggested perhaps a very small positive effect in favour of subsidised-private schools. Fourth, based on schools' incentives and the results of some qualitative literature, there are reasons to think that SIMCE scores may not necessarily be the best indicators to assess the relative quality of different school types. Fifth, very little empirical literature has focused on the role of school type on other individual outcomes, such as educational attainment, occupational situation and earnings. Additionally, this literature does not provide substantive conclusions when it comes to comparing educational and labour market outcomes of people who attended subsidised-private schools with those of their counterparts in public schools. Moreover, these studies have paid very little attention to changes in the relationship between school type and individual outcomes over time and to potential interaction effects between school type and social background on educational and labour market outcomes.

1.3. Aims, objectives and research questions

Taking the weaknesses of the existing literature as a starting point, this thesis intends to widen the knowledge about the effects of the 1981 voucher school reform in Chile, with a focus on the guarantees provided to subsidised-private schools over the period 1981 - 2015. More particularly, this thesis has two main purposes: (1) to study in more detail the role of social background as a determinant of school choice in Chile before and after the 1981 reform and its subsequent amendments until 2015, and (2) to compare the relative performance of subsidised-private and public schools in the post-1981 reform period by using a set of individuals' outcomes other than cognitive test scores achieved by students while still in school[8]. The first purpose of this thesis makes it necessary to study the school-type trajectories followed by all students in the Chilean school system over the second part of the twentieth century and the first fifteen years of the twenty-first century. In contrast, the second purpose of this thesis requires a focus on individuals who specifically attended either a public or a subsidised-private school in the post-reform era (1981 to 2015) because the 1981 reform did not affect fully-paid private schools and they continued to operate as before.

Following the prior discussion, this thesis has been structured on the basis of the two following overarching sets of research questions:

(1) How important are individuals' social backgrounds in explaining children's and their parents' choice of school type at both primary and secondary levels in Chile? Did the effect of social background on school-type choice change significantly after the implementation of the 1981 voucher school reform? Did the effect of social background on school-type choice change significantly after the introduction of the 'Shared Financing Scheme' in 1993?

(2) Is there any effect of the school type on individuals' educational attainment, employment situation and hourly earnings by the age of 25? If so, did the effect of school type on these individuals'

[8] It is relevant to observe that even the studies that analyse the effect of socioeconomic characteristics and school type on people's earnings are focused on short-term outcomes because these earnings represent a snapshot of a particular moment in individuals' career paths. In this regard, this thesis posits that educational attainment and employment characteristics in the most relevant job after graduation are outcomes that much better reflect the medium and long-term status of individuals.

outcomes change over the period of quick expansion of publicly subsidised schools? Was this school-type effect on individual outcomes different for individuals coming from different socio-economic backgrounds?

In order to address these two sets of research questions, this thesis proposes to perform quantitative analyses based on Chilean large-scale data that account for the educational and labour market trajectories of individuals and also their social backgrounds. These analyses will allow empirical insights into the nature and magnitude of the relationship between social background, school type, and individuals' educational and labour market outcomes, and how these relationships have changed over time.

1.4. Expected contributions of this project

By answering the two sets of research questions previously described, this thesis expects to make a series of contributions to the literature on the effects of the voucher school system in Chile.

First, the analysis of individual-level data on students' socioeconomic background and the school type where they studied over many decades, both before and after the 1981 reform in Chile, will make it possible to visualise whether the link between these two variables was significant before the reform and whether it increased after the reform. The scarcity of longitudinal studies containing this information prior to 1981 had prevented researchers from addressing this exact research question before. Also, by repeating the same exercise with a comparable methodology on a more recent group of individuals, this thesis expects to identify whether the 1993 'Shared Financing Scheme' had a role in making the association between social background and school type even stronger, increasing the socioeconomic stratification across school types in the Chilean system. Even though these empirical exercises are not causal, they at least allow us to identify whether there are good reasons to suspect that these two important educational reforms may have had a role in increasing inequality of educational opportunity in Chile.

Second, this thesis also expects to contribute to the literature on the effects of voucher schools in Chile by using a multidimensional approach to individuals' socioeconomic background that emphasises the importance of including at least three, and ideally four, of its different aspects: parental education, parental class, parental social status and parental income. The separate inclusion of these different components can much better enlighten the discussion on possible mechanisms explaining the reported empirical association between socioeconomic background, school type choice and students' outcomes.

Third, by studying the effects of the school type where individuals studied over the post-1981 reform era on their educational attainment, employment situation and earnings at the age of 25, I expect to contribute to the literature on the relative performance of subsidised-private vs. public schools by analysing a set of medium-term outcomes that have been scarcely studied in the past, as most of this literature has focused on educational achievement on standardised tests while students are still attending school. This can also be explained by the lack of long-term longitudinal studies in Chile.

Fourth, I expect not only to identify whether having attended a subsidised-private rather than a public school has had a positive and significant effect on the three previously mentioned outcomes over the post-reform period, but also whether these effects became stronger or weaker with the maturity of the reform; this is something that no other study has explored before and that can illuminate the debate on whether or not the increasing competitive pressures in the school system have made one or both of these two groups of schools more effective. Additionally, I will also be able to check if there is any evidence that the relative gains of having attended a subsidised-private instead of a public school have been mediated by socioeconomic background; this means to observe whether these schools offered better educational prospects for all individuals regardless of their social origins or if they, in contrast, worked better for children from advantaged social backgrounds.

Fifth, by targeting the analyses of the relative effectiveness of subsidised-private vs. public schools to focus on individuals who already finished secondary school, I can try to understand whether all possible school-type trajectories - i.e., all the combinations of school type that individuals can attend at primary and

secondary level – had different effects on the outcomes of interest. This is something that not many studies have addressed before and can feed into the debate on the convenience of attending a subsidised-private school at a particular school level. This is important from an educational policy perspective. As long as many subsidised-private schools continue to charge additional fees to parents, it may not be optimal for parents to pay for their children to attend a subsidised-private school at both levels if, for instance, only attending at the secondary level makes a difference to their education or employment outcomes. However, even if all the subsidised-private schools are free, as is expected to be the case in the near future, this can still be relevant. For example, parents living in isolated areas may struggle to enrol their children at a distant subsidised-private school at the primary level if their children are too young to commute on their own and they do not have the time or financial resources to provide transportation to the school. Despite this, if attending a primary subsidised-private school makes a positive difference to children's chances of a better future, parents may still want to take that information into account in order to evaluate the costs and benefits of their decisions in a sensible way.

By performing all these empirical analyses, I expect to produce new information to feed into future Chilean education policy. As already mentioned, the 'School Inclusion Act', enacted in 2015, introduced important amendments to the voucher school system, including a prohibition on schools that receive state funding from selecting students, making profit or imposing tuition fees on parents. However, these policy issues have become so controversial that, just four years after the enactment of this law, the new government from the opposing coalition sent a new bill to the Chilean congress (the 'Fair Admission Bill') to reinstate at least part of the selection practices used at subsidised schools. Thus, I believe that further evidence on the relative performance of subsidised-private and public schools operating under a fully free market competition scheme is still needed. I hope that having more empirical evidence about the consequences of the previous rights granted to subsidised-private schools, as well as further insights into the incentives promoted by these rights, will help to prospectively assess future modifications to the Chilean voucher school system.

Apart from filling these particular gaps in the literature on the effects of voucher schools in Chile, this thesis seeks to make a number of broader contributions to the literature on education policy evaluation. First, this research project intends to emphasise the importance of assessing the performance of different school types by considering a set of outcomes that is broader than student achievement in standardised test scores (typically maths and language). Indeed, one could argue that a policy evaluation based exclusively on educational achievement may be too focused on the short term results of students, while an integral policy assessment would benefit from including a larger set of individuals' medium-term and long-term outcomes, such as educational attainment and labour market outcomes measured later in life.

Second, this thesis also aims to improve the knowledge about inequality of educational opportunity in developing countries in general, and in Latin America in particular. To date, the scarcity of longitudinal individual data in these countries has meant that only a small number of studies on this matter have been conducted. Thus, producing more quantitative research on the link between socioeconomic background, educational trajectories and labour market outcomes in developing countries is important in order to test whether the existing theories of educational inequality still hold in the different institutional, social, and macroeconomic contexts that characterise these countries. Investigating educational inequalities in Latin America seems to be particularly important, as empirical evidence suggests a much stronger connection between socioeconomic background and educational attainment in this continent than in developed countries. For instance, although the US is often identified as the developed countries that exhibits the most uneven educational opportunities, some studies have reported that inequality of educational opportunity in Latin America is in general higher than in the US (Behrman *et al.*, 2001; Binder and Woodruff, 2002; Gaviria, 2006). Finally, as Hsieh and Urquiola, (2006) have pointed out, among all Latin American countries, Chile is the only one that offers the possibility of analysing the consequences of a radical transition from a centrally controlled public school system to one in which all students were given the right to choose between public and private schools.

Third, in a much broader sense, the way societies design, organise and regulate their school systems can have an impact on the intergenerational reproduction of socioeconomic characteristics of individuals, which

may produce persistent long-term effects on social and economic mobility and seriously affect the opportunities societies offer, in particular, to their most disadvantaged members. For these reasons, educational reformers everywhere should carefully study and prospectively analyse both the immediate and long-term potential consequences of introducing new educational reforms, ideally on the basis of evidence-based evaluations, like the one I will try to conduct in this thesis.

All things considered, I believe that the Chilean experience of a competitive private-public voucher school system provides useful lessons on educational policy for countries undertaking market-based school reforms around the globe. The combination of publicly funded vouchers with for-profit educational institutions, selection mechanisms at schools, and tuition fees on top of the voucher has been unique: no other country undertook a voucher reform with these characteristics. Countries like Sweden, Finland and the Netherlands, which have established different arrangements for publicly funded private schools, do not charge additional tuition fees to parents. Quasi-market mechanisms established in the UK introduced competition and choice into the school system, but unlike Chile, even privately sponsored secondary schools (academies) have continued being non-profit. Thus, studying the Chilean case makes it possible to observe the consequences of introducing extreme neoliberal competition principles into the school sector, which can inform and feed future school policy everywhere.

1.5. Outline of the remaining chapters

Having presented the motivation, the main objectives, and the expected contributions of the present research project, the remainder of this thesis is organised as follows. Chapter two introduces the theoretical approaches and key concepts that I consider the most relevant for this thesis. Chapter three presents a general overview of the Chilean educational system and its development from 1981 until the present. The fourth chapter, which is the first analytical chapter of this thesis, empirically addresses the first set of research questions presented above. Similarly, the fifth chapter presents and analyses empirical evidence intended to answer the second set of research questions already introduced. The sixth and final chapter of this thesis summarises and concludes.

2. Theoretical background and key concepts

Education policy analysis and, more specifically, the empirical study of the effects of school reforms is not the exclusive domain of a single social discipline; therefore, this thesis has a multidisciplinary approach. For example, while the definitions of social background that I use to construct explanatory and control variables in Chapters 4 and 5 are based on the sociological literature on educational inequalities, Chapter 5 strongly relies on program evaluation concepts and estimation techniques that were developed by economists. Moreover, the analysis and conclusion sections of this thesis present plausible explanations for my findings based not only on some sociological theories of inequality of educational opportunity and social stratification but also on economic theories of school competition, rational individual behaviour, and incentives. Therefore, this chapter, briefly introduces the theoretical approaches and key concepts taken from both sociology and economics that I consider the most relevant for this thesis.

2.1. Theoretical approaches from Sociology

2.1.1. Inequality of educational opportunity

Even though the concept of inequality of educational opportunity (IEO) is known internationally and broadly used, many important sociologists and educational researchers recognise that its definition is not absolutely clear and some even consider the term to be ambiguous (Jackson, 2013; Peterson and Woessmann, 2007). Moreover, far from being static, the notion of equality of educational opportunity has experienced several transformations over time. As early as 1968, Coleman described how the IEO concept had notoriously evolved in the US from the idea of ensuring a set of free school services to a notion of institutional responsibility in creating achievement (Coleman, 1968: 22). In other words, Coleman highlights that the modern notion of equality of educational opportunity was the result of a shift in the perception of the role of schools, which transited from equalizing schools inputs - while leaving students and their families the responsibility of making a good use of them - to equalizing the distribution of school effects across

different student groups[9]. This notion of IEO, which focuses on outputs rather than inputs, is also discussed by Evetts (1970) who acknowledges that equal educational opportunity is met at the extent to which groups of students from different social classes achieve proportionately equal success rates (Ibid:429)[10] Regardless of the many debates on the appropriateness of the definition of IEO and its underlying assumptions, this thesis uses the simple concept proposed by Boudon (1974) who understands IEO as "the differences in level of educational attainment according to social background" (Ibid: xi).

What is well established in the contemporary sociological literature is that the IEO can be decomposed into two parts: one part is determined by differences in students' previous educational performance and the other is determined by the distinctive educational decisions made by students and their families conditional on students' performance (Jackson, 2013). These two components are known as primary and secondary effects of socioeconomic origin on educational opportunity. As has been explained by Breen and Goldthorpe (1997), primary effects are expressed in the association between the individual's socioeconomic or class origin and their levels of demonstrated academic ability, and secondary effects are expressed in the actual choices that these individuals make in the course of their educational careers (Ibid: 277). According to Jackson (2013), the first authors to introduce explicitly the language of primary and secondary effects into the analysis of educational opportunity were Girard and Bastide (1963); however, it was only after the publication of Boudon's famous book: *Education, Opportunity and Social Inequality* (1974), that these key concepts captured the attention of sociological research and started being discussed explicitly or implicitly in numerous empirical studies conducted in developed countries (Jackson, 2013:8-9).

Over time, methodological developments and access to better quality data have made it possible to conduct improved empirical research on the relative importance of primary and secondary effects in producing IEO.

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[9] Although Coleman's work that I describe in this section (1968, 1969) was mainly focused on racial differences in educational achievement in the US, these concepts can easily be extended to any groups of students that differ according to family and parental characteristics.

[10] This author also reflects on the fact that this notion of IEO relies on the assumption that talent distributes randomly in the population as well as within social class-groups, which is arguably unrealistic; he also states that even if this assumption holds, students are still exposed to different environments (this point is also made by Coleman (1969)). Therefore, in order to promote IEO, it would be necessary to positively discriminate in favour of certain groups of students to compensate them for environmental deprivation (Evetts, 1970: 428). The latter can be understood as a certain form of manipulation of environment that the author does not consider necessarily desirable or even feasible. For these reasons, Evetts concludes that this interpretation of equality of educational opportunities is still unsatisfactory.

The findings of recent empirical literature based on European data (e.g. Erikson, 2007; Kloosterman *et al.*, 2009; Erikson and Rudolphi, 2010) agree that both primary and secondary effects are important in explaining educational inequality. Moreover, since educational inequalities in student performance are normally considered as much more invariant (Erikson and Jonsson, 1996:12), most of the studies conclude that IEO would be reduced significantly if inequalities in educational choices, i.e. secondary effects, were ameliorated.

In this thesis, although my main interest is isolating the school-type effect from the social background effect to answer the second set of research questions presented in the Chapter 1, I indirectly evaluate the secondary effects of socioeconomic origin on educational opportunity in Chapter 5 when I study the effects of attending a subsidised-private school rather than a public school on educational attainment at the age of 25. In these analyses, the primary effects are also taken into account when I include the overall secondary school marks obtained by students as a covariate in the multiple regression models explaining educational attainment by the age of 25.

2.1.2. Economic and cultural theories of educational inequality

The sociological study of the underlying mechanisms explaining the link between social background and educational opportunity has been guided by two types of theoretical perspectives: cultural theories and economic theories. While the cultural theories associate individuals' educational outcomes with the cultural background of their parents and families, economic theories assume that the educational attainment of children and adolescents is the result of informed decisions made by their families, who act as rational agents.

Cultural theories are mainly based on the work of Bourdieu (1973 and 1984) and Bourdieu and Passeron (1977 and 1979) who developed the concept of cultural capital. Lamont and Lareau (1988) argue that the notion of cultural capital has had slightly different meanings across Bourdieu and Passeron's lifework (Ibid:36), which makes it difficult to arrive at a single definition; however, they identify that the concept

refers to a large number of cultural attitudes, preferences, behaviours and goods that characterise dominant classes. This may include linguistic aptitudes, formal knowledge, general culture, and credentials (Bourdieu and Passeron, 1977), as well as the tastes, manners and conducts of those in possession of those cultural and economic advantages (Bourdieu, 1984). For Bourdieu *et al.* (1973), capital cultural is also a power resource that both facilitates the access to organisational positions and reflects (i.e. is an indicator) of those positions. For the purposes of this thesis, I adopt the definition provided by Lamont and Lareau (1988) who understand cultural capital as 'widely shared, high status cultural signals (attitudes, preferences, formal knowledge, behaviours, goods and credentials) used for social and cultural exclusion' (Ibid:156).

By building on Weber's (1946; 1968) theories of status, Bourdieu and Passeron (1977) develop a complex conception of the process of exclusion based on the idea that dominant groups in societies use cultural capital as a way to mark their distance with respect to other groups, to define who accesses high status positions and to exclude individuals from other groups (Lamont and Lareau, 1988)[11]. For Bourdieu and Passeron, exclusion take place through four major forms: self-elimination, over-selection, relegation and direct exclusion. Self-elimination means that individuals adjust their aspirations according to their perceived possibilities of success and tend to act to exclude themselves from environments whose cultural norms are not familiar to them (Bourdieu, 1974). Over-selection occurs when the dominant groups expect that others with less advantaged cultural backgrounds adhere to their standards, which in practice means that these groups are required to perform even better than their more cultured counterparts (Bourdieu and Passeron, 1977). Relegation refers to the fact that, regardless of their educational investment, individuals who do not possess the cultural background of the dominant groups end up accessing lower prestigious positions. Finally, direct exclusion is produced when individuals choose to establish links with others based on "elective affinities" or similarities in taste.

[11] Perhaps one of the most interesting points in the work of Bourdieu (1977) is that he considers that many of these signals of exclusion are sent by the dominant classes unconsciously because they have been learnt by individuals through socialisation and are therefore part of their inherent dispositions or *habitus*. For that reason, the author pointed out that they were unlikely to disappear as a result of the expansion of capitalism and the decline of the hegemony of traditional status groups (Lamont and Lareau, 1988)

Among the economic theories of educational inequality, one of the most influential is the Rational Action Theory (RAT) (Boudon, 1974). The RAT outlines that educational pathways can be seen as a number of consecutive and interdependent decisions made by students and their families; at every step of their educational pathway, children and adolescents may opt for continuing their studies or withdrawing from the educational system. The rationality assumption implies that individuals make decisions considering both the costs and benefits of remaining in the educational system, and also the expected probability of success in completing their further studies. Given that school attendance implies a series of costs for families, including tuition fees, transportation, study materials, and also the opportunity cost associated with further study (Erikson and Jonsson, 1996), families who have a more privileged position in terms of economic resources will choose to make higher investments in education than those who have limited resources. (Blossfeld and Shavit, 1993).

An important extension of the RAT was made by Breen and Goldthorpe (1997). These authors observe that over the last half of the twentieth century, class differences in educational attainment have been shown to remain quite stable in the majority of developed countries. Thus, Breen and Goldthorpe develop a rational choice model of educational decisions aimed at providing an explanation for the persistence of class differences in the educational attainment of young people across generations. The authors show that the only requirement for families from upper social classes to systematically invest more in education than those from lower social classes is the existence of a *'relative risk aversion'* towards downward mobility present in all social classes. This means that a situation in which all parents expect that their children reach a socioeconomic situation that is equal to or better than their own will consequently lead to persistent educational inequality by social class. The RAT has been frequently used as the main theoretical framework to study inequality of educational opportunity by sociologists in developed countries because it has been considered to have superior explanatory power than cultural theories to understand how the IEO have changed over time (Boudon, 1974: 28; Goldthorpe, 1996:318).

This thesis also relies on the RAT as an important theoretical approach, not only because it offers a good explanation for the generation and reproduction of inequalities in educational attainment in Chile, but also

because, as will be seen later, I believe that it provides a useful framework to understand the preferences of families for certain school types. However, I believe that some elements of the cultural theories of educational inequalities also provide useful analytical tools to study the evolution of the Chilean voucher school system, as Chile has been portrayed by many sociological studies as a highly status-driven society[12]. Therefore, I use elements of both theories in the analysis of my empirical results.

2.1.3. Theories of educational expansion and educational inequality

The notion that educational expansion would promote educational equalisation emerged from the Modernisation Theory (Boliver, 2011). This theory posited that industrialisation would make it necessary to have an increasingly highly skilled labour force; therefore, over time, labour markets would start to reward achieved attributes rather than background characteristics of individuals (Parsons 1970; Bell 1973). Nevertheless, empirical studies would soon contest this theory, by showing that disparities in educational attainment have persisted regardless of societies' efforts to expand education at secondary and tertiary levels through the establishment of universal coverage (Halsey *et al.* 1980).

To try to solve the apparent puzzle of having persistent inequalities along with educational expansion, sociologists have developed several hypotheses. For Boliver (2011), two of the most influential are the hypotheses of *Maximally Maintained Inequality* (MMI) (Raftery and Hout 1993; Hout 2007) and *Effectively Maintained Inequality* (EMI) (Lucas 2001, 2009). In a nutshell, the MMI hypothesis explains that educational expansion has not resulted in a reduction in educational inequalities because socioeconomically advantaged families are better placed to make good use of the opportunities provided by this expansion[13]. Therefore, this theory predicts that educational expansion will bring about a decrease in IEO only after the enrolment rates among the most privileged socioeconomic groups have reached a 'saturation point'. In other words, only when the demand for a certain level of education has reached a hundred percent among the upper

[12] As I will discuss at a later stage, some my findings in Chapter 4 tend to support this view.
[13] Like Boudon (1974), Raftery and Hout (1993) also build on the rational action theory to propose their MMR hypothesis. In particular, the authors explain that the choice of continuing to the next stage of education rather than dropping out takes into account both the costs and benefits. Therefore, it is expected that more highly educated families, which typically attach a higher value to education, will perceive larger benefits for their children to remain in the educational system in comparison with less educated families. Therefore, the most privileged social groups are the first in reaching the 'saturation point'.

classes, the link between social background and educational attainment can decrease (Raftery and Hout, 1993: 57).

On the other hand, the EMI hypothesis suggests that, while educational expansion has helped less privileged families to reach higher levels of educational attainment, the most advantaged groups have managed to secure their privileges by acquiring qualitatively better kinds of education at all educational levels. As Lucas (2001) explains, empirical evidence for the US suggests that individuals in advantaged groups tend to act in ways that ensure they obtain advantages for themselves and their children; specifically, when quantitative advantages are important, they try to obtain those advantages, but once quantitative advantages have become scarce (e.g. by reaching universal schooling) they attempt to differentiate themselves by acquiring qualitative advantages (Ibid:1652). In his seminal work on this matter, Lucas (2001) defined as qualitative advantages those given by stratified secondary school curricula or tracked school systems; however, this hypothesis can be arguably expanded to consider access to elite schools or prestigious universities. For example, Boliver (2011) tests the EMI hypothesis in Britain by focusing on inequalities by social background in the access to traditionally high status degrees and old universities, finding that they have persisted even after the 'saturation point' has been reached and quantitative inequalities have been reduced.

Although the empirical link between educational attainment and socioeconomic background across decades is not one of the core focuses of this thesis, I consider that these hypotheses provide plausible explanations for understanding why the period of very impressive expansion of the Chilean educational system – especially at the secondary level – apparently did not reduce the stratification of the school system by socioeconomic background.

2.1.4. Definition and measurement of social background

Having presented the main theories and concepts related to educational opportunity, including how social background is expected to have an important and perhaps persistent effect on individuals' educational

outcomes regardless of nations' educational expansion, it remains to define what social background is and how it can be measured.

This thesis follows the work of Bukodi and Goldthorpe (2012), who proposed measuring individuals' social background by decomposing it into parental social class, parental social status and parental education. For these authors, these three components of social origins are relevant determinants of educational attainment because they reflect different dimensions of an individual's family background.

In particular, for Bukodi and Goldthorpe (2012), parental social class accounts for the differences in employment relations that are associated with economic advantage and disadvantage. These include differentials not only in people's levels of earnings but also in their income stability and security in the medium and long-term (Ibid: 1025). On the other hand, for these authors, social status is understood in a Weberian sense as based on individuals' perception of social superiority, equality or inferiority associated with different lifestyles (Chan and Goldthorpe, 2004). Finally, for Bukodi and Goldthorpe (2012), parental education, when included in empirical models along with parental social status and parental social class, captures the capacity of parents to participate in and influence their children's educational careers by encouraging them to study and providing them with a stimulating learning environment.

I believe that this conceptualisation of socioeconomic background is very appropriate and provides me with a useful framework to study its influence on the explained variables of this thesis, which are school-type choice, educational attainment and labour market outcomes. First, the economic aspect is an important consideration for families when deciding about their children's education; for instance, depending on their school choice, they may pay nothing for their children's education (if they choose a public school), pay a relatively small amount of money (if they choose a subsidised private one) or pay a considerable amount (if they prefer a fully-paid private school). At the same time, tertiary education in Chile has proved to be among

the most expensive in the OCDE[14]. Also, I expect that social status has an important association with the educational decisions of families in Chile because this variable reflects access to sociocultural networks and active participation in cultural activities, which seem to be highly correlated with educational choices at school level (Gallego and Hernando, 2009; Elacqua, Schneider and Buckley, 2006). Finally, I anticipate that parental education is a key determinant of all the outcomes of interest for this thesis. Particularly, I expect that highly educated parents will use their accumulated knowledge and experience not only to make good educational decisions on behalf of their children (and to help them with their own educational and labour market decisions later in life), but also - as Bukodi and Goldthorpe (2012) suggest - to support them directly with their subject studies, courses and examinations (Ibid: 1026).

2.2. Theoretical approaches from Economics

2.2.1. Voucher school schemes

The idea of a voucher school system was originally proposed by the economist M. Friedman in his well-known book *Capitalism and Freedom*. According to Friedman, an ideal school model is one in which the government gives all parents a voucher redeemable for a set maximum amount of money per student per year that can be spent on any approved educational institution of their own choice (Friedman, 1962:89). This model has the advantage that parents, acting as rational agents, can express freely their preference regarding schools by withdrawing their children from a school they dislike and sending them to their preferred one (Ibid: 91). Over time, school choice and competition will increase quality of education since low quality schools will tend to disappear as a consequence of not having a high enough enrolment; this result, however, relies on Freidman's assumption that parents will choose a school for their children based on its quality. Friedman also stresses that the educational services may be provided either by for-profit private enterprises, or non-profit institutions (Friedman, 1962: 89); in this regard, the author emphasises

[14] According to the OECD report 'Education at a Glance 2017', tuition fees at private tertiary institutions in Chile (around 7,000 USD per year) are as high as those in Korea, Japan and Australia, which is the group that presents the most expensive tuition fees after the US and the UK. In the case of public tertiary level institutions, only the US exhibits slightly higher average tuition fees than Chile (around 8,000 USD per year). For more details see figure B.5.1 on page 212 of this report.

that private enterprise is "more efficient in satisfying consumer demands than nationalised enterprises or enterprises run to serve other purposes" (Friedman, 1955: 129). The introduction of competition among schools is also seen as beneficial by Friedman since it promotes a variety of different school types and flexibility in the school system. (Ibid). With respect to the role of the government in a voucher school system, Friedman proposes that it must be limited to guarantee that schools meet minimum standards, which in practice means to establish the basic contents to be covered in their educational programmes. (Friedman, 1962:89).

As Wolf *et al.* (2013) have pointed out, Friedman's prediction that a voucher school scheme with these characteristics would produce better outcomes for students and their parents has been contested by the literature. For example, Henig (1994) argues that the model wrongly assumes that families have access to good quality information about schools and their characteristics when they make their choice. Stewart and Wolf (2011) note that the establishment of voucher schools leads to the emergence of a group of new "choosers" who will need substantial information and guidance to make their decisions. On the other hand, Levin (1998) indicates that parents may decide to enrol their children in private voucher schools based on non-academic criteria. All these situations could undermine the quality of such a voucher school scheme not only because parents may not have appropriate information to make the best choice for their children, but also because schools, being aware of this lack of knowledge, will not have any pressure to enhance their performance (Schneider and Buckley, 2002).

As observed by Levin (2002), by establishing the value of the voucher at a very modest level and giving parents the ability to add to the voucher, Friedman's model (1962) prioritised the promotion of freedom of choice and economic efficiency possibly at the expense of other educational goals. For instance, Friedman's proposal did not consider any provisions for parents to afford either transportation or the compilation of information on schools; at the same time, regulation had a minimal role in this model (Ibid: 164). Although this combination of attributes could reduce the opportunities for socially disadvantaged students to both choose and attend a school of their preference, reducing costs and avoiding governmental intrusion in family decisions were the most important elements in Friedman's original model.

Regardless of these criticisms, several countries have established voucher school schemes. Many of these countries have followed the basic rules of competition and choice and, as suggested by Friedman (1955 and 1962), have promoted private provision by allowing parents to fully or partially afford tuition fees by using school vouchers. However, a wide variety of different voucher school arrangements have emerged over time, ranging from national programs covering both the private and public sectors to small-scale local programs that target only specific populations.

For Levin (2002), voucher school schemes can vary in terms of three important aspects: finance, regulation and support services; depending on these characteristics, they can have profoundly different results. Finances refers to the monetary value of the school voucher, its variation across groups of students and the existence of co-payments. It is important to observe that the voucher can be a flat-rate subsidy - as in the case of Chile before 2008 – or differentiated by student's needs - as in the case of Chile after 2008 - and tuition fees on top of the voucher may or may not be allowed. If additional tuition fees are allowed, they may or may not be capped. While differentiated voucher schemes can lead to positive discrimination in favour of socially disadvantaged children, parental fees (as proposed by Friedman, 1962) on the contrary may induce negative discrimination against these groups of students. The second element defined by Levin (2002), regulation, refers to the criteria that governments define for schools to be eligible for vouchers, as well as other rules for students and families that wish to use the vouchers. For instance, governments may want to establish a common curriculum or standardised tests for all voucher schools or may want to give vouchers only to socially vulnerable populations[15]. Another important regulatory aspect is the definition of general admission procedures for voucher schools in the case of oversubscription. Governments concerned about the fairness of these processes may prefer to establish a total or partial lottery, while others concerned about scarcity of resources and cost-efficiency may prefer to prioritise student candidates in consideration of their past academic merit. Finally, Levin (2002) defines as 'support services' the combination of publicly provided services designed to improve the functioning of voucher school schemes. For instance, as said

[15] Levin (2002) points out that in the United States both private and public voucher school schemes have generally targeted students from poor families. The idea of this practice is to increase the choice of socially disadvantaged families beyond their neighbourhoods. He also observes that voucher programs in Florida have restricted the vouchers to students in failing public schools.

before, costly or scarce public transportation may limit the potential for families to make good use of school choice, thus this would be a key support service. Moreover, as Schneider (1999) proposes, information needs to be collected, systematised and disseminated to families in order to help them to choose schools wisely.

A common characteristic of most voucher school schemes established around the globe is that, despite Friedman's (1962) recommendations, state or governmental provision of education has also been maintained either as part of or in parallel to voucher school programs[16] For that reason, when evaluating voucher school reforms, economists suggest that the effects on the whole national education system should be analysed, rather than restricting the analysis only to voucher schools and their students (Neal, 2018).

2.2.2. A framework to evaluate educational vouchers

This section is based on the work of Levin (2002) who proposes a comprehensive framework to evaluate voucher schools based on the variety of motivations and goals of different voucher school arrangements. Even though the author developed this framework for the US, I believe that it accurately summarises the main elements of controversy in the contemporary debate on voucher schools, not only in the US but globally.

For Levin (1987, 2002) the debate on voucher schools can be partially understood in terms of the different perspectives of economic liberals who rely on the markets to provide public services and political liberals who rely on governments. Levin's framework for the evaluation of voucher school plans is based on four important criteria: freedom of choice, productive efficiency, equity, and social cohesion.

[16] For instance, Bangladesh, Belize, Chile, Colombia, Czech Republic, Guatemala, Ivory Coast, Lesotho, Poland, Sweden, the United Kingdom, and also several states and cities in the United States such as Atlanta, California, Colorado, Cleveland, Florida, Kansas, Milwaukee, New Jersey, and Washington have implemented systems in which parents can use vouchers to either send their children to a public school or a private school, according to their own preference. Other countries and states, such as Alberta (CN), Belgium, British Columbia, France, Japan, New Zealand, Quebec, and the Netherlands, have implemented some sort of state support to private schools (Brasington and Hite, 2014).

As Levin (2002) explains, freedom of choice is the right given to families to choose a school for their children that best reflects their values, religion, political views and educational philosophies. For this author, voucher school proponents typically give greater importance to this criteria with respect to the others. The second criterion, productive efficiency, is related to cost-efficiency, i.e. the maximisation of educational outcomes for any given amount of resources. As explained in point 2.2.1, Friedman (1955 and 1962) and the advocates of voucher school schemes believe that school choice and school competition will necessarily induce productive efficiency in so far as bad quality schools that would not be chosen by families would disappear over time.

The third criterion to evaluate voucher schools, equity, is defined by Levin (2002) as the fairness of access to "educational opportunities, resources and outcomes by gender, social class, race, language origins and geographical location of students" (Ibid: 163) [17]. Voucher school advocates believe that these systems have the potential to open educational opportunities precisely for the most economically disadvantaged students that are often locked into their neighbourhood's schools that tend to be of low quality. On the contrary, voucher schools' detractors argue that the uneven amounts of information available to parents and their differing ability to understand, process and use that information may produce inequalities in their capacity to benefit from school choice[18]. Moreover, opponents of school vouchers believe that families' preferences for schools that resembles their own social and religious standings will increase segregation by family income, power and status.

The final criterion defined by Levin (2002) is social cohesion and it can be seen as the need of countries to have common elements in their educational systems. For example, a unified language, certain social values, civic education and a basic curriculum may be considered by nations as fundamental for individuals' economic, social and civil participation. Even Friedman (1962) recognised that the societal benefits of education justified the need for public funding in education. The detractors of voucher school schemes

[17] I consider it necessary to observe that Levin's (2002) definition of equity gives space for some ambiguities. For instance, the quest to equalise educational outcomes across different student groups may imply different educational resources being given to those groups of students. Therefore, as explained in Section 2.1.1, I prefer to use the definition of equality of educational opportunity provided by Boudon (1974) to assess the criterion of equity in voucher school systems.
[18] These opposing hypotheses are also explained in Coleman (1990).

normally argue that these unification strategies are not enough and the marketisation of schooling, and particularly the competitive pressures on schools and families, will lead to further social divisions rather than social cohesion.

From the four key dimensions for the evaluation of voucher school reforms in Chile proposed by Levin (2002), my thesis contributes with new empirical evidence to the analysis of both equity and productive efficiency. These are the two dimensions that I will address in the conclusion and policy discussion of this thesis that I present in Chapter 5.

2.2.3. Voucher schools, educational outcomes and efficiency

In the economics literature, the 'gold-standard' evaluations of the effects of vouchers on educational outcomes comes from experiments (randomised control trials) because either targeting or offering the vouchers openly to the public introduces problems of selection or self-selection of students that would bias the results of non-experimental evaluations. In cases where they are politically and ethically viable, these experiments randomly allocate vouchers through a lottery and later compare the educational performance of students who received and did not receive a voucher to assess the advantages of school choice in a competitive system.

In the US, vouchers have been allocated through lotteries in Milwaukee, New York, Washington, Cleveland, Dayton and Charlotte to allow students to attend a private school of their preference rather than their local public school. A series of studies have measured student achievement in maths and English after a number of years of attendance at private voucher schools in these cities, obtaining different results. For example, while evaluations of the Milwaukee and the Charlotte experiments have found modest gains (Rouse, 1998; Greene at al 1999; Witte *et al.*, 2011; Cowen *et al.*, 2013; Greene, 2001; Cowen, 2008), the Cleveland experiment has provided no evidence of significant improvement (Plucker *et al.*, 2006; Belfield, 2006) and the Washington experiment has showed either no effects (Wolf *et al.*, 2013) or negative effects (Dynarski *et al.*, 2017). On the other hand, the evaluations of the experiments conducted in New York and Dayton have

reported achievement gains only for African American students (Howell and Peterson, 2002; Krueger and Zhu (2004); Chingos and Peterson, 2012). In the case of potential effects on educational attainment rather than achievement, only some of these experiments have found significant positive effects of vouchers on high school graduation (Wolf *et al.*, 2013) and college enrolment and persistance (Wolf *et al.*, 2018; Cowen *et al.*, 2013)

As Neal (2018) observes, many voucher schools in the US have produced either similar or moderately better educational outcomes, while spending much less than the local public schools (Ibid, 162). This may induce us to believe that private voucher schools are more efficient than public schools. However, students who were part of these studies are members of families who made the decision to apply for school vouchers, which raises concerns about sample selection and the external validity of these studies. For instance, as Neal (2018) reflects, it is possible that the children from families who did not apply for school vouchers would have obtained worse academic results if they had been enrolled in the private schools that adhered to these voucher programs. Moreover, it is important to observe that the mechanism driving better educational outcomes could be better student peers rather than better learning practices. In fact, recent economics literature suggests that peer effects may be an important determinant of student achievement (Sacerdote, 2011; Epple and Romano, 2011)[19].

The concept of peer effects is used to describe the influence of attending a school with low or high ability students on a particular student's performance (Epple and Romano, 1998). As Walton (2010) has pointed out, there are several ways in which peer-effects may exert their effects and parents have good reasons to take them into account when choosing a school for their children. First, students not only learn from their teachers, but also from other students. Second, the overall quality of teaching may be positively or negatively affected by the behaviour of classmates. Third, teachers may push their students harder when they perceive a high average ability. Fourth, students may also benefit from their successful school peers later in life.

[19] Neal (2018) recognises that structural models of school choice and school competition normally do not explicitly take into account peer effects. This is due to two reasons. On the one hand, peer effects make these models much more complicated and, on the other hand, he considers that the vast literature in peer effects has yet to come up with definite conclusions of these effects under different school settings.

Finally, even if peer-effects on performance are not significant, parents may still be concerned about the peer environment, as schools are the most important location for the social interaction of children and adolescents (Walton, 2010: 739).

Apart from the voucher school experiments that were conducted in the US, other well-known experiments with school vouchers have taken place in the developing world, particularly in Colombia and India. In the case of Colombia, as part of a wider strategy to expand private provision of public services, the so-called PACES program – programme of expansion of secondary education – was established in 1991. This program offered school vouchers to individuals who resided in poor neighbourhoods, were previously attending a public primary school, and were 15 years old or younger. The voucher gave students the possibility of attending one of the participating schools that were located in pre-defined territories, including all Colombian main cities. In the case of cities where schools were oversubscribed, lotteries were held to award the vouchers, which opened the possibility of evaluating this program free of selection bias (King *et al.*, 1997; 1998). The results of this voucher school experiment (Angrist *et al.* 2001; Angrist *et al.*, 2006) suggest that voucher winners experienced larger increases in school achievement, lower rates of grade-repetition and higher rates of graduation from secondary school. However, private voucher schools in the PACES program tend to spend as much or slightly more than public schools (Neal, 2018). Therefore, it is not possible to conclude that private voucher schools have been more efficient than public schools.

The voucher school experiment in India was applied in 180 villages in the province of Andhra Pradesh between 2008 and 2009; ninety of these villages were randomly chosen as treatment villages and a lottery was run in each of them to select the fraction of applicants that would receive school vouchers. This evaluation design allowed for the estimation of the effects of vouchers within villages and also made it possible to identify how the existence of the voucher program in a certain village affected non-treated individuals compared to those in control villages. The evaluation of this program (Muralidharan and Sundararaman, 2015) conducted two and a half years after the lottery, reports that the growth in achievement rates was not statistically different for students who won the vouchers relative to those who

did not win[20]. In terms of efficiency, unlike the Colombian case, private voucher schools tended to spend much less than public schools, which, as Neal (2018) observes, allows them to conclude that private voucher schools are more efficient than public schools. As Muralidharan and Sundararaman (2015) indicate, there is no evidence to suggest that the only reason that voucher schools are capable of educating children at a lower cost than public schools is because they receive students whose background characteristics make them much easier to teach[21]. Public schools in India tend to have very high costs associated with high teacher salaries and employment protections that do not exist in the private school sector, and these are the main factors explaining the difference in efficiency between the two school types.

In summary, the literature on the relative performance of private voucher schools and public schools provides many precautionary notes for the assessment of students outcomes and school efficiency. Not even the randomised controlled trials, which represent the 'gold-standard' in program evaluation are completely exempt from the problem of sample selection. The consequence of this is that the extrapolation of their conclusions to larger populations and, in particular, to the whole education system is unviable. Also, the possible existence of peer effects makes it difficult to visualise what portion of students' performance is related to learning practices and what portion may be explained by a better peer environment if information about peers is not available. Finally, in the presence of different laws and regulations affecting both the cost structures and sources of funding of public and private schools, identifying what school types have developed the most cost-effective teaching practices is not an easy task.

The experiences of the US, Colombia and India teach us how difficult and challenging it is to arrive at definitive conclusions about the consequences of voucher schools on school efficiency even when the research design is optimal. These challenges will be even greater when I analyse my results for Chile given all the additional complications associated with the lack of randomisation of vouchers and school selection practices. I will discuss all these issues in detail in Chapters 5 and 6.

[20] The only significant difference was found for students' performance in Hindi, which is only taught by private schools in India.
[21] Although vouchers can be offered to families by lottery, families cannot be forced to accept them and normally those who do it are the most interested in their children's education, which typically correlates with the child's ability and parental social background.

2.2.4. Voucher schools, student sorting and school segregation

A different stream of economic research on voucher schools has suggested that school choice tends to have a significant effect on school segregation (McEwan, Urquiola and Vegas, 2008) and subsequently on fairness. This means that competition among schools may produce a situation in which each of them attracts a homogeneous group of students in terms of ability, income and/or social background. This effect is known in the economic literature as 'student sorting'.

The introduction of choice in school systems may produce two types of student sorting. The first type is produced because schools prefer students with better socioeconomic background and higher ability, measured by previous educational achievement (Levin 1998: 379). Parry (1996) points out that the interest of schools in selecting their students may be understood by using the theory of coproduction (Davis and Ostrom, 1991). As Parry observes: "by selecting the best coproducers (students), a school can achieve higher output with the same level of input" (Parry, 1996: 823). Under a competitive voucher system, schools are encouraged to improve their results in order to attract or maintain students. A possibly simple way to meet this objective is by increasing the quality of the "coproducers", which implies the implementation of rigorous admissions processes.

It is important to notice that establishing and maintaining selection procedures at schools can be expensive. However, if these processes help schools to reach the same levels of improvement in students' outcomes than, for example, developing more effective teaching practices or installing better infrastructure at a lower cost, schools will have strong incentives to implement selection. In terms of procedures, Contreras, Sepulveda and Bustos (2010) note that student selection may be carried out by schools in various ways. When selection by ability is performed, younger students may be required to attend a game session, while older ones may have to take an admission test. When schools select students based on the socioeconomic status of their families, parents or carers may be required to attend a meeting with school officials or provide evidence of their assets and earnings. Student selection can also be based on religious criteria, in which case

parents may be asked to submit their children's baptism certificate or their (church) marriage certificate. (Ibid: 1355-1356).

The second type of student sorting is produced by differences in parental decisions across social classes. These differences may produce a high concentration of students with similar backgrounds in the same schools even in the absence of school selection procedures. For example, as seen in Section 2.2.1, Levin (1998 and 2002) suggests that more privileged families take better advantage of choice than disadvantaged ones because they have better access to information, more ability to afford transportation, and greater experience with the comparison of different alternatives. On the other hand, parents from all socioeconomic backgrounds may be interested in having a favourable social and academic environment for their children. This may be associated either with plain discrimination, or with the expectation that the influence of peers will be beneficial for their children (González *et al.*, 2004)[22]. In sum, even if voucher school regulations completely prevent schools from establishing selection practices, student sorting can still be observed.

To date, a series of studies based on general equilibrium models have found evidence for student sorting and school segregation in competitive school systems. For example, Nechyba (1999) suggests that a private school market operating under perfect free market conditions and constant returns to scale in production will generate perfect sorting if each school announces a fixed per-pupil level of spending and a 'minimum peer quality level accepted'. The sorting in this case is perfect because, in equilibrium, each school will serve only one student type and tuition fees will be equal to the spending level that is most preferred by this type (Nechyba, 2006). Epple and Romano (1998) analyse a similar problem but introduce the possibility that private schools apply price discrimination, by giving scholarships to high-ability, low-income students and charging tuition to low-ability, high-income students. The authors conclude that, in equilibrium, this scheme leads to a quality-based hierarchy of schools that target students according to their ability and income. Their model also predicts that all private schools will offer higher quality than the single public school introduced in the model. In a more recent article, McLoad and Urquiola (2009), introduce school reputation into an

[22] I presented in more detail the notion and implications of peer effects in Section 2.2.3.

equilibrium model, predicting that, when schools are not allowed to select their students based on ability, competition and choice lead to efficiency and promote the emergence of high productivity schools. However, when selection is allowed, market forces will produce student sorting by parental income, increased transmission of income inequalities, and reduced effort from students.

Therefore, the economics literature on voucher school competition provides certain evidence that school choice accompanied by differentiated tuition fees and selection practices may lead to a situation of separating equilibrium, in which students with similar background characteristics are grouped into the same schools. This can not only have an effect on the fairness of the school system but, as seen, can also induce losses in the productive efficiency of schools.

All the models presented in this section offer a compelling theoretical framework to understand how the incentives provided by different voucher school arrangements can have a determinant role in shaping the allocation of students with similar socioeconomic characteristics and ability into different school types. In particular, the model of McLoad and Urquiola (2009), which includes selection of students at schools, is very helpful for understanding how the Chilean national voucher scheme can produce student sorting into school types and promote educational inequalities across generations of students.

3. The Chilean school system: General overview and recent developments

This chapter presents a description of the most important policy changes in the Chilean school system from 1981 to the present. The 1981 reform - which I present in Section 3.1 - and some of its key modifications introduced by the democratic governments in Chile that followed the dictatorship - which I present in Section 3.2 - are the main focuses of the empirical analyses of this thesis, as my main purpose is trying to understand their effects on both educational equality and effectiveness. However, in Section 3.3, I also present a description of the most recent policy changes that have taken place since 2015 with the purpose of later discussing whether they have the potential to reduce educational inequalities in the future without sacrificing quality.

3.1. The 1981 reform

The structure of the Chilean school system has been studied extensively over the last few decades because it has been seen as an exemplary case of increasing the role of the market in the provision and financing of education. According to Harvey (2005), Chile is not only the first country in which neoliberal policies were applied (ibid: 7), but it is also an example of "pure neoliberal practices" from 1975 onwards, and especially between 1982 and 1983 (ibid: 74). It has also been said that Chile was a pioneer that "went further than any other country in redefining the roles of the state and private sector in education, by separating the financing from the provision" (Patrinos and Sakellariou, 2011). Other authors highlight that the Chilean experience with voucher schools is the most influential in the developing world (Heyneman and Stern, 2014). In the light of this, and also considering the many theories reviewed in the previous section that describe how schools have the potential to reproduce socioeconomic inequalities across generations, the Chilean case is an especially interesting one to analyse.

However, these distinctive features of the Chilean educational system are relatively recent. In fact, until 1980, the Chilean school system was characterised by a high level of centralisation, with nearly 80% of the national enrolment concentrated in state schools directly managed and funded by the Ministry of

Education. Of the remaining 20%, 15% attended non-tuition-charging private schools that received limited governmental funding and 5% attended fully-paid private schools (Hsieh & Urquiola 2003 and 2006).

This scheme changed radically in 1981, when the military dictatorship enacted a major educational reform programme, which had two main consequences. First, between 1981 and 1987, the administration and ownership of state schools was gradually transferred to local governments or municipalities, whose highest authorities were their respective mayors (Elacqua *et al.*, 2011; Elacqua and González, 2013). Second, the government changed the mechanism by which public as well as non-tuition-charging private schools were funded by establishing a fixed per-student voucher that would be paid directly to both types of schools on an equal basis (Mizala, 2007; Tokman, 2002). This scheme included primary schools as well as secondary schools. Fully-paid private schools that were already charging tuition fees to parents continued operating as before (Elacqua *et al.*, 2011).

Apart from transferring resources to municipalities, the 1981 reform established that the central government would keep the responsibility of designing the basic national curriculum, but schools would be given great flexibility in deciding how to implement it (Parry, 1997)[23]. Under this new arrangement, the Chilean school system was now based on three main pillars: the old state schools (now known as 'public schools' or 'municipal schools'), private schools that receive state support (the so-called 'subsidised-private schools'[24]), and fully-paid private schools (Patrinos and Sakellariou, 2011).

The new Chilean voucher system was meant to cover school running costs and to improve the quality of education by encouraging competition amongst public and private schools (Anand, Mizala and Repetto, 2009). This competition was expected to increase the diversity of educational programmes and to better

[23] It is worth mentioning that, despite the potential advantages of having a decentralised model of public school management, the municipalisation of public schools has been heavily criticised for having introduced even more educational inequalities into the public educational system in Chile. The reason for this is that municipalities had the ability to give additional resources to the public schools in their districts at their entire discretion, meaning that those in wealthier districts typically had better infrastructure and supporting services than public schools in poor areas.

[24] In this thesis, I may also refer to these schools as 'private voucher schools' because in Chile, unlike other countries where voucher school programs were introduced, public schools were also transformed into voucher schools. More importantly, it is relevant to notice that the term 'subsidised-private schools' (that is the most common way to refer to these schools in Chile), can indistinctly apply to private schools receiving funding from the central government before and after the 1981-reform, although these schools were not voucher schools in the pre-1981 period.

reflect family needs and preferences (Fisher, González and Serra, 2006). Another goal of the voucher programme was to support low-income and middle-class families in accessing better quality education for their children (Elacqua and González, 2013).

As discussed in Chapter 2, voucher school systems, which are characterised by school choice and competition, were originally proposed by Friedman (1955, 1962). One of the important assumptions of Friedman's model (Friedman, 1955 and 1962) is that both parents and schools are rational agents who make informed decisions to obtain the highest possible benefits. On the one hand, this means that schools (for-profit or non-profit alike) will seek to maximise educational performance in order to attract enough students to survive school competition. On the other hand, rational parents will choose a school after carefully assessing all relevant costs and benefits. Therefore, following Friedman's ideas, policy makers in Chile – particularly those identified with the Chicago School of Economics – assumed that public/private school competition would bring efficiency. As vouchers would be transferred directly to each school according to its number of enrolled students, and parents would be completely free to choose their preferred (private or public) school for their children, schools would have strong incentives to improve the quality of education at primary and secondary level (Fisher, González and Serra, 2006). Naturally, this result relies on two additional premises: that parents make school decisions based on academic quality, and that they possess enough information to compare alternative educational offers.

The first attempt to provide parents with information on the school supply was made in 1982, when the military dictatorship established the School Achievement Evaluation Programme ('Programa de Evaluación de Rendimiento Escolar', PER). This programme administered a national test between 1982 and 1984 (McEwan, Urquiola and Vegas, 2008), but its results were not comparable over time and were only used by governmental agencies (Elacqua and González, 2013). Later, in 1988, the National Measurement System for Quality of Education ('Sistema Nacional de Medición de la Calidad de la Educación', SIMCE) was set up. Since its establishment, SIMCE has administered standardised achievement tests on a yearly basis; however, test scores at school level have only been publicly available and widely disseminated since 1995 (Meckes and Carrasco, 2010). Nowadays, SIMCE assesses academic targets in language, mathematics,

natural sciences, and history (Peirano and Vargas, 2005). Tests are given to fourth grade students at the end of every academic year; eighth and tenth graders are assessed biennially in rotation (Taut *et al.*, 2009).

A distinctive characteristic of the voucher school system in Chile is that subsidised-private schools were allowed to select their students based on their own preferences. In contrast, public schools could only reject students in the case of oversubscription (González *et al.*, 2004). As has been reported in the literature, the most common selection mechanisms used by subsidised-private schools in Chile are admission tests, students' prior school marks, and interviews with parents (Contreras, Sepulveda and Bustos, 2010). The latter are mostly conducted in order to get information about the socioeconomic and religious status of families. Evidence on school admission processes in 2005 revealed that around 48% of students enrolled in subsidised-private schools were chosen by ability and 26% for socioeconomic reasons, such as family income or parental employment status (Ibid: 1360). A more recent study by Drago and Paredes (2011) found that by 2008, 67% of subsidised-private schools used some sort of admissions screening (Ibid: 171).

Another important feature of the new school system was that all private schools fulfilling certain basic requirements regarding curriculum, infrastructure, safety and attendance would be eligible to receive governmental vouchers (Tokman, 2002)[25]. These minimum requirements have been criticised for being extremely basic and lax (Elacqua and González, 2013). Traditional private tuition schools could have opted to stop charging fees to parents and accept vouchers instead. Yet, it has been reported that in practice, they decided to continue charging high tuition fees (Hsieh and Urquiola, 2006)[26]. Thus, subsidised-private schools after the 1980s were in their majority either old private schools that were already receiving funds from the central government or completely new schools that opened after the reform.

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[25] The requirements for private schools to receive state vouchers were: (1) To have a manager or director ('sostenedor') that can be both, a natural person or a legal entity. This person is required to have graduated from secondary school. (2) To adhere to the study programmes established by the Ministry of Education. (3) To have a sufficient number of teachers and administrative staff according to the number of enrolled students. (4) To have an adequate establishment that fulfils the minimum space and sanitary conditions, as well as appropriate furniture and study material according to the type of teaching provided. (5) To comply with the minimum and maximum number of students per class. (6) To not be in arrears with teacher's salaries, taxes and social security payments. (Almonacid, 2008:160-161).

[26] It is important to note that in Chile all students that graduate from any secondary school, including those who followed academic tracks as well as vocational tracks, have equal rights to apply to university education. Secondary school marks and the scores achieved by students in a national test to access tertiary education (known as PSU Test) are the only factors considered by Chilean universities to offer students a place in their undergraduate programmes.

Shortly after the 1981 reform, fiscal constraints produced by the economic crisis of 1982-1983 resulted in significant cutbacks in the national educational budget. The consequences of this crisis included that during the 1980's, the real value of the per-student voucher was reduced by about 28% (Espinola, 1991:26), teachers' salaries decreased by around 40% in real terms (Elacqua and González, 2013:6), and much of the public-school infrastructure suffered.

3.2. The return to democracy: consolidation of a market-based school system

In late 1988, a national referendum resulted in a 56% vote against the military dictatorship in Chile. The new government, which was elected democratically in December 1989, took office in March 1990. Three days prior to handing over the government to its successor, the military regime enshrined the education reforms in the Constitution by enacting the 'Organic Constitutional Law of Education'. This constitutional reform meant that future governments could only change education legislation with a two-thirds majority in the Senate (Elacqua and González, 2013).

After the reestablishment of democracy, the main focus of the new government was to provide resources to restore the deteriorated public-school system. During the 1990's, the value of the per-student voucher was increased, and regulations were established to ensure that its value was adjusted in line with the national consumer price index (Mizala, 2007:9). Moreover, a series of educational improvement programmes were introduced over the decade. These programmes were designed to transfer resources from the state to public schools that serve poor or rural communities[27].

One of the most important changes to the voucher school system in Chile took place in 1993, when the government undertook a tax reform aimed at increasing social expenditure and funding the emergent programmes designed to improve educational standards. The support of the right-wing opposition for this reform was conditional on the inclusion of two bills: tax exemptions for school donations and the 'Shared

[27] For example, the '900 Schools Programme' provided resources and technical support to the 900 most disadvantaged public Chilean Schools (García-Huidobro and Jara, 1994).

Financing Law' (Elacqua and González, 2013). The latter allowed subsidised-private secondary schools to charge tuition fees to parents to supplement the voucher, under a scheme that decreased the subsidy given to schools when parental fees increased (Mizala, 2007)[28]. The law also established a maximum tuition fee above which subsidised schools would not receive any state funding and would therefore become an entirely privately funded school (González, 1998). Once introduced by a determined subsidised-private school, tuition fees had to be paid by all parents who wanted to either enrol or keep their children in that school, regardless of their financial constraints (Elacqua and González, 2013).

Given that the new 'Shared Financing Scheme' had the potential to strengthen the relationship between resources available at publicly funded private schools and their student bodies' socioeconomic backgrounds, several factions within the coalition in power strongly criticised the scheme as regressive (Elacqua, 2006; Elacqua and González, 2013). However, the Ministry of Finance in 1993 saw this new arrangement as an opportunity to ease the strain on public spending while securing extra financial resources for the school system (Marfan, 1998). Also, it was argued that the progressive decrease in the value of the public voucher given to students at non-free subsidised-private schools would improve the targeting of public resources aimed at socially disadvantaged families (Elacqua and González, 2013). Finally, some technocrats and policy makers considered that the bill could bring an opportunity to reduce the gap between subsidised-private schools and fully-paid private schools in Chile (González *et al.*, 2004).

After the 'Shared Financing Law' was enacted, many subsidised-private schools in Chile started charging fees to parents. As reported by González (1998:182), twenty-seven per cent of these schools had introduced tuition fees by 1997. According to self-reported information provided by subsidised-private schools to the Ministry of Education, 41 per cent of them had imposed a monthly co-payment by 2014; on average, the

[28] Even though the law also allowed public schools to charge fees to parents, it was explicitly stipulated that these payments had to be voluntarily accepted by students' families. This means that the majority of parents had to vote in favour of being charged. For that reason, only a few elite municipal schools have implemented this system (Mizala and Torche, 2012). In contrast, subsidised-private schools could freely choose whether or not to charge tuition fees without previous consultation with parents and families.

co-payment was very close to fifty percent of the monthly voucher paid to primary schools during that year, i.e. around USD $38 in 2020 dollars (MINEDUC, 2014)[29].

In the 2000's, priority was given to improving the quality and equity of the school system (Elacqua and González, 2013). One of the most important reforms occurred in 2003, when the '12-year Education Act' extended compulsory education to 12 years. Since then, access to free public secondary schools has been guaranteed to all Chilean citizens. Later, in 2008, the voucher school system experienced another significant modification when the 'Preferential Subsidy Law' was enacted. This law established that, in addition to the fixed per-student voucher, an extra grant would be given to schools for every enrolled student who qualifies as 'priority' according to a socioeconomic status index (Mizala, 2007). This law was based on the acknowledgement that educating students from disadvantaged social backgrounds is expensive, which is why the state should compensate schools where these students are enrolled (Mizala and Torche, 2012). The law also forbade schools receiving these extra grants from using parental interviews and admission tests to select their students (Elacqua and Santos, 2013).

In late 2009, after much parliamentary debate, a new education act was enacted. The 'General Law of Education', which replaced the controversial 'Organic Constitutional Law of Education', aimed at increasing voucher school regulation, reducing discrimination at private voucher schools, and introducing a broad national accountability programme to improve the quality of primary and secondary schools (Elacqua and González, 2013). Among its key points, the law forbade all primary schools that received state funding from requesting socioeconomic background information or previous marks of applicants in their admission processes. However, these selection procedures were still allowed at the secondary level.

[29] It is important to mention that I have found some inconsistencies in the reported percentages of subsidised-private schools that charged tuition fees to parents over the 1990s and 2000s. For example, Mizala and Torche (2012: 134), mention that 16% and 80% of subsidised-private schools in 1993 and 1998 respectively were charging fees to parents. Also, Bellei, (2008:166) reports that, at the time of writing of that study, around 90% of subsidised-private schools had some form of co-payment in place. Although neither of these two articles provide the source of these figures, it seems that these authors had access to unofficial sources. This coincides with my impression that the statistics collected and published by the Ministry of Education may be underestimates, because anecdotical evidence suggests that some subsidised-private schools have had informal arrangements with parents to charge tuition fees in a discretionary way.

3.3. Raising concerns about inequality: the 'School Inclusion Act'

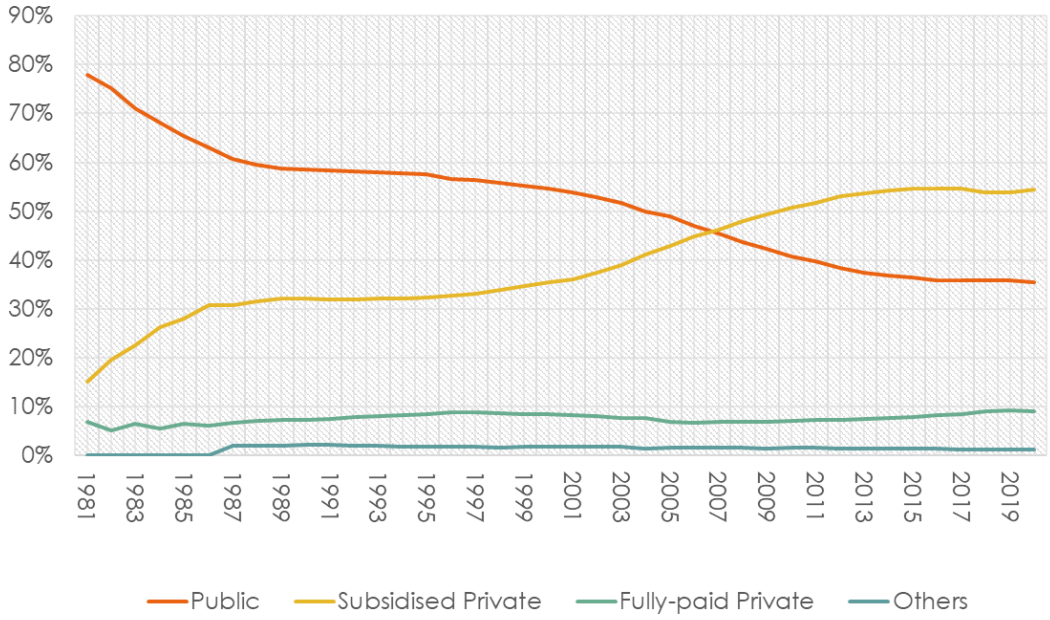
In spite of the advances made by the 'Preferential Subsidy Law' and the 'General Law of Education', by the early 2010s the general perception was that the new laws introduced by the democratically elected governments to modify certain aspects of the school system established in 1981 were not sufficient to mitigate educational inequalities. These modifications to the voucher school system were believed to have failed to guarantee minimum quality standards of education to all citizens, especially to those who could not afford private school fees (Leer, 2011). For that reason, the beginning of the 2010s was marked by mass social mobilisation and student protests pushing for a substantial educational reform that would effectively modify core organisational and funding components of the educational system (Pousadela, 2013; Bellei, Cabelin and Orellana, 2014).

It is worth noting that the views of university researchers and scholars tended to coincide with the general public's perceptions; several academic articles published in the 2000s and early 2010s pointed out that the essential features of the Chilean school system, which were set up during the dictatorship, had remained unchanged for the last two or three decades. These articles explicitly recognised that the governments in power from 1990 onwards had chosen to focus on providing additional resources to schools that served socially disadvantaged students, improving poor public school infrastructure and raising teachers' salaries, while keeping intact the main principles of the system: per-student voucher payment for both public and private schools, unrestricted competition, school freedom to select students, and parental freedom to choose schools (Hsieh and Urquiola, 2003 and 2006; Elacqua, Schneider and Buckley, 2006; Mizala, 2007; Pinedo, 2011; Mizala and Torche, 2012; Elacqua and González, 2013).

All in all, one of the most striking consequences of the principles that governed the Chilean voucher school system for more than three decades was the strengthening of the participation of the subsidised-private sector in the provision of education. As Figure 3.1 shows, the enrolment rate of students in private institutions receiving funding from the central government increased from 15.1% in 1981 to 54.7% in 2016. In contrast, public primary and secondary enrolments rates decreased from 78% to 35.9% in the same

period. The participation of the fully-paid private schools has remained relatively constant over the same period, at around 8%. From Figure 3.1, it can be easily inferred that the rapid proliferation of subsidised-private schools occurred mostly at the expense of public ones (Elacqua, Schneider & Buckley, 2006).

Figure 3.1: Enrolment rates in the Chilean school system by School type, 1981-2020



As a consequence of the student movement, education policy was one of the most important issues during the 2013 presidential campaign. For this reason, the legislative programme (2014 - 2018) of the subsequently elected President Michelle Bachelet included several reforms that were intended to promote equal access to good quality education, regardless of families' ability to pay (General Secretariat of the Presidency, 2014). The most salient of these reforms, the 'School Inclusion Act', proposed, among other modifications to the Chilean school system, three key amendments to the 'General Law of Education'. These amendments aimed at completely redefining the rights granted to subsidised public schools by prohibiting all primary and secondary schools that receive state funding from selecting students, charging tuition fees, or making a profit.

After an intense period of complex debate in both parliamentary chambers due to strong resistance from the right-wing coalition (Bellei 2016), the 'School Inclusion Act' was approved and enacted in January 2015 with the name of Law 20,845. Regarding the ability of schools to make a profit, the new law stated explicitly

that each subsidised-private school would now have to decide between closing the school, starting to operate as a non-profit entity (foundation), or transforming into a fully-paid private school. Subsidised-private schools that decided to keep their state funding would be given a maximum period of two years to become a foundation (MINEDUC, 2017)[30]. With respect to student selection processes, the law forbade all public and subsidised-private schools from screening students based on means tests, socioeconomic characteristics of families, religion or prior academic achievement at any level[31]. When oversubscribed, these schools would have to choose students by random allocation[32]. Apart from a few sports- or art-oriented schools, the only schools exempt from this prohibition were the so-called 'emblematic lyceums' that were allowed to select up to 30% of their enrolment based on prior school achievement, since these schools were always in very high demand. All schools receiving state funding were given up to one year to implement new non-discriminatory enrolment mechanisms, except for the abovementioned exempted schools that were given up to two years (MINEDUC, 2017). In order to make the school enrolment more homogenous and transparent, the law 20,845 also included the gradual establishment of a centralised online admission system for all the public and subsidised schools in the country (Holz, 2019)[33]; this system started operating in 2016 in only a single region but the intention was to expand the system to all other regions by 2020[34].

In terms of co-payments, the 'School Inclusion Act' established a 10-year transition process to a completely free-of-charge school regime. Over this transition period, family resources would be gradually replaced by public resources, through a combination of an increase in the value of the general per-student voucher, an increase in the value of the preferential subsidy, and the creation of an additional subsidy targeting children from the eight bottom income deciles. Subsidised-private schools were ordered to stop increasing tuition

[30] Subsidised-private schools that did not own the building where they were operating were also given a maximum period of twelve years to acquire the building.
[31] Apart from abolishing selection criteria in all public and subsidised-private schools, the law also established that students could not be expelled because of changes in the socioeconomic situation of their families, inability to afford school uniforms and other student material, or pregnancy.
[32] The algorithm selects the applicants randomly but takes into consideration the following criteria: being a priority student (defined by the 'Preferential Subsidy Law'), having siblings enrolled in the same school, having a parent working for the same school or being an alumni of the same school (Holz, 2019).
[33] The regulations of this new admission system are described in the Decree 152 from 2016.
[34] The new national school admission system, as well as its general description and instructions to applicants, can be found in: www.sistemadeadmisionescolar.cl. It is already operating in all the regions of the country.

fees in 2016 and to start reducing them from 2017, coinciding with the start of the increase in public contributions (MINEDUC,2017). At the time of writing this thesis, Chilean schools funded by the state are still in the process of completely eliminating tuition fees. Therefore, it will take some time to observe and evaluate the full effects of the 'School Inclusion Act'.

Before finishing her term in office, President Michelle Bachelet sent another bill to the Chilean parliament that was intended to restructure the national public school system. This bill, which was finally enacted as Law 21,040 in November 2017, explicitly recognised the social value of public education (Bellei *et al.*, 2018) and established a number of new public education institutions. One of the most important changes introduced by this law was the creation of 70 local public education services ('Servicios Locales de Educacion Publica', SLEs). The SLEs, which would be composed of an executive director, regional and local representatives, as well as representatives of students' parents, would be in charge of the administration of public schools that the 1981 voucher school reform had given to municipalities. Law 21,040 established a calendar for the transfer of the management of public schools from municipalities to the SLEs that will be fulfilled in 2025. Apart from the SLEs, this law also created the National Direction of Public Education; this new institution would be a new centralised public education organism dependent on the Ministry of Education and headed by a national director that would be in charge of the national public education strategy.

In March 2018, the newly elected president from the opposing coalition, Sebastian Piñera, started his presidential term with several concerns regarding the school-reforms approved during the Bachellet administration. In particular, the right-wing alliance of parties supporting his government considered that the prohibition on the selection of students introduced by the 'School Inclusion Act' would damage freedom of teaching and the overall quality of school education in Chile. For that reason, the government sent a bill known as the 'Fair Admission Bill' to the congress in March 2019. This bill was intended to reopen the debate on school selection practices in the Chilean school system. Aside from including some uncontroversial articles on prioritising orphaned students and students with learning disabilities in the school admission process, the bill proposed that all publicly funded schools should be allowed to select up

to 30% of students based on their own criteria, which should be based on the educational project and priorities of each school. The bill also introduced the idea of permitting schools funded by the state to select their current students' siblings on top of the 30% proposed free admission quota. The latter two possible modifications to the 'School Inclusion Act' were very controversial, as the centre-left coalition saw this bill as a setback to their long-term goal of equalising educational opportunity in Chile. Despite this opposition, the education commission of the senate gave approval for the project to be discussed in the parliament in August 2019.

The 'Fair Admission Bill' has remained undebated in the congress thus far because, in October 2019, another important social movement emerged in Chile. Triggered by a new increase in the cost of public transportation in Santiago, the Chilean population, who had reportedly expressed exhaustion with the rising cost of living, high levels of indebtedness and persistent economic inequalities, started to take over the streets and organised massive protests that persisted for months. This social unrest, characterised by a quick escalation of violence, thousands of accusations of excessive use of police force, dozens of civilian casualties, and the destruction of private and public infrastructure, produced a serious political crisis in Chile that put the government of Sebastian Pinera under both national and international public scrutiny. The social movement only ceased around March 2020 because of the COVID-19 pandemic and the subsequent establishment of partial lockdowns in Santiago and many other cities; however, the general discontent with the government's management of the crisis continued to grow[35]. One of the most salient complaints of protestors in Chile was that the country was still being governed by the 1980 constitution that was written and established during Augusto Pinochet's dictatorship. This constitution is seen as the embodiment of the neoliberal model promoted by the dictatorship, which prioritised a market-driven economy at the expenses of adequate levels of provision of education, healthcare, social security and pensions for most Chileans. As a result of this, the government called a referendum by which Chileans would have the opportunity to decide whether they wanted to have a new constitution. On October 25, 2020, 78.3% of Chileans voted in favour of a new constitution, while 21.7% rejected the change. A second

[35] It has been reported that levels of approval in the government had decreased to 7% by November 2020, the lowest level of approval for the whole presidential period (Criteria Survey, December 2020)

vote is scheduled for April 11, 2021, to select 155 Chileans who will form the convention that will draft the new constitution.

Currently, most Chileans are looking forward to having a new constitution written by a democratically elected group of representatives. As occurred in the case of primary and secondary education, the 1980-constitution provided the basic legal framework intended to encourage and safeguard the flourishment of privately supplied services at the expense of public services in several social areas. Thus, many Chileans consider that a new constitution may provide the possibility of rebalancing the relative importance of the public and private sectors in the country, which will hopefully make it easier to improve the quality of public services in the near future.

4. Social stratification in the Chilean school system: the role of social background on school-type choice in the pre- and post- 1981 reform era

4.1. Introduction

In 1981, Chile undertook a substantial reform to its school system that is considered to be one of the most radical and influential in the developing world (Harvey, 2005; Heyneman and Stern, 2014). Following M. Friedman's ideas (Friedman 1955 and 1962), the Chilean military dictatorship established a voucher system for primary and secondary schools with several distinctive characteristics: (1) the management of public schools was transferred from the central government to municipalities; (2) public and private schools wanting to take part in the new scheme would be funded by the central government through a per-student voucher; (3) to participate, private voucher schools (better known in Chile as 'subsidised-private schools') had to meet some basic infrastructure requirements and commit to not charging additional fees to parents on top of the voucher; (4) while public schools could reject students only when oversubscribed, subsidised-private schools were given the right to select their students using their own criteria (Tokman, 2002; Arenas, 2004; McEwan, Urquiola and Vegas, 2008; Contreras, Sepulveda and Bustos, 2010); and (5) no restrictions on making a profit were imposed on subsidised-private schools (Arenas, 2004; Peirano and Vargas, 2005). It was hoped that the resulting competition in a free market would increase efficiency and enhance school quality (Elacqua and González, 2013).

After twelve years operating under market-oriented rules, the Chilean school system experienced another important modification when the 'Shared Financing Law' was enacted in 1993. This new financing scheme for the voucher school system allowed subsidised-private schools to begin charging parents a co-payment with the only restriction being that the value of the per-student subsidy (or voucher) received by these schools would be reduced in proportion to the level of the individual tuition fees. This law also established the maximum tuition fee that a subsidised-private school could charge whilst still claiming the per-student subsidy; schools charging fees above this level would transform into fully-paid private schools and stop receiving the voucher (González, 1998).

Following the 1981 reform, private voucher schools experienced uninterrupted growth in their participation as providers of education in Chile. In early 1981, just before the reform was enacted, only 15% of students at the primary and secondary levels attended subsidised-private schools (Maldonado, 2003: 50); however, this number had risen to more than 50% in 2010 and continued to increase systematically until 2015, when the 'School Inclusion Act' marked the beginning of the end for the era of generous guarantees provided to subsidised-private schools.

Given that the expansion of the private voucher sector in Chile occurred alongside a remarkable increase in secondary school enrolment and moderate improvements to graduation rates at this educational level (Gauri, 1998 ; MDS, 2011, MDS, 2015), the Chilean voucher school system has been considered as a successful example of the introduction of the private sector to expand secondary-school coverage (Bentancur, 2006; Marteleto *et al.*, 2012)[36]. However, at the same time, the system has been criticised because these policy goals have been for achieved at the expense of an increase in educational inequalities (Torche, 2005a; Patrinos and Sakellariou, 2008). Although the 1981 reform gave children from disadvantaged social backgrounds the opportunity to attend subsidised-private schools, descriptive evidence from the 1990s, 2000s and 2010s has reported an increasing concentration of children from each extreme of the socioeconomic spectrum in the same kinds of schools. For example, the information from the Socioeconomic National Survey (CASEN) reveals that, while 34.3 percent of students from the top income quintile in 1990 were attending a public school, only 18 percent of these students were attending a public school in 2011. Conversely, the proportion of students from the bottom quintile attending fully private schools decreased from 2.1 percent to 0.8 percent over the same period (MDS, 2011).

Several academic articles have analysed the link between the social background of students and their allocation across different school types in Chile. Most of this literature uses post-1981 data geographically aggregated at the municipality level and measures students' social background as a compound measure of

[36] Gauri (1998) reports that, between 1981 and 1994, the gross enrolment rates at secondary school in Chile increased from 65% to 79.7% while the completion rates rose from 79% to 80.7%. During the same period the school drop-out rates at secondary school decreased from 8.4% to 7.1%. The primary education sector did not experience a similar improvement primarily because the enrolment rates at this school level were already quite high in Chile in the early 1980s (95.3% in 1981). According to the Chilean Ministry of Social Development (MDS, 2015), the gross enrolment rate at secondary school increased from 81.8% in 1990 to 99.6% in 2015.

socioeconomic family characteristics (SES). These studies have found evidence of an increase in socioeconomic stratification by SES in the school system that coincides with the expansion of the subsidised-private sector (Hsieh and Urquiola, 2006 and 2012; Valenzuela, Bellei and de los Rios, 2014). A second group of studies have directly or indirectly analysed the relationship between socioeconomic background and school-type choice in Chile using individual-level cross-sectional data from the post-reform period. Many of these studies have found a strong positive correlation between variables such as mother's education and per-capita household income and the likelihood of preferring private education (Contreras, 2002; Bellei, 2008; Paredes and Pinto, 2009). A third group of studies, whose primary focus is the attributes that make schools appealing for parents and children in Chile, have shown that families tend to prefer schools whose student-bodies resemble their own educational, economic, moral and religious standing (Elacqua *et al.*, 2006; Gallego and Hernando, 2009).

In summary, the literature investigating the influence of the socioeconomic characteristics of parents on their choice of school type for their children in Chile has reported high levels of social segregation of student-bodies across school types since the implementation of the voucher school reform. However, the results of this literature do not allow us to distinguish whether this phenomenon is mainly explained by economic, educational or cultural aspects of family background. Moreover, none of these studies has enabled a comparison between the strength of the link between socioeconomic background and school-type choice before and after the 1981 voucher school reform, as they have all been conducted using information from 1981 onwards. Therefore, little can be said about how much of the increasing social stratification of students across school types observed in the last four decades could have had its origins with the 1981 reform. Furthermore, over the post-1981 period not much attention has been paid to the particular role of the 1993 'Shared Financing Scheme' in increasing the concentration of students with similar social backgrounds within the same school types.

This chapter intends to contribute to the literature on the socioeconomic stratification of students in the Chilean voucher school system by analysing socioeconomic background as a factor in school-type choice. In particular, I pursue the following two groups of research questions:

(1) How important is individuals' socioeconomic background in explaining choice of school type at both primary and secondary levels in Chile? If there is an important association between socioeconomic background and school-type choice, how did this association change following the 1981 voucher school reform? If there is an important association between socioeconomic background and school-type choice, through which of its components (parental education, parental social class or parental social status) has socioeconomic background mainly exerted its effect on school-type choice in Chile?

(2) Did the association between socioeconomic background and school-type choice identified for the post-1981 period experience a further change after the 1993 'Shared Financing Law' was enacted in Chile? If the association between socioeconomic background and school-type choice changed after the introduction of the 'Shared Financing Scheme', was this change mainly mediated by the influence of the economic components of socioeconomic background (e.g. parental income and parental social class) over and above the other components of socioeconomic background (such as parental education and parental social status)?

To answer these two groups of research questions, this chapter presents quantitative analyses based on multinomial logistic models and a cohort approach using data on individuals' educational trajectories and their social backgrounds. In the case of the first set of research questions, which I will attempt to answer in Section 4.3, I use information from the 2002 and 2004 waves of the longitudinal Chilean Study of Social Protection (CSP Survey). For 2002, data on parental occupation was not included in the CSP database and I therefore retrieved it directly from individual questionnaires in Chile for all the observations in the sample (around 17,000). Consequently, this analysis is based on a novel dataset. The analyses conducted to answer the second set of questions, on which I will report in Section 4.4, rely on the information provided by the 1996, 2006 and 2015 waves of the Chilean National Socioeconomic Survey (CASEN). Unlike the CSP Survey, these datasets enable a comparison between individuals who were at school both shortly before as well as long after the 1993 reform, including those students who were attending school in 2015, which is

the last year in which the most distinctive aspects of interest of the Chilean voucher school system were fully in place.

Informed by the results of the extant literature on the Chilean school system and the international empirical evidence, I expect to find a very strong association between socioeconomic background and school-type choice in Chile. In particular, I hypothesise that individuals from the most advantaged backgrounds tend to choose fully private schools, those from middle-privileged backgrounds tend to opt for subsidised-private schools and less socially advantaged families tend to enrol their children in public schools. Therefore, my first hypothesis is that socioeconomic background has a very important role in school-type choice in Chile and that this association can be observed all over the period both before and after the 1981 reform. Since the 1981 voucher school reform allowed subsidised-private voucher schools to begin selecting students according to their own criteria, which could include prior educational performance and the socioeconomic information of families, I also expect to find a strengthening of this association following the 1981 reform. Therefore, my second research hypothesis is that the role of socioeconomic background in the selection of school type became more important after 1981. Regarding which components of social background are the most relevant to explain school-choice, I believe that parental education, parental class and parental social status should have a significant influence on school-type choice over the whole period of the analyses. However, because of the need for families to collect, organise and analyse information on school attributes in order to decide where to enrol their children in the post-1981 era, my third hypothesis is that parental education must have become a most important determinant of school-type choice since 1981.

As seen, the introduction of the 'Shared Financing Scheme' in 1993 meant that a considerable number of subsidised-private schools started to charge additional tuition fees to families. Thus, I believe that, since that year, the social stratification of students across different school types in Chile may have become more pronounced. As a consequence, my fourth hypothesis is that the link between social background and school-type choice should be stronger in the post-1993 period compared to the period of 1981-1993. Moreover, since 1993, monetary resources would be necessary to attend many private voucher schools that

were for free in the past; therefore, my fifth hypothesis is that the economic components of socioeconomic background must have been the main components leading that change. In other words, I hypothesise that parental income and/or parental social class in particular should have become more important determinants of school-type in the post-1993 period.

In pursuing these research questions, this chapter seeks to address a number of shortcomings in the existing literature on social stratification of students in the Chilean school system. First, school choice in Chile has been predominantly studied with a focus on the school attributes that make schools more attractive to students and their families. Social background characteristics have been included in existing studies mainly as controls or in interaction with the main explanatory variable but have not been fully studied in their own right. This chapter focuses explicitly on social background as a determinant of school choice. Second, existing studies remain limited in their measurement of social background, employing either only partial measures (such as parental education or household income) or overly aggregated ones (such as the scale of socioeconomic status, SES). In contrast, this chapter draws on previous work by Bukodi and Goldthorpe (2012) that suggests measuring the socioeconomic backgrounds of families in a multidimensional way by considering parental social status, parental social class, and parental education. This allows the mechanism by which social background exerts its effect on school choice to be studied. Third, studies that analyse the effects of increased school competition in Chile on social stratification over time are based on models using data aggregated at the local level (municipalities). This thesis is the first study to use individual-level data to explore the specific role of an individual's socioeconomic background on school choice over time. Fourth, existing research is limited to the post-1981 period, and hence the question of how the 1981 reform affected the role played by social background on school-type choice in comparison to the situation before 1981 is yet to be answered. Fifth, I believe that analysing the role of socioeconomic background on school-type choice in the pre-and post-1981 period, as well as in the pre-and post-1993 period, makes it possible to observe whether the social stratification of school students found by previous studies can be associated with the foundational principles of the voucher school reform, with the later introduction of the 'Shared Financing Scheme', or with them both.

The remainder of this chapter proceeds as follows: Section 4.2 briefly introduces the main findings of the literature that analyses the impact of economic characteristics of students' parents on student sorting across school types during the post-1981 period. Section 4.3 presents the methodological strategy, data, variables, results and conclusions of the analyses intended to answer the first set of research questions in this chapter. Similarly, Section 4.4 describes the methods, data, results and conclusions used to answer the second set of research questions in this chapter. Finally, Section 4.5 summarises the main insights of Section 4.3 and 4.4 and provides a conclusion.

4.2. Extant research on the effects of social background on school choice in Chile

The existing literature on the effects of the 1981 reform on school choice and school-type allocation of students can be divided into three groups. The first focuses on the school attributes that parents from different social backgrounds take into account when choosing a school for their children. The second group studies the variance or dispersion of students' social background characteristics across different types of schools. The third group, to which this chapter of my thesis belongs, analyses the determinants of choosing a private versus a public school. Since these three types of studies address the relationship between school choice or allocation of students across school types and socioeconomic background (either as main explanatory variables, control variables, or in interaction with other explanatory variables), the main findings of all of them are presented below.

4.2.1. Preferences for school attributes

According to Chakrabarti and Roy (2010), the literature on preferences for school attributes may be divided into studies that ask parents and families about the school-related characteristics that they consider paramount in their choice of a school on the one hand, and studies looking at the actual choice of schools made by parents and students ('revealed preferences') on the other. Since the former are based on responses provided by families in opinion polls or surveys, Chakrabarti and Roy observe that their results may be biased by intended or unintended misrepresentation, or by parents not being completely honest about their

preferences (Ibid: 337). The latter, in turn, may or may not reflect appropriately the true preferences of parents and students because some families may face restrictions on sending their children to their preferred schools, such as high transportation costs, expensive study material, and long commuting times, amongst other factors. Thus, to have a better idea about real preferences, it is useful to compare the results obtained from both approaches. For this reason, all the studies presented below contrast the information reported by families with information on revealed preferences.

Elacqua, Schneider and Buckley (2006) analyse the school search behaviour of parents from the capital region of Chile and compare the school attributes that parents mentioned as important when choosing a school with their revealed preferences. Even though the socioeconomic characteristics of student bodies are not mentioned by parents as a key factor in choosing a school, this study shows that 87% of the parents in the sample only consider schools whose student body is similar to their own social standing, measured by parental education and socioeconomic status. The study also reveals that parents who enrol their children in any of the different school types – i.e. public, subsidised-private and fully-paid private schools – construct their sets of options by considering a number of schools that differ greatly in terms of their performance in test scores. Moreover, most parents do not prefer the highest performing school in their set of options, and this result is independent of the school type that they finally choose. The study also shows that school location is an important factor in parents' opinion ranking, but its importance varies across school types. As reported, out of eight reported factors, school location is the most important for parents whose children attend public schools, the second most important for parents of children attending subsidised-private schools, and it is the third priority for those choosing fully-paid private schools[37]. Finally, this article concludes that simple survey data can lead to unrealistically optimistic conclusions about the way that parents choose schools in Chile.

Gallego and Hernando (2009) use the information on students and schools provided by SIMCE 2002 to study the school attributes considered by Chilean parents at the moment of choosing schools and how these preferred attributes change depending on family characteristics. Their findings suggest that families

[37] Unfortunately, the authors cannot confirm the last result by using parental revealed preferences.

value school characteristics such as test scores, inculcation of particular religious or social values, discipline, the gender composition of the school, the monetary cost of the school, and the school's distance from their home. In particular, parents value highly those school attributes that closely resemble their own beliefs or social standing, be these characteristics of the student body, the importance of religious instruction, or the balance between academic and extra-curricular activities. Moreover, this article shows that, compared with low-income families, wealthy families tend to give a higher importance to the average level of education and income of peer families when choosing a school for their children. This has two implications: first, children tend to attend schools whose students are alike in terms of socioeconomic background (including family income, parental education, and preference for the teaching of values). Second, more highly educated (and wealthier) parents have higher expectations for the educational attainment of their children and, consequently, place a greater value on the academic characteristics of schools. For that reason, they are more willing pay expensive tuition fees.

Aiming to study the centrality of school location as a criterion for selecting a school in the capital region of Chile, Chumacero, Gomez and Paredes (2011) devise a model to explain the probability of choosing the school that is closest to home. The authors use a database containing the full postal addresses of students and the respective schools they attended which they then merged with the 2003 version of the National Socieconomic Survey (CASEN). Their estimated model includes socioeconomic characteristics of students, their households, and school attributes as explanatory variables. The study finds that location, price, and quality – measured as the average score in the SIMCE test – as well as potential competition are important determinants of school choice in Chile. However, the probability of choosing the nearest school significantly decreases with both household per-capita income and the mother's education. The results also suggest that children attending public schools are more likely to have chosen the closest school.

The review of the main findings of the literature on preferences for school attributes suggests that, even though there is certain, albeit contested, evidence that parents choose schools based on their quality (as the policy makers who designed the 1981 reform assumed), this is highly mediated by socioeconomic background. That is to say that the evidence supports the idea that the families who gain most from having

a freely competitive public-private educational system in which they can choose the best school for their children without location restrictions and according to their preferences and the information they possess, seem to be those that are the most socially advantaged. The evidence also suggests that parents, especially those from the most advantaged social backgrounds, tend to choose for their children schools whose student bodies present socioeconomic and cultural characteristics that resemble their own.

4.2.2. Social stratification in the Chilean school system

Another set of studies, which analyse the consequences of the voucher school reform in Chile by using information aggregated at the municipal level, have provided evidence of considerable social stratification in the Chilean school system. This literature is based on measures of dispersion of the socioeconomic characteristics of students across school types and how they have changed over recent decades.

For example, by merging information of the 1990 and 1992 National Socioeconomic Chilean Survey (CASEN) with PER (1982) and SIMCE (1988), Hsieh and Urquiola (2003 and 2006) run OLS and IV regressions models for the ratio between the average socioeconomic characteristics of students in public schools and the average socioeconomic characteristics of all students attending a school in the same municipality. The authors introduce the private enrolment rate in a municipality as the main explanatory variable in their models, concluding that higher enrolment in private schools correlates with higher stratification of students in terms of socioeconomic status, student achievement in tests scores and grade-repetition rates. In particular, the main finding of this study suggests that between 1982 and 1988 the proportion of middle-class students enrolled at subsidised-private schools increased and the proportion of them enrolled at public schools decreased, which produced a great decline in the socioeconomic status of public school students relative to the community average (Ibid: 1479).

By using administrative records of Chilean schools from 1999 to 2008, Elacqua (2012) estimates dissimilarity indices for a social vulnerability measure constructed with information on schools' student bodies and also for students' parental ethnicity. His results suggest that the introduction of unrestricted

choice in Chile has produced increased stratification. Specifically, the author finds that public schools are statistically more likely to serve socially disadvantaged students than subsidised-private schools. He also provides evidence that the diversity of student bodies in terms of family income is much higher in public than in subsidised-private schools.

Finally, Valenzuela, Bellei and de los Rios (2014) use the SIMCE datasets from 1999 to 2008 and residential segregation indicators taken from the 1992 and 2002 National Censuses to analyse the evolution of students' socioeconomic status (SES) by using the Duncan dissimilarity index (Duncan and Duncan, 1955). The authors define socially disadvantaged students as those in the bottom 30% of the SES distribution. Their results show that the magnitude of segregation is high for both low and high SES students in Chile. The study also reveals that during the observed 10 years, school stratification by SES slightly increased, especially at the secondary level. The findings of this study also corroborate Elacqua's findings (2006 and 2012) that subsidised-private schools are more segregated than public schools in terms of their students' SES

In summary, all the studies focused on the socioeconomic stratification of students across school-types in Chile since 1981 that I was able to identify have found increasing levels of stratification coinciding with the expansion of private provision of schooling.

4.2.3. Private versus public school choice

As seen, one of the most distinctive differences between subsidised-private and public schools in Chile over the 1993-2015 period was that fully-paid and subsidised-private schools usually charged tuitions fees while public schools were all for free. Thus, following the Rational Action Theory described in the Chapter 2, rational parents will send their children to private schools only when they believe that the benefits outweigh the price differential (Chakrabarti and Roy, 2010).

Most of the empirical literature that tackles the choice between public and private schools in Chile has been conducted with the aim of estimating the impact of school type on students' scores in cognitive ability tests. Thus, to try to control for the selection of students across school types, the estimation of models explaining school choice based on students' socioeconomic background has been typically performed as the first stage of a two-stage model analysing the impact of school type on other outcomes. The results of the first-stage estimations of these studies are reported below.

Using the datasets of the 1998 National Test of University Selection, Contreras (2002) conducts multinomial probit models to explain parental school choice in Chile. As a measure of socioeconomic background, this author uses fathers' and mothers' educational attainment. His results indicate that parental education is an important determinant of school choice: children of the most educated parents are significantly more likely to attend a subsidised-private school instead of a public school. The author also finds that school choice is gender-biased, as he finds that girls are more likely to be sent to subsidised-private schools than boys.

In order to explore the relationship between school type and having been selected through an admission process, Bellei (2008) uses the 2002 and 2003 databases of SIMCE to estimate probit models for the probability of attending a subsidised-private school versus attending a public one. When including fathers' and mothers' education, as well as family income and number of books at home as covariates, the author finds that all of these variables significantly increase the probability of attending a subsidised-private school instead of a public one. Interestingly, he also finds that after controlling for all these family-background variables, having been selected through an admission process still correlates strongly with attending a subsidised-private school.

As part of a wider study that analyses the reasons why the subsidised-private sector grew at the expense of the public sector in primary and secondary education, Paredes and Pinto (2009) study the parental choice for different school types in Chile. The authors use multinomial probit models and the information provided by the 2003 version of the CASEN Survey to explain the probability of choosing a fully-paid

private school rather than a subsidised-private or a public school. As explanatory variables, they consider family income, parental education, whether or not students receive free food at school, number of siblings and gender. Their results indicate that the socioeconomic characteristics of students and their families (parental education, income and being a recipient of free school meals) are all significant determinants of attendance at a certain school type. However, the most important effects, both in terms of magnitude and significance, are associated with parental education and the number of siblings. In contrast with Contreras (2002), these authors find that gender seems to have no role in explaining school choice in Chile.

All in all, the studies that address the influence of family characteristics of students on school-type choice in Chile tend to agree that school-type choice is significantly explained by socioeconomic background.in the post-1981 reform era.

4.2.4. Summary of previous research findings

This literature review enables me to conclude the following. First, the existing studies on socioeconomic segregation of students across school types in Chile based on information from the post-1981 period agree that schools have become somewhat stratified in terms of the social background of their student bodies, particularly over the years in which the private voucher sector experienced a significant expansion. Second, all studies based on cross-sectional data from the 1990s and 2000s that incorporate estimations of the probability of attending a subsidised-private rather than a public school in Chile find that socioeconomic characteristics of students and their families are important predictors of that probability. Third, although the literature on the school attributes that are valued by parents and families provides certain evidence that parents consider the 'quality' of schools (measured as average scores in the SIMCE test) when choosing one of them for their children, this is strongly mediated by their social background. Thus, only the most socially advantaged parents seem to be taking advantage of their freedom to choose a school based on its academic merits in a highly competitive system. Forth, the same literature also identifies that parents appreciate that their children mingle at schools with peers that resemble their own socioeconomic characteristics, and this appreciation increases with their socioeconomic advantage. Fifth, all these studies

have measured socioeconomic background as either a restrictive set of social background variables or as a condensed SES measure. Finally, none of these studies have used data prior to 1981.

Thus, this chapter will try to make a relevant contribution to this literature by analysing in more detail the specific socioeconomic dimensions of students that are the most influential in determining school-type choice in Chile, as well as by how much the importance of these dimensions has varied after both the voucher school reform and the 'Shared Financing Scheme' were put in place.

4.3. Analysis: Effects of social background on school-type choice before and after the 1981 voucher school reform

4.3.1. Data and methods

Having reviewed in detail the existing literature on school choice and student attendance across different school types in Chile, this section introduces the data and methodological strategy that I followed to try to answer the first set of research questions in this chapter. As stated in the introductory section of this chapter, these questions are as follows. How important is individuals' socioeconomic background in explaining school-type choice at both primary and secondary levels in Chile? If there is an important association between socioeconomic background and school-type choice, how did this association change after the 1981 voucher school reform? If there is an important association between socioeconomic background and school-type choice, through which of its components has socioeconomic background mainly exerted its effect on school-type choice in Chile?

4.3.1.1. Data description

One of the principal limitations in the study of inequality of opportunity and social mobility in Latin America has been the absence of large panel surveys. For this reason, several countries in the region have opted to include a set of questions designed to capture recall information from the interviewees in cross-

sectional or short panel surveys. While the integrity of recall information is naturally lower than answers pertaining to the present, it still allows insight into the past. The Chilean Survey of Social Protection (or CSP Survey), which will be used to conduct the empirical analysis in this chapter, uses this approach, with recall questions focused on the socioeconomic information of parents and the demographics of the households in which these individuals grew up.

The CSP Survey is a short longitudinal survey designed by the Ministry of Labour and Social Security in Chile, whose first wave was conducted in 2002. To date, five additional waves have been conducted in 2004, 2006, 2009, 2012 and 2015. Since 2004, the survey has selected a representative sample of the national population of adults over the age of 18[38], and contains information about individuals' labour market transitions during the complete observation period as well as recall information about individuals' employment status from 1980 onwards. Aside from a set of socioeconomic characteristics of individuals at the point of measurement, the survey includes recall information about individuals' socioeconomic background and educational careers from primary school to their highest level of completed education. The total sample size of the initial nationally representative panel is around 17,000 observations (Centro Microdatos, 2010).

The information on parental social class and parental social status, which constitutes two of the main explanatory variables in my analyses, was constructed on the basis of fathers' occupational titles reported by individuals in the 2002 and 2004 waves of the CSP Survey. The specific questions included in these two waves required individuals to describe, in their own words, the most typical occupation that their parents had during their whole careers. Unfortunately, this detailed information was not included in the 2002 databases of the CSP Survey. Thus, for the purposes of this study, I recovered parental (fathers' and mothers') occupational titles directly from individual questionnaires in Chile for all of the observations in the sample. I then encoded this information by using 4-digits ISCO codes, and subsequently merged this

[38] The first wave conducted in 2002 was not representative of the entire national population of over 18-year-olds, but only formal workers at that time. That is why I consider the 2004 wave as the first point of measurement.

data with the public datasets. This means that the empirical analyses in this article were performed on a novel dataset.

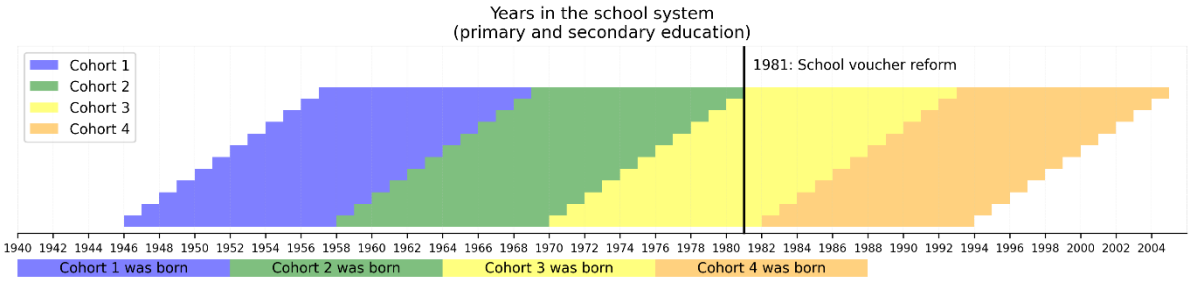
As the reform that dramatically changed the Chilean school system occurred in 1981, special attention must be paid to the effect of school type on individuals' outcomes before and after 1981. At the same time, it is also important to study whether these effects changed over the years in which the subsidised-private school sector expanded significantly. Therefore, to investigate the potentially time varying effects of social origins on school-type choice, this section uses a cohort approach. In particular, I distinguish three groups of people: (1) those who completed secondary education prior to the reform; (2) those who were attending primary or secondary school when the reform took place; and (3) those who started primary school after the reform. The first group consists of individuals aged 18 or older in 1981. The second group includes people between 6 (the legal age to enter primary school in Chile) and 17 years old in 1981. The third group includes all individuals aged 5 or younger in 1981. In practice, the first group of individuals, who completed secondary education before 1981, is the largest, thus I constructed two twelve-year birth-cohorts (cohort 1: 1940-1951 and cohort 2: 1952-1963) representing this group, one twelve-year birth-cohort representing the second group (cohort 3: 1964-1975) and one twelve-year birth-cohort representing the third group (cohort 4: 1976-1987).

Figure 4.1 graphically illustrates the cohort approach used in this chapter. The figure indicates the years in which individuals belonging to each birth-cohort were born (below the time line) and the periods in which they were most probably attending primary and secondary education in the Chilean school system (above the time line), as well as the moment when the voucher school reform was implemented[39]. Thus, every differently coloured tier of the stepped diagram represents the approximate period of time when individuals started and finished school, considering that the typical ages for commencing and completing school in Chile are 6 and 17 years old (both inclusive) respectively. The introduction of interaction effects between

[39] Unfortunately, the questionnaires of the Social Protection Survey do not include questions on the exact year in which individuals started and completed secondary education. However, the questionnaires included exact information about when individuals started, completed or dropped out of each educational program they were ever enrolled in at the tertiary level. With this information, as well as the information about individuals' grade repetition, I estimated for each person the years in which they were most likely attending both primary and secondary school. Of course, Figure 4.1 illustrates a very simplified version of this analysis that does not consider the possibility of grade repetition or drop outs before completing secondary education.

the birth-cohort and socioeconomic background variables in the regression models explaining school type will allow me to assess whether socioeconomic background became a more or less important determinant of the type of school that individuals attended over time.

Figure 4.1: School Progression by Birth-Cohort



4.3.1.2. Models

Given that the aim of this chapter is to explore the influence of socioeconomic factors on the three relevant school types chosen by families in Chile – public schools, subsidised-private schools or fully-paid private schools – multinomial logistic regression models (ML models) were performed.

Since it may be the case that individuals did not always attend the same type of school throughout their educational careers, the school type attended at the primary level and at the secondary level (only in the case of individuals who transitioned to secondary education) are included in the logistic regressions as independent observations. To allow the multinomial logistic models to account for intra-group correlation (in this case repeated observations on individuals), the variance-covariance matrix was estimated assuming clustered standard errors.

A three-category multinomial logit model estimates:

$$Prob\ (Y = 1) = \frac{e^{X\,\beta_1}}{e^{X\,\beta_1} + e^{X\,\beta_2} + e^{X\,\beta_3}} \quad , \qquad for\ Y = 1 = public\ school$$

$$Prob\,(Y=2)=\frac{e^{X\beta_2}}{e^{X\beta_1}+e^{X\beta_2}+e^{X\beta_3}}\quad,\qquad for\ Y=2=subsidised-private\ school \qquad (1)$$

$$Prob\,(Y=3)=\frac{e^{X\beta_3}}{e^{X\beta_1}+e^{X\beta_2}+e^{X\beta_3}}\quad,\qquad for\ Y=3=fully-paid\ private\ school$$

$$where\ ,X=explanatory\ and\ control\ variables\ of\ the\ model$$

$$and\quad \beta_j=estimated\ parameters\ for\ school\ type\ j,\ with\ j=\ 1,2,3$$

However, it is not possible to identify this model because there is more than one solution for β1, β2 and β3 that is consistent with the same probabilities for Y=1, 2 and 3. Thus, in practice, it is necessary to arbitrarily set one of these vectors of coefficients to be equal to 0 (in this case β1=0), and the other vectors of coefficients will measure changes relative to the group Y=1. Therefore, the estimated model is:

$$Prob\,(Y=1)=\frac{1}{1+e^{X\beta_2}+e^{X\beta_3}}\quad,\qquad for\ \ Y=1=public\ school$$

$$Prob\,(Y=2)=\frac{e^{X\beta_2}}{1+e^{X\beta_2}+e^{X\beta_3}}\quad,\qquad for\ Y=2=subsidised-private\ school \qquad (2)$$

$$Prob\,(Y=3)=\frac{e^{X\beta_3}}{1+e^{X\beta_2}+e^{X\beta_3}}\quad,\qquad for\ j=3=fully-paid\ private\ school$$

4.3.1.3. Variables

Main Explanatory Variables

The main explanatory variables in my models are those accounting for individuals' socioeconomic background. As explained in Chapter 2, I follow Bukodi and Goldthorpe's (2012) recommendation and use

a multidimensional approach to individuals' socioeconomic background, which includes: parental social class, parental social status and parental education. However, since the social class and status scales used in the seminal literature of inequality of educational opportunity were designed for developed countries, I have adapted these scales based on the previous work of Chilean scholars who have used them to study other social issues in Chile.

The measure of parental social class included in my empirical analyses is based on previous studies of social mobility in Chile, particularly those of Espinoza and Núñez (2014) and Torche (2005), who developed a class classification based on the EGP-scheme (Erikson, Goldthorpe, and Portocarero, 1979), tailored to Chilean data. Following these authors, I developed a 7-social class category measure for father's social class, distinguishing the following class groups: I+II: service class, III: routine non-manual, IVab: self-employed, IVc: farmers, V-VI: skilled manual, VIIa: semi-skilled and unskilled manual, and VIIb: farm workers. However, the final models reported in this section incorporate a 4-category simplified version of parental social class that I constructed by collapsing some of these classes. The resulting variable includes the following categories: I+II+IIIa+b: service class and routine non-manual workers, IVa+b: self-employed, IVc+V+VI: skilled manual workers and farmers, and VIIa+VIIb: semi and unskilled manual workers, and farm workers. It is important to mention that the measure of parental social class was exclusively based on the father's occupation unless an individual reported not having had a relationship with their father, in which case I used their mother's occupation. The reason for not using mothers' occupation when the occupational titles of both parents were reported is that female labour participation rates have been traditionally very low in Chile in comparison with the average of the OECD countries and even when compared with most Latin American countries (Contreras and Plaza, 2010).

Regarding parental social status, I constructed a variable based on the work of Chan (2010) and Torche (2010 and 2007). By using the information about marriage and cohabitation patterns obtained from the National Socioeconomic Survey CASEN 2003, Torche develops a status hierarchy that ranks 28 different status groups and assigns them a standardised score that varies between 1.92 and -1.42. For the purposes of this study, I replicated the same social status scale with the information of fathers' occupation titles that

I recovered from the questionnaires of the CSP Survey. As in the case of parental social class, I opted to construct this variable by using only the information regarding fathers' occupations and ignored mothers' occupations, unless fathers were not present, because of the low female labour participation rates in Chile.

The last component of individuals' socioeconomic background that I included in my models was parental education. After testing different specifications, I decided to construct this variable as the highest number of years of education completed by either an individual's father or mother. The reason for this methodological decision is that I believe that the dimension of social background that this variable intends to capture – which is parental stimulation and direct involvement in their children's studies and career decisions – is better associated with the number of years of studies of the parent that possesses the highest educational attainment. This approach is also followed by Bukodi and Goldthorpe (2012).

Explained variables

The only explained variable for the analyses I am presenting in this section is a categorical variable indicating which of the three school types individuals attended: public schools, subsidised-private schools or fully-paid private schools. Although the main focus of this study is to compare the characteristics of students who studied in public schools with their counterparts at subsidised-private schools, unlike Bellei (2008), I opted for maintaining the fully-paid private school category in the logistic regression analyses to work with the entire population sample.

Control variables

Several variables were introduced as controls in the ML models, including sex, age of parents when the child started primary school, number of siblings, two-parent family vs. one- or no-parent family, region of primary and secondary school attended, urban vs. rural area of primary and secondary school attended, ethnic group (self-identification with an Amerindian ethnic group) and migration status (Chilean vs. immigrant). Despite the evidence that the latter two variables may be important determinants of school-

type attendance in Chile (Elacqua 2006 and 2012), they were not included as control variables in the final version of the ML models I estimated because they did not have a high response rate in the CSP survey and, therefore, highly reduced the size of the sample included in my estimations[40]. All the other variables mentioned above were included in the ML models, whose results are presented in the following section of this chapter.

Although finding gender differences in student attendance at public schools versus subsidised-private schools in Chile is not the focus of this chapter, the variable gender was included in the analysis as a control for the purpose of testing whether my findings coincide with Contreras (2002) or with Paredes and Pinto (2009). As seen, while Contreras (2002) claims that girls are more likely to attend subsidised-private schools than boys, Paredes and Pinto (2009) find no gender differences across school types.

Number of siblings and parental age were included as control variables because there is international evidence, as well as evidence for Chile, that both variables are important determinants of school choice (e.g. Reardon, *et al.* (2009), Paredes and Pinto (2009)). Particularly, a higher number of children implies a higher financial investment in their education for parents who are willing to pay for it; thus, all things being equal, I expect that the higher the number of siblings, the lower the probability of attending a subsidised-private school[41]. Regarding parental age, if experience is well rewarded by the labour market, older parents will probably have more labour-market experience, more possibilities of being promoted, and as a result, higher salaries than younger ones. Therefore, this variable can be associated with higher levels of income to invest in children's education, which means a higher probability of enrolling their children at a subsidised-private school. Alternatively, given the Chilean context, it is possible to expect that older parents may be more likely to have religious views than younger ones and, consequently, would rather enrol their children in Christian subsidised-private schools rather than in public ones. Therefore, in both cases, parental age

[40] This is because the question about self-identification with one of the Amerindian ethnic groups was only included in one of the latest waves of the Social Protection Survey. Therefore, by the time this question was included, many respondents were not part of the longitudinal study anymore due to attrition.

[41] It is important to consider that tuition fees, which became prevalent after the introduction of the Shared-Financing Scheme, are not the only differential cost of attending a subsidised-private school rather than a public school. For instance, transportation costs tend to be higher for students who attend the subsidised-private school of their preference compared with those who attend their closest public school.

would positively correlate with subsidised-private school attendance. Given that social class and social status variables were constructed by taking into account fathers' information, I opted for constructing parental age the same way; therefore, I considered the age of the father unless the father was not present, in which case I reported the age of the mother.

Finally, the variables 'region of primary school and secondary school attended' and 'urban vs. rural location of the school attended at primary and secondary level' may act as proxy variables of the region and area in which students were living while attending school[42]. The inclusion of these variables may be relevant because previous literature has reported that in rural areas the low density of pupils has prevented the establishment of subsidised-private schools; therefore, the public schools tend to have a monopoly on the provision of education (Peirano and Vargas, 2005, Elacqua *et al.*, 2012). Specifically, I introduced 12 regional dummy variables in the ML models that account for the political division of the Chilean territory into 13 regions until 2005, and another dummy variable indicating whether the area within the region is rural or urban[43]. This means that all my estimations are based on regional fixed effects ML models.

4.3.2. Results

4.3.2.1. Descriptive statistics

The distributions of students across school types, level of education (primary or secondary) and birth-cohorts obtained from the CSP Survey are reported in Table 4.1. As expected, the figures account for a significant increase in the proportion of individuals attending a subsidised-private school in the last two birth-cohorts, as well as a notable reduction in the proportion of students attending a public school.

[42] Unfortunately, amongst the recall information included in the Social Protection Survey, the geographical location of individuals' household at the moment they attended primary and secondary school was not included. Therefore, I can only observe geographical information about where individuals attended both primary and secondary school.
[43] The political geography of Chile changed in 2005, when two of the original thirteen regions were divided in two, resulting in fifteen regions. To avoid complications associated with this issue, I opted for using the thirteen original regions in all my empirical analyses.

Table 4.1: Distribution of individuals according to the type of school they attended at primary and secondary level in Chile, across birth cohorts: 1940-1987

Type of School Attended	Cohort 1 (1940-1951)	Cohort 2 (1952-1963)	Cohort 3 (1964-1975)	Cohort 4 (1976-1987)	All cohorts (1940-1987)
Primary					
public	83.59%	82.64%	80.23%	65.80%	78.13%
subsidised private	7.83%	9.70%	13.95%	25.50%	14.43%
fully-paid private	8.58%	7.65%	5.81%	8.70%	7.44%
Secondary					
public	74.33%	79.76%	67.77%	56.19%	68.58%
subsidised private	14.30%	12.50%	24.40%	32.41%	22.20%
fully-paid private	11.37%	7.73%	7.84%	11.40%	9.22%
Primary + Secondary					
public	80.16%	81.45%	74.70%	61.25%	74.00%
subsidised private	10.23%	10.86%	18.59%	28.77%	17.79%
fully-paid private	9.61%	7.69%	6.71%	9.98%	8.21%
observations	2,539	5,017	6,267	4,268	18,091

Table 4.2 summarises the descriptive statistics I obtained for all socioeconomic background variables introduced in the previous section, across birth-cohorts. Unsurprisingly, these figures suggest that the average level of parents' educational attainment and their average social status score increased across the children's birth-cohorts. The results also show an increase in the proportion of Chilean parents who work for the service sector or in routine non-manual occupations, along with a slight decrease in semi-skilled and non-skilled occupations. Perhaps surprisingly, my data accounts for an important decrease in the proportion of parents working in skilled manual jobs, especially in the youngest cohort. Also, interestingly, I observed a relatively stable proportion of self-employed workers across cohorts.

Table 4.2: Descriptive statistics: means and standard deviations of parental socioeconomic background in Chile, across children's birth-cohorts: 1940-1987

Variable	Cohort 1 (1940-1951)	Cohort 2 (1952-1963)	Cohort 3 (1964-1975)	Cohort 4 (1976-1987)	All cohorts (1940-1987)
parental social class:					
service class and routine non-manual workers	16.25%	16.41%	19.45%	23.43%	18.77%
self-employed	12.66%	13.82%	15.44%	14.94%	14.47%
skilled manual workers and farmers	32.91%	32.02%	27.12%	24.20%	28.58%
semi- and non-skilled workers and farm workers	38.18%	37.75%	37.99%	37.44%	38.19%
parental status	-0.258	-0.250	-0.221	-0.111	-0.207
	(0.693)	(0.642)	(0.664)	(0.723)	(0.680)
parental education (years)	6.984	7.557	8.575	10.232	8.477
	(4.203)	(4.075)	(4.114)	(4.034)	(4.255)
observations	2,539	5,017	6,267	4,268	18,091

Table 4.3 reports the descriptive statistics I estimated for control variables. As expected, the age of parents when the child started primary school increased for younger birth-cohorts while the average number of siblings decreased. I also observed an important reduction in the proportion of children who lived with both parents, specifically in the youngest cohort. The figures also indicate that the levels of attendance at secondary level education and urban schools have become higher across birth-cohorts; this is consistent with the expansion of secondary education and, also, with the phenomenon of migration from the countryside to large cities that has occurred in Chile during the analysed period (Jaspers-Faijer, 2007).

Table 4.3: Descriptive statistics: means and standard deviations of control variables, across individuals' birth-cohorts: 1940-1987

Variable	Cohort 1 (1940-1951)	Cohort 2 (1952-1963)	Cohort 3 (1964-1975)	Cohort 4 (1976-1987)	All cohorts (1940-1987)
number of siblings	4.243	4.300	3.156	2.182	3.385
	(3.026)	(2.854)	(2.255)	(1.582)	(2.566)
parents' age when child started primary school	35.824	36.365	37.401	37.564	36.688
	7.915	7.960	8.452	8.891	8.254
proportion of cases in biparental families	90.49%	91.99%	91.58%	85.77%	90.09%
proportion of male cases	46.54%	45.02%	46.66%	50.45%	47.13%
proportion of urban cases	85.21%	89.84%	91.69%	94.31%	90.90%
proportion of secondary school cases	37.06%	41.25%	44.37%	47.30%	43.19%
observations	2,539	5,017	6,267	4,268	18,091

4.3.2.2. Multinomial logistic regressions

Main effects models

Table 4.4 summarises the results of the main effects multinomial logistic models. Since the principal interest of my empirical analyses is the influence of social background variables on the choice between public and subsidised-private schools, the base outcome in all ML models (i.e. the omitted category) is public-school attendance, and I only report the differential effects of attending a subsidised-private school instead of a public one.

To present my results, I opted for reporting the relative-risk ratios (RRR), $\exp(\beta)$, rather than the estimated coefficients, β, themselves. The exponentiated value of a coefficient is the RRR for a one-unit change in

the corresponding variable, where risk is measured as the probability of an outcome (in this case, attending a subsidised-private school) relative to the base outcome (attending a public school).

In terms of the equations presented in Section 4.2.1 (equations (2)), it follows that the RRR of having attended a subsidised-private school (Y=2) instead of a public one (Y=1) is:

$$\frac{Prob\,(Y=2)}{Prob\,(Y=1)} = e^{X\,\beta_2} \qquad (3)$$

Since β_j and X are vectors, where: $X = (x_1, x_2, x_3, \dots, x_k)$ and $\beta_j = (\beta_1^j, \beta_2^j, \beta_3^j, \dots, \beta_k^j)$, we can represent the RRR for a one-unit change of the variable x_i by:

$$\frac{e^{\beta_1^2 X_1 + \beta_2^2 X_2 + \dots + \beta_i^2 (X_i+1) + \dots + \beta_k^2 X_k}}{e^{\beta_1^2 X_1 + \beta_2^2 X_2 + \dots + \beta_i^2 X_i + \dots + \beta_k^2 X_k}} = e^{X\,\beta_2} \qquad (4)$$

The models I ran included all the explanatory and control variables introduced in the last section, as well as birth-cohorts.

Regarding the main explanatory variables, since I expected to find differences between the situation of students before and after the 1981 reform, I decided to use birth-cohort 4 as the base category (omitted dummy variable). This is the birth-cohort composed only of individuals who started school (first grade) when the changes introduced by the 1981 reform were already operating. In the case of parental social class, I have opted to leave out the third category: V+VI: Skilled Manual and Farmers, in order to visualise whether there are different effects between individuals whose parents belong to this intermediate social class category and those whose parents belong to the top and bottom social class categories.

The results for four different specifications presented in Table 4.4 clearly indicate that the probability of attending a subsidised-private school rather than a public school has increased across birth-cohorts, with the younger ones having a much higher probability of studying in a subsidised-private school than the older

ones when all the other variables held constant. This finding is consistent with what was observed from the descriptive statistics and the Chilean administrative records.

Regarding the main effects of the three social background variables, when included separately, they all have a significant effect on school choice, except, perhaps, for parental social class. In particular, according to specifications (2) and (3), the RRR of subsidised-private school attendance to public school attendance is 1.079 for one more year of parental education and 1.463 for one more unit of the social status score, both significant at the 1% level. In the case of social class, significant differences appear only when comparing the omitted category (skilled manual workers and farmers) with the service and routine non-manual class.

These results provide evidence of socio-cultural stratification within the Chilean school system. In particular, students with more highly educated parents and higher social status are concentrated in subsidised-private schools, while those whose parents are less educated and less privileged in terms of status attend public schools. In contrast, the third component of social origin, parental social class, does not appear to have a significant effect on whether individuals attend a subsidised-private rather than a public school in Chile. This is not very surprising; as Bukodi and Goldthorpe (2012) point out, when parental social class is introduced in empirical models along with parental social status and parental education, social class captures the economic aspects of parental background. I believe that the economic aspect of socioeconomic background can be expected to have become significantly more important in explaining who attends a subsidised-private school rather than a public school only in 1993, when subsidised-private schools began charging fees to parents on top of the voucher; however, at that time, only the youngest individuals in birth-cohort 4 were still in school.

When including the three measures of social origin in the same model (specification (4)), we observe that the explanatory power of social class is reduced even more. This could be partially due to its correlation with the other social background components and partially due to the fact that most observations in my sample come from the pre-1993 period when most students at subsidised-private schools were not paying tuition fees. However, the effect of parental social status and parental education prevails. In fact, the RRRs

of subsidised-private school attendance to public school attendance are still significantly greater than 1 at 99% confidence level, being specifically 1.063 for one more year of parental education and 1.207 for one more unit of the social status score.

Table 4.4: Effects of socioeconomic background on the probability of choosing a subsidised-private school vs. a public school at primary and secondary level; main effects: Relative Risk Ratios (base outcome: public schools)

VARIABLES	(1)	(2)	(3)	(4)
birth cohort = 1, 1940-1951	0.368***	0.370***	0.442***	0.427***
	(0.0374)	(0.0379)	(0.0455)	(0.0443)
birth cohort = 2, 1952-1963	0.370***	0.370***	0.422***	0.413***
	(0.0291)	(0.0291)	(0.0339)	(0.0330)
birth cohort = 3, 1964-1975	0.599***	0.598***	0.645***	0.639***
	(0.0390)	(0.0389)	(0.0422)	(0.0417)
birth cohort = 4, 1976-1987 (omitted)				
parental class = 1, service class & routine non-manual workers	1.515***			1.011
	(0.123)			(0.104)
parental class = 2, self-employed	0.973			0.909
	(0.0835)			(0.0788)
parental class = 4, semi- & non-skilled manual workers and farm workers	0.914			1.011
	(0.0605)			(0.0699)
parental status		1.463***		1.207***
		(0.0701)		(0.0852)
parental education (years)			1.079***	1.063***
			(0.00805)	(0.00868)
school level = 2, secondary	1.506***	1.504***	1.481***	1.482***
	(0.0564)	(0.0565)	(0.0559)	(0.0560)
sex = 1, male	0.923	0.920	0.905*	0.905*
	(0.0501)	(0.0498)	(0.0493)	(0.0493)
zone = 1, urban	2.245***	1.995***	2.059***	1.958***
	(0.322)	(0.289)	(0.299)	(0.285)
number of siblings	0.895***	0.899***	0.907***	0.909***
	(0.0123)	(0.0123)	(0.0126)	(0.0127)
parent age when child started primary school	1.003	1.004	1.006*	1.006*
	(0.00335)	(0.00335)	(0.00341)	(0.00340)
biparental family = 1, lived with both parents	1.204**	1.141	1.113	1.095
	(0.109)	(0.103)	(0.101)	(0.101)
constant	0.264***	0.329***	0.129***	0.166***
	(0.0563)	(0.0693)	(0.0292)	(0.0392)
fixed effects for region where attended school	YES	YES	YES	YES
observations	18,091	18,091	18,091	18,091

Clustered-robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

All in all, the results in Table 4.4 are consistent with the findings of the existing literature that are based on post-reform cross-sectional estimations of the probability of attending a subsidised-private school rather than a public one (Contreras 2002; Bellei, 2008; Valenzuela, Bellei and de los Rios, 2014). According to my estimates, parental education is a more important determinant of school-type choice than parental class, just like previous studies have found that parental education is a more important determinant of school-

type choice than parental income. However, my results contribute to the literature by providing evidence of the importance of parental social status as a determinant of school-type choice over and above the effect of parental educational and economic variables.

Regarding the RRRs estimated for the control variables, as reported in Table 4.4, individuals are significantly more likely to attend a subsidised-private school at the secondary level than at the primary level. In the post-1981 and especially post-1993 era, this could be explained by the fact that parents preferred to make a higher financial sacrifice in the case of their children's secondary education rather than primary education, by paying either tuition fees or at least presumably higher transportation costs; however, the RRRs are greater than 1 and highly significant for the whole period analysed in this section, which includes the two birth-cohorts prior to 1981. For this reason, I believe that this must be mainly associated with the fact that traditional subsidised-private schools were non-profit entities (foundations) providing vocational secondary education for Chilean individuals interested in obtaining a trade certificate along with their secondary school diplomas. On the other hand, like Paredes and Pinto (2009) and unlike Contreras (2002), I find only very slight and mostly insignificant gender differences in the attendance of a subsidised-private school rather than a public school across school types; as reported, these differences favour women but are only significant at the 10% level and appear in only two out of four specifications. Moreover, as expected, the geographic location variables proved to be very important determinants of the type of school that individuals attended. In particular, students who study in rural areas have a much higher probability of attending a public school in comparison with their counterparts who grow up in large cities. Finally, as the theory would predict, the number of siblings reduces the probability of attending a subsidised-private school instead of a public school, and the opposite occurs in the case of both parental age when the child started primary school and having a biparental family rather than a single-parent or no-parent family; nevertheless only the first of these three associations proved to be significant at the 95% confidence level in all specifications.

Interaction effect models

Since one of the main purposes of this section is to observe whether the 1981 reform may have had an impact on the influence of social origin as a determinant of attendance at different school types, I performed ML models that incorporate the interaction of individuals' birth-cohorts with the three components of parental social background: parental social class, parental social status and parental education. To be consistent with the main-effect models, the reference birth-cohort (the omitted one) is the youngest, i.e. cohort 4. I hypothesise that, if the 1981 reform produced a difference in terms of the socioeconomic background of individuals who attended a subsidised-private school compared to those who attended a public one, this difference should be revealed in the comparison of cohorts 2 and 4, because cohort 3 is composed of people who were studying at school (at any grade) in 1981 when the reform took place.

The results of Table 4.5 provide some evidence against the idea that subsidised-private schools became more accessible for socially disadvantaged students after the 1981 reform. In fact, the interaction effects between birth cohorts and both parental social class and parental social status do not account for a statistically significant and robust reduction of their impact over time, but rather, they mainly suggest that the socioeconomic disparities in school choice have been persistent. However, the positive effect of parental education on the probability of attending a subsidised-private school instead of a public one seems to have increased after the 1981 reform.

The increased inequality in access to subsidised-private schools for the children of lower educated parents can be visualised as a significantly lower positive effect of parental education on the RRR of attending one of those schools for older cohorts in comparison with the post-reform one (cohort 4). This effect is also robust, as it appears not only when parental education is the only social background variable included in the models (specification 3) but also when the three components of parental socioeconomic background are considered (specification 4).

Table 4.5: Effects of socioeconomic background on the probability of choosing a subsidised-private school vs. a public school at primary and secondary level; interaction effects: Relative Risk Ratios (base outcome: public schools)

VARIABLES	(1)	(2)	(3)	(4)
birth cohort = 1, 1940-1951	0.435***	0.339***	0.952	0.808
	(0.0754)	(0.0367)	(0.204)	(0.244)
birth cohort = 2, 1952-1963	0.428***	0.369***	0.666**	0.837
	(0.0594)	(0.0306)	(0.135)	(0.214)
birth cohort = 3, 19964-1975	0.637***	0.610***	0.832	1.093
	(0.0765)	(0.0410)	(0.148)	(0.255)
birth cohort = 4, 1976-1987 (omitted)				
parental class = 1, service class & routine non-manual workers	1.682***			1.021
	(0.238)			(0.183)
parental class = 2, self-employed	1.005			0.925
	(0.156)			(0.146)
parental class = 4, semi- & non-skilled manual workers and farm workers	1.049			1.164
	(0.124)			(0.145)
birth cohort=1 # parental class=1	0.608*			1.143
	(0.179)			(0.445)
birth cohort=1 # parental class=2	0.613			0.716
	(0.233)			(0.271)
birth cohort=1 # parental class=4	1.003			0.859
	(0.230)			(0.211)
birth cohort=2 # parental class=1	0.819			1.017
	(0.195)			(0.294)
birth cohort=2 # parental class=2	1.097			1.121
	(0.260)			(0.274)
birth cohort=2 # parental class=4	0.680**			0.660**
	(0.127)			(0.128)
birth cohort=3 # parental class=1	1.017			0.930
	(0.194)			(0.224)
birth cohort=3 # parental class=2	1.000			0.982
	(0.203)			(0.203)
birth cohort=3 # parental class=4	0.851			0.887
	(0.136)			(0.150)
parental status		1.479***		1.140
		(0.108)		(0.129)
birth cohort=1 # parental status		0.625***		0.715
		(0.0957)		(0.179)
birth cohort=2 # parental status		1.008		1.057
		(0.154)		(0.226)
birth cohort=3 # parental status		1.148		1.288
		(0.121)		(0.208)
parental education (years)			1.114***	1.106***
			(0.0141)	(0.0160)
birth cohort=1 # parental education			0.912***	0.931***
			(0.0208)	(0.0257)
birth cohort=2 # parental education			0.953**	0.939***
			(0.0212)	(0.0210)
birth cohort=3 # parental education			0.976	0.958**
			(0.0167)	(0.0189)
school level = 2, secondary	1.507***	1.510***	1.489***	1.490***
	(0.0566)	(0.0569)	(0.0564)	(0.0566)
sex = 1, male	0.924	0.916	0.900*	0.897**
	(0.0502)	(0.0497)	(0.0492)	(0.0490)
zone = 1, urban	2.247***	2.005***	2.076***	1.972***
	(0.323)	(0.289)	(0.302)	(0.289)
number of siblings	0.895***	0.899***	0.907***	0.910***
	(0.0124)	(0.0123)	(0.0126)	(0.0127)
parent age when child started primary school	1.003	1.004	1.007**	1.006*
	(0.00336)	(0.00335)	(0.00343)	(0.00341)
biparental family = 1, lived with both parents	1.214**	1.144	1.114	1.101
	(0.111)	(0.104)	(0.102)	(0.102)
constant	0.238***	0.325***	0.0919***	0.102***
	(0.0530)	(0.0687)	(0.0226)	(0.0284)
fixed effects for region where attended school	YES	YES	YES	YES
observations	18,091	18,091	18,091	18,091

Clustered-robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

In summary, these results coincide with the findings of the literature on social stratification and student sorting in the post-reform Chilean educational system, in particular with Hsieh and Urquiola (2003 and 2006), Elacqua (2006 and 2012), and Valenzuela, Bellei and de los Rios (2014), who worked with aggregated post-reform data. By using individual-level data I find an increase in the influence of parental social background on the allocation of students across school types when the post-reform situation is compared with the pre-reform one. According to my estimates, this result is mainly explained by the role of parental education on the probability of choosing a subsidised-private school rather than a public school, which has become significantly more important than it was before the 1981 reform.

These findings imply that, far from having made private education more accessible for children and adolescents from disadvantaged social backgrounds, the 1981 reform mostly maintained the degrees of inequality in the Chilean school system in terms of parental social class and parental social status, while increasing the disparities associated with parental education.

4.3.2.3.Predicted probabilities analysis

To illustrate more clearly the combined effect of the three components of social background on school-type choice across birth-cohorts in Chile, it is convenient to use the results of an interaction effects model, like the one previously described, to obtain the predicted probabilities that individuals who possess specific parental characteristics attended a public school and a subsidised-private school. With that purpose, I conveniently modified the three socioeconomic background variables: parental social class, parental social status and parental education.

I started by collapsing parental social status and parental education into aggregate categorical variables. In the case of parental social status, from the 28 hierarchical groups distinguished by Torche (2007 and 2010) for the Chilean society, I aggregated some of them as follows to produce four broad categories: (1) groups 1 to 4 (containing the most prestigious professionals and associate professionals); (2) groups 5 to 13 (containing managers and a series of non-manual highly prestigious occupations); (3) groups 14 to 23

(containing a few less prestigious non-manual occupations as well as most manual ones, except for those associated with farming[44]); and (4) groups 25 to 28 (containing only subsistence farmers, farm labourers, vegetable growers and domestic servants)[45]. In the case of parental education, I also transformed the variable into a four-category variable by distinguishing the following groups: (1) at least one parent has a bachelor's degree; (2) at least one parent completed secondary education (twelve years of school) but no parent possesses a bachelor's degree; (3) at least one parent completed six years of education, but no parent graduated from secondary education; and (4) no parent completed more than five years of studies[46].

In the case of social class, to better discriminate the extreme top and bottom social classes that can be associated with the parental social status and parental education groups described below, I redefined the social class variable into a different 4-category class scheme as follows: (1) I+II: service class; (2) IIIa+b + IVa+b: routine non-manual and self-employed workers; (3) IVc + V+VI + VIIa: farmers, skilled manual, semi and unskilled manual workers; and (4) VIIb: farm workers[47].

Considering these new specifications for the three components of socioeconomic background, I re-estimated the ML model including their interaction with birth-cohorts as well as all control variables described in Section 4.2.3. From the results of this new model, following Bukodi and Goldthorpe (2012), I calculated the predicted probabilities for four different types of hypothetical individuals that were defined by combining the four levels of parental social class, parental social status, and parental education explained above. To identify these types of individuals, I gave them the following names: (1) 'consistently privileged', (2) 'upper-middle privileged', (3) 'lower-middle privileged', and (4) 'consistently unprivileged'. Table 4.6

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[44] As reported by Chan (2010), Torche finds that the occupations related to farming in Chile, which encompass an important part of the labour force, can be divided into a handful of different social status categories, all of them being at the bottom of the social status score distribution.

[45] Torche's (2007 & 2010) status group table, containing an accurate description of the occupation titles included in each category, can be found in Appendix A.

[46] I distinguish people with 5 or fewer years of education as the bottom category, because until 1965 primary education in Chile comprised six years of education ('Preparatoria') and four years of secondary education ('Humanidades'). In 1965, a reform introduced by President Eduardo Frei Montalva, changed this scheme, establishing eight years of primary education ('Educación Básica') and four yours of Secondary Education ('Educación Media'). The latter arrangement has prevailed in Chile since then.

[47] At the bottom of the parental status scale for Chile that I used in this thesis there are practically only occupations related to farming. As a consequence, to obtain a larger number of coincidences (i.e. observations) between the bottom of both parental status and parental social class schemes, I preferred to also leave only the farm workers and labourers at the bottom of the class scheme when constructing individual types for this analysis. Also, as reported by Chan (2010) and Torche (2007 and 2010a) this group represents a systematically unprivileged group in the Chilean society.

summarises the combined socioeconomic background characteristics associated with each of these groups and their numerical importance in the sample.

Table 4.6: Summary of types of hypothetical individuals

Type	Social background component			Type description	Illustrative case	Cohort 1 (1940-1951)	Cohort 2 (1952-1963)	Cohort 3 (1964-1975)	Cohort 4 (1976-1987)	All cohorts (1940-1987)
	Class	Status	Education							
1	1	1	1	Consistently privileged	professional parent with a bachelor's degree in sciences, social sciences or education	1.19%	1.22%	2.25%	4.72%	2.22%
2	2	2	2	Upper Middle privileged	cashier, manager, clerck, shop sale worker or driver parent with a secondary school diploma	2.73%	4.30%	6.68%	8.57%	5.55%
3	3	3	3	Lower Middle privileged	construction worker, plumber, electrician, doorman, porter or cleaner parent with six to eleven years of education	14.83%	19.13%	19.67%	20.24%	18.64%
4	4	4	4	Consistently unprivileged	farm worker, vegetable grower, field cropper or gardener parent with less than six years of education	6.74%	5.43%	4.44%	1.68%	4.65%
Total	1-4	1-4	1-4	All previous categories	all previous categories	25.49%	30.08%	33.04%	35.21%	31.06%

The predicted probabilities of attending a public school or a subsidised-private school for each of these types of individuals, with their respective 95% confidence intervals, are shown in Figure 4.2 and Figure 4.3. Even though I have included the four cohorts in these figures, the analyses I present here mainly focus on birth-cohorts 2, 3 and 4. In particular, I am interested in the comparison between the group who attended school right before the 1981 reform was enacted (birth-cohort 2) with the group who went to school right after the reform was implemented (birth-cohort 4).

As reported in Figure 4.2, the comparison of birth-cohorts 2 and 4 suggests that the predicted probabilities of attending a public school decreased during that period (school attendance between 1958 and 1993) for all types of individuals except for the socioeconomically most advantaged ones. The probability of attending a public school for the consistently privileged group was already low for individuals in birth-cohort 2 (37%) and kept very stable across birth-cohorts 3 and 4 around the same value. At the other extreme, children of socially disadvantaged parents had a very high probability of attending a public school right before the 1981 reform (over 86%) and although this probability decreased slightly across birth-cohorts 3 and 4 by about 3 percentage points, the reported 95% confidence intervals do not show a statistically significant difference. In contrast, the probability of attending a public school dramatically falls for the middle-classes. When comparing birth-cohorts 2 and 4, this probability is reduced from 71% to 56% for the upper-middle privileged group and from 84% to 75% for the lower-middle privileged group. Both differences are statistically significant at the 95% level, as the diagram shows.

Figure 4.2: Predicted probabilities of attending a public school, by cohort and hypothetical individual type

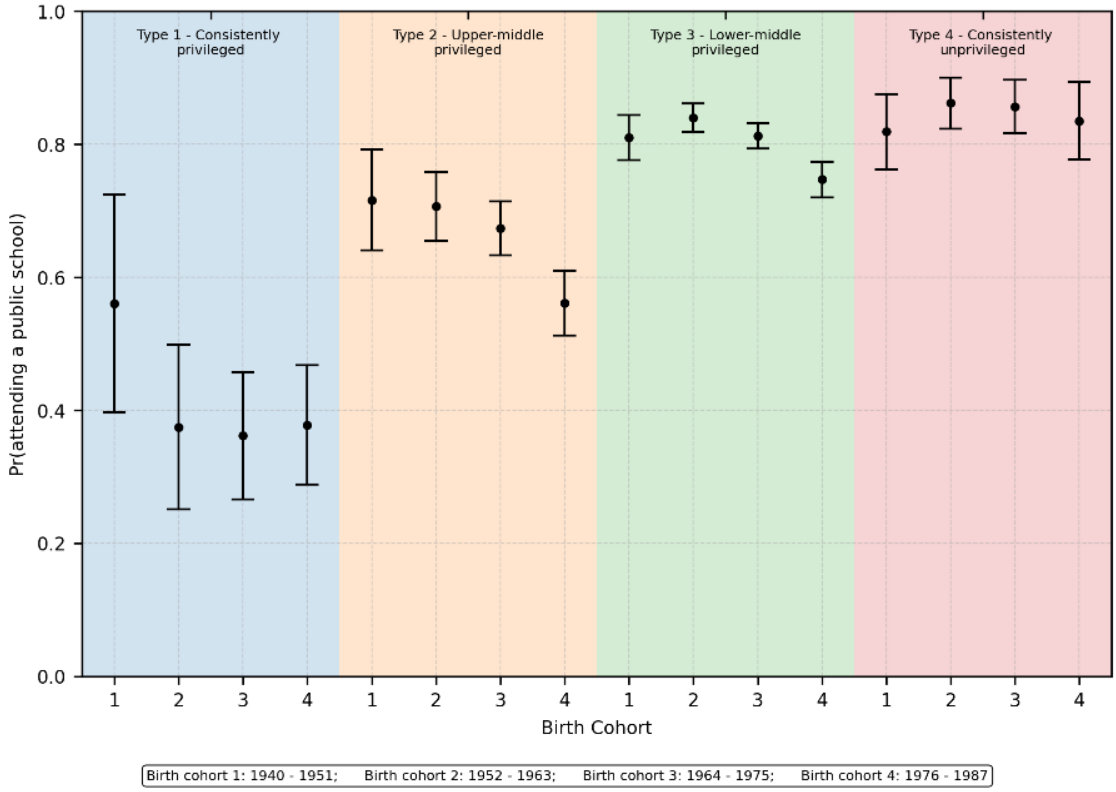
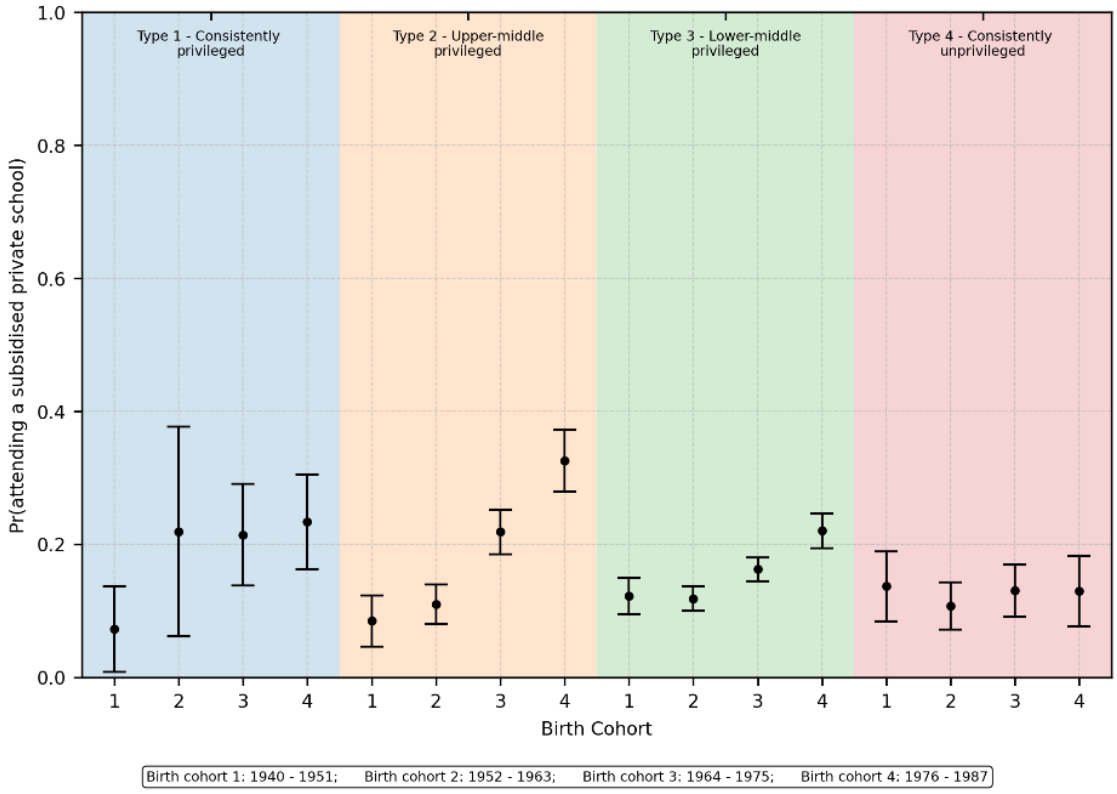


Diagram 4.3 reports the predicted probabilities of attending a subsidised-private school for the same types of hypothetical individuals across the fourth birth-cohorts. Unsurprisingly, the diagram provides evidence of a general increase in the attendance at subsidised-private schools when we compare birth-cohorts 2 to 4. However, the results are consistent with those obtained for public schools in that the only significant differences between birth-cohorts 2 and 4 at the 95% level of confidence are those estimated for the middle classes and especially for the upper-middle privileged individuals. As reported, the predicted probability of attending a subsidised-private school increased from 11% to 33% for individuals in the upper-middle privileged group, while for those in the lower-middle privileged group this proportion saw a less dramatic but still very statistically significant increase from 12% to 22%.

In summary, the evidence presented in this section suggests that the impressive expansion of the subsidised-private sector as a provider of education in Chile after the 1981 reform meant that a large number of children from the middle classes shifted from public to subsidised-private schools, while the most advantaged and disadvantaged children, from the top and bottom of the social background distribution,

mostly remained attending fully-paid private and public schools respectively, as they were doing right before the reform was enacted. However, it is important to highlight that the previous results are highly mediated by parental education. In fact, amongst all the components of parental social background, parental education is the one that played the most important role in explaining who left public schools and moved to subsidised-private schools in Chile over the analysed period, and particularly in the post 1981 reform period. As a matter of fact, I find no robust evidence of a significant change in the importance of parental social class and parental social status in explaining the choice between a subsidised-private and a public school when birth-cohorts 2 and 4 are compared.

Figure 4.3: Predicted probabilities of attending a subsidised-private school, by cohort and hypothetical individual type



As the present study is the first that compares the socioeconomic background of students across school types before and after the 1981 reform, perhaps the most interesting finding is the confirmation that the Chilean school system did not become less stratified by socioeconomic origins across school types in the post-reform period compared with the pre-reform one. This means that, although more children and adolescents who had no access to private education in the past were given access to these schools after the

reform, these children mainly came from the upper-middle social strata in Chile, which produced a concentration of them in subsidised-private institutions, while the most disadvantaged children remained in public schools.

4.3.3. Conclusions

The intention of this section was to contribute to the literature on the effects of the sweeping school reform that Chile undertook in 1981 by analysing the role of parental social background on the probability of having attended a subsidised-private school rather than a public school across several generations of students. The two innovative aspects that I introduced here were: the fact that my empirical analyses were conducted with novel individual data that included people who studied at school in Chile before and after the 1981 reform, and that, following Bukodi and Goldthorpe (2012) individuals' social origin was decomposed into three variables reflecting different aspects of parental background: parental social class, parental social status and parental education. Previous studies analysing the same problem had been based on data aggregated at the municipal level and have relied on compounded measures of parental background as the main explanatory variable, which made it difficult to explore the mechanisms behind the association between parental social background and school-type choice.

My research hypotheses were: (1) socioeconomic background must have played a very important role in school-type choice in Chile and this association must have been observed all over the period before and after the 1981 reform; (2) since the 1981 voucher school reform allowed each subsidised-private school to start selecting students according to its own criteria, there must have been a strengthening of this association following the 1981 reform; and (3) given that the voucher school system made it necessary for families to collect, organise and analyse information on school attributes to decide where to enrol their children in the post-1981 era, parental education must have gained importance as a determinant of school-type choice after 1981.

The findings of this section suggest the following. First, the three components of parental social background have been important determinants of the type of school that Chileans attended between 1946 and 2004, both at primary and secondary level. However, over this period, sociocultural variables seem to have played a relatively more significant role compared with the labour-market variables. Second, except for parental education, the influence of these variables on school type seems to have remained mostly unchanged over the last few decades and, particularly, after the 1981 reform took place. Third, parental education seems to have become a much more important predictor of the type of school attended by individuals in the post-reform era than in the pre-reform era.

Regarding the first result, the relevance of socio-cultural factors mediating school-type attendance decisions is not surprising, as it seems to be consistent with the findings of previous studies analysing how parents form their preferences for school attributes in Chile. These studies report that higher educated parents tend to prefer schools whose student bodies possess average characteristics that resemble their own (Gallego and Hernando, 2009). Also, qualitative evidence for Chile (Hernandez and Raczynski, 2015) suggests that middle-class parents tend to avoid public schools because they fear that their children will adopt some of the "bad social habits and behaviours" that are seen as predominant amongst children from the most disadvantaged social groups (Ibid:135). This possible mechanism, which is consistent with Breen and Goldthorpe's (1997) thesis of 'relative risk aversion toward downward mobility' could explain why social status is such an important predictor of the probability of attending a subsidised-private school instead of a public one and there are persistent inequalities by social status across school types in the Chilean education system.

Regarding my second and third results, one could conjecture that highly educated parents have been the 'winners' of the 1981 educational reform, and particularly of the introduction of a freely competitive system of public and private voucher schools. This result validates the hypothesis that only more educated parents would be able to benefit from the freedom to choose a school when given the right to do so, as they are more prepared to process, analyse and compare relevant data on school fees and attributes to make a rational and well-informed decision. (Coleman, Schiller and Schneider, 1993). This hypothesis opposes the

alternative one proposed by the same authors, which argues that, if the prior school system sorted students based on their place of residence (as was the case in the pre-reform period in Chile), socially disadvantaged families would gain the most from having the freedom to choose (Ibid: 150). Of course, this alternative hypothesis assumes that socially disadvantaged parents would become 'knowledgeable choosers' if they were given all the relevant information about school characteristics, which does not seem to have occurred in Chile. In fact, as previous empirical literature suggests, the majority of disadvantaged parents appear to have kept choosing schools primarily based on their location (Elacqua, Schneider and Buckley, 2006; Chumacero, Gomez and Paredes, 2011). The latter argument also coincides with qualitative evidence for Chile that indicates that parents from disadvantaged social backgrounds, as well as those whose children attend public schools, do not know if the performance of their children's school in the SIMCE test is better than, similar to or worse than other schools' performances (Hernandez and Raczynski, 2015; Gubbins, 2013; Córdoba, 2014)

Overall, my analyses do not allow me to reject the hypothesis of previous studies that the 1981 reform produced more stratification across school types by parental education. However, I found evidence of 'persistent inequalities' in school-type choice by the other two dimensions of parental social background: social class and social status. This means that, making private education accessible for everyone and particularly for children from the most disadvantaged social backgrounds - which was one of the premises of the 1981 reform (Elacqua and González, 2013) - was not one of the consequences of the expansion of the subsidised-private sector in education.

Another interesting aspect of this section is that social class did not appear to be a highly significant determinant of school-type choice in Chile over the entire period analysed after controlling for the other dimensions of parental social background. The only exception to this was, perhaps, the role of having a parent in the top social class-category (service class and routine non-manual workers) compared with having a parent at any other class category. A plausible explanation for this is that the measure of social class that I constructed may not be accurately reflecting social class categories in Chile and, consequently, may be misinterpreting family's financial capacity to afford the costs of subsidised-private education. This is

unfortunately possible because, unlike other studies on social mobility conducted with Chilean data, the dataset I worked with has a set of variables perhaps too restrictive to construct optimal social class categories[48]. In addition to this, as previously stated, the lack of long-term longitudinal socioeconomic studies for Chile impedes having parental income as a dimension of parental social background prior to 1990. Therefore, I believe that the social class scheme that I constructed was the best proxy for the economic dimension of parental background that I was able to produce with information prior to 1981 in Chile using the CSP Survey data[49]. That being said, it is still possible to check whether the relationship between parental social class and school choice in Chile is stronger than the one I predicted in this section (and also to explore the relationship between parental income and school choice) by using a sample of students who attended school in the 1990s and 2000s when the voucher system was already operating; however, this would not allow for comparisons between the pre- and post-reform periods.

Regarding the fact that I found no robust evidence that social class became a more important determinant of attending a subsidised-private rather than a public school after 1981, I think that it is also necessary to consider that the economic dimension of social background may have really played a small role in school choice during the period following the 1981 reform. As explained in the introduction of this chapter, subsidised-private schools only started charging fees to parents on a large scale after 1993, when the 'Shared Financing Scheme' was implemented. Before that, subsidised-private schools were not allowed to do so. Thus, it is possible to hypothesise that the Chilean voucher school system may have had an effect on economic stratification (or stratification by parental social class or earnings) across school types only from the second half of the 1990s. Unfortunately, only half of the individuals of the youngest birth-cohort that

[48] For instance, accurate information on whether individuals are in charge of work teams, supervise people in their working places and how many people they supervise, strongly helps to produce a more accurate classification of them into social class categories compared with a classification based on only 4-digit ISCO codes. In Chile, Espinoza and Núñez (2014) produced a social class scheme for the country based on information of such quality. However, it is unlikely that reports on parental occupation based on adult children's recall - which is the kind of data that I used in this section - contains that exhaustive level of detail. To overcome this difficulty, I ran a series of checks for the class categories I constructed by reproducing my analyses on a very large dataset based on all waves of the National Socioeconomic Survey (CASEN) conducted up to the present day; this allowed me to better identify the most prevalent associations between ISCO codes and employment statuses (employee, employer or self-employed) in Chile which I subsequently applied to my data to validate the social class categories I constructed. Despite these efforts, I cannot be certain that my categorisation of social class is not exempt of problems in the allocation of certain occupations.

[49] The first longitudinal socioeconomic and cultural studies emerged in Chile in the 1990s and, unfortunately, in most cases they have not continued in the long-term. Some examples of this are the CASEN Panel Survey 1996-2001-2006, the CASEN Panel Survey 2006-2007-2008-2009 and the Longitudinal Early Childhood Study 2010-2012-2017. Even the Social Protection Survey that I used to produce most of the estimates of this thesis, has not continued since 2015.

I included in my empirical analysis (birth-cohort 4) were attending school by then. Thus, it is not possible to test this hypothesis using the dataset I worked with in this section. To test whether the 'Shared Financing Scheme' may have further increased the importance of family background - and particularly its economic component - in explaining the type of school that individuals attend in Chile, I will conduct a similar analysis with a more recent dataset that includes younger cohorts of students. This analysis will be presented in Section 4.4.

In summary, the overall results of this section provide evidence that the introduction of a voucher school system, even in the absence of tuition fees, may produce high and increasing levels of social stratification of students across different school types when schools are allowed to select students based on their own criteria and are not offered any sort of economic incentive to educate children from the most disadvantaged social backgrounds. For that reason, further research on the Chilean voucher school system could focus not only on the effects of the 'Shared Finance Scheme' on social stratification of students across school types, but also on the school composition effects of the more recent reforms intended to equalise the opportunities for students from disadvantaged backgrounds, such as the 'Preferential Subsidy Law' and the 'School Inclusion Act'.

4.4. Analysis: Effects of social background on school-type choice before and after the 1993 'Shared Financing Scheme'

Having found a significant and increasing association between socioeconomic background and the likelihood of attending a subsidised-private school rather than a public school in Chile during the transition from a centralised public school system to a market-based voucher system, this section presents an extension of the empirical analyses of Section 4.3 to a more recent period. As mentioned in the conclusions of Section 4.3, the fact that the youngest individuals included in the sample of the Chilean Social Protection (CSP) Survey started primary school in 1994 and that no further waves have been conducted since 2015, prevented me from using this longitudinal study to analyse whether the effects of social background on school choice experienced further increases after subsidised-private schools were allowed to charge fees to

parents in 1993. For that reason, in this section I will use the same methodological approach and a different set of data to try to answer the second set of research questions of this chapter, which are the following: (1) did the association between socioeconomic background and school-type choice identified for the period post-1981 experience a further change after the 1993 'Shared Financing Law' was enacted in Chile? (2) If the association between socioeconomic background and school-type choice changed after the introduction of the 'Shared Financing Scheme', was this change mainly mediated by the influence of the economic components of socioeconomic background over and above its other components?

4.4.1. Data and methods

4.4.1.1. Data description

To address the aforementioned research questions, this section relies on the National Socioeconomic Chilean Survey (CASEN), and particularly its 1996, 2006 and 2015 waves. CASEN is the most important cross-sectional household survey carried out in Chile. Its sample is representative at national and regional levels and contains a very wide set of socioeconomic variables of households and their members. CASEN has been conducted since 1990 on a biennial or triennial basis, and its 2015 version had a sample size of around 82,120 dwellings (MDS, 2016) [50].

The most important reason to use CASEN to answer the last two questions of this chapter is that the similarity of its questions with the questions included in the CSP Survey allows me to reproduce in a very exact way the empirical analyses conducted in Section 4.3 on a younger sample of students. Moreover, unlike the CSP Survey, CASEN contains very detailed information on income and earnings of students' parents and families. In fact, one of the main objectives of CASEN is to measure poverty and income inequality in Chile on a regular basis; thus, the information on household income reported in CASEN is

[50] As a matter of fact, two waves of the CASEN survey were conducted before 1990: one in 1985 and another one in 1987. However, these greatly reduced studies were undertaken by the military dictatorship with the purpose of collecting information on poverty and extreme poverty in Chile. Unlike the latter versions of this survey, which have been conducted regularly by all the governments since the return to the democracy, the databases for these two initial waves are not currently available for public use.

very detailed and of high quality. For this reason, working with CASEN makes it possible to include in my empirical models not only the three components of parental social background that I used in Section 4.3 but also a fourth component: family income. I expect that this fourth component of socioeconomic background will help me to better identify whether the implementation of the 'Shared Financing Scheme' in 1993 may have affected the socioeconomic stratification of students across different school types in Chile.

Despite the advantages of using CASEN to investigate the influence of parental background on school-type choice in Chile over recent years, there are several relevant methodological differences between this survey and the CSP Survey. As a consequence, the empirical analyses conducted here are not strictly comparable to those performed in Section 4.3. While CSP is a longitudinal survey whose primary units of analysis are adult individuals, CASEN is a cross-sectional survey regularly conducted in Chile whose primary units of analysis are households. Although the CSP Survey has followed a sample of Chilean individuals for thirteen years, the observational period does not include the time when these individuals where studying at school and presumably living with their parents; however, its first two waves include very detailed recall information of individuals' social background, particularly parental education and occupations. This recall information was the basis for the estimations of Section 4.3. In contrast, CASEN contains a large set of variables accounting for different characteristics of individuals' households but, as any cross-sectional study, CASEN does not follow the same individuals over time. Despite this, the fact that CASEN registers detailed information on each member of the household makes it possible to link the information of children and parents that are living in the same household at the point of measurement and that is the information that I used to perform the empirical estimations in this section.

Using cross-sectional data has some implications for the correct interpretation of the results in this section compared with those obtained in Section 4.3. Particularly, parental occupation, which is the basis for the construction of parental social class and parental social status in both studies, is reported in CASEN as the current occupation of fathers (and mothers) at the point of measurement. This implies that, for the analyses in this section, parental social class and parental social status reflect the employment status of parents at a

particular time: the time when the household was surveyed. In contrast, I constructed these variables in Section 4.3 using recall information reported by children that reflects the most typical occupation of their parents during their entire careers. Therefore, one could argue that there is a trade-off between accuracy and representativeness in the way in which these variables are constructed in both studies. While the variables constructed with the information of CASEN can be considered more accurate because they reflect the exact occupation of parents at the point of measurement, variables constructed with the information of the CSP Survey may be considered as more representative of the long-term employment status of parents, instead of being a temporary reflection of the labour circumstances of parents when the survey was conducted.

On the other hand, it is relevant to recognise that the variables constructed with CASEN and the CSP Survey may be affected by different types of bias[51]. For example, one could argue that, in comparison with CSP, all the information about parents collected by CASEN has a lower bias related to parental age because older adults may have more problems remembering the occupations and educational levels of their parents, especially if they already passed away. In contrast, one can expect no bias in the report of current information about parents in CASEN, unless the survey respondent, who answers the survey in the name of the other members of the household, does not possess accurate information on the occupations and educational levels of the other household members. Despite this, it is also important to observe that using CASEN instead of CSP may introduce a different source of bias: the fact that I can only connect the information about parents and children if they live together. In fact, it is easy to argue that many parents who did not live with their children over their childhood or adolescence still had a very important role in their upbringing and also provided them with financial, cultural and educational support. Therefore, the socioeconomic information of these parents is still relevant in predicting their children's school choice.

[51] One source of bias that is common to the estimates of Sections 4.3 and 4.4 is the assumption that students did not change the school-type they attended within the same educational level. In the case of this section, which is based on CASEN, this means that if a student was attending primary (or secondary) school at the moment he/she was surveyed, I assume that the student attended all his/her years in primary (or secondary) school at the same school type. In the case of Section 4.3, whose estimations are based on the CPS Survey, the educational trajectories of individuals come from recall information. Therefore, individuals were required to report the type of school they attended at primary and secondary level separately. If they switched the type of school they were attending within primary or secondary education, they were asked to report the type of school in which they spent more years studying. Therefore, in both Sections 4.3 and 4.4, having only one school type per educational level is a simplification of the reality.

Unfortunately, there is no way I can recover parental information for children who do not live with their parents at the point of measurement when using the CASEN Survey[52].

Aside from making a precautionary note on the different sources of bias in CASEN and the CPS Survey that may affect the comparability of the results of Section 4.3 and 4.4, it is worth noting that CASEN also has an important limitation. The reason why I did not use CASEN to analyse both policy changes - the 1981 voucher school reform and the 1993 'Shared Financing Law' – is because the first CASEN Survey whose data is publicly available was conducted in 1990; ergo, CASEN provides no information on the situation prior to the establishment of the voucher school system[53]. In practice, this means that I can reproduce in CASEN only the youngest cohort that I constructed in Section 4.3 and, therefore, I can compare the link between socioeconomic background and school-type choice only between that cohort and two other younger cohorts. This approach is useful for the purposes of the particular research questions of this section, but it unfortunately does not allow me to check the robustness of the findings of Section 4.3 by reproducing the same estimations on a different set of data.

Given that the main objective of this section is to provide evidence of a potential change in the link between socioeconomic background and school-type choice after the 'Shared Financing Scheme' was introduced, it is important to compare groups of students who studied before and after this law was enacted. Thus, similarly to the analyses I performed in Section 4.3, I use data from CASEN to conduct a birth-cohort approach distinguishing between the two following groups: (1) individuals who were attending primary or secondary school in 1993 during the time the reform was implemented (birth-cohort 1: 1978-1987)[54]; and (2) individuals who started primary school after 1993 and, consequently, have spent all their time at school under a regime that allows for tuition fees in subsidised schools (birth-cohorts 2: 1988-1997, and 3: 1998-

[52] It is worth noting that a recall question on parental education, addressed only to certain adults (heads of nuclear families and their partners), was included in the 2006 and 2015 versions of CASEN, however this question was not included in the 1996 version. Moreover, the one work-related recall question about individuals' parents – which asked what was the most prevalent employment status of each parent during his/her child's infancy (i.e. whether that parent was employed, self-employed or employer) - was only part of the 2006 questionnaire and not even this wave of CASEN included parental occupational categories. This explains why I could not use CASEN to conduct any of the empirical analyses of Chapter 5.

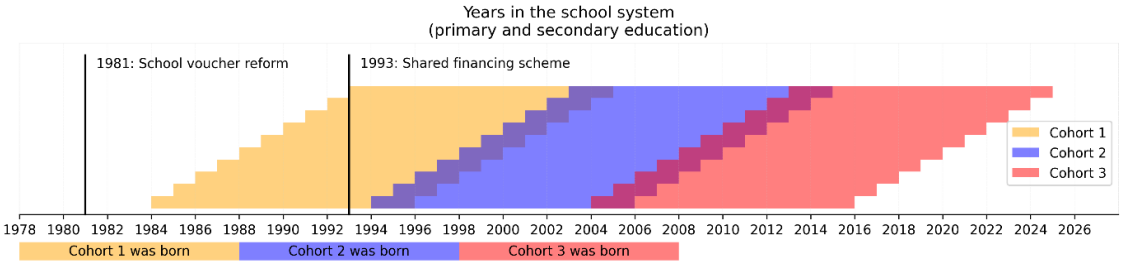
[53] In fact, the oldest students at the primary or secondary levels that could be included in a sample constructed with CASEN data are those who were 17 or 18 years old in 1990, that is to say, 8 to 9 years old in 1981. As a consequence, any sample obtained from the CASEN Survey will only contain people who were affected by the 1981 reform during their entire educational careers.

[54] The only exception to this are the individuals who were born in 1987 and started primary school exactly in 1993.

2007). Although an optimal research design would have also included a cohort of students that fully completed secondary education in the Chilean School system before 1993, as already stated, CASEN databases are only publicly available from 1990 and detailed information on parental occupations is only available from 1996 onwards[55]. As a consequence, it is not really possible to construct a birth-cohort that is older than birth-cohort 1.

Figure 4.4 graphically illustrates the cohort approach used in this section. As in Section 4.3, the coloured bar below the timeline indicates the years in which individuals from the three cohorts were born, and the stepped diagram above the timeline shows the periods in which these individuals were most likely to be attending school. More specifically, each differently coloured tier of the stepped diagram represents the period of time when individuals from these three birth-cohorts started and finished school, assuming that everyone started primary school at the age of 6 and graduated from secondary school around the age of 17. The only differences between Figure 4.3 and Figure 4.4 are the darker areas representing the intersection of the cohorts of students in the educational system. This is because, unlike the birth-cohorts I constructed in Section 4.3, these are ten-year cohorts rather than twelve-year cohorts and (if we assume no grade repetition) individuals take twelve years to complete school studies in Chile[56].

Figure 4.4: School progression by birth-cohort



[55] Although I could have constructed slightly older cohorts by using the three waves of CASEN conducted before 1996 (1990, 1992 or 1994), I decided against this because the information on individuals' occupations based on the International Standardised Classification of Occupations, ISCO 1985 has only been coded using 4 digits since 1996 onwards. Not having the 4 digit-codes causes several problems in constructing parental social status and parental social class because many additional assumptions must be made. As a consequence, the accuracy of these measurements would have been greatly reduced, while the gains in terms of having cohorts six years older were not that considerable.

[56] Although one could argue that I could have constructed 12-year cohorts by using a more recent wave of CASEN than 2015, this would have meant including information of students who were in the school system after the enactment of the 'School Inclusion Act'. This important law was the one that finally removed the three major guarantees provided to subsidised schools that are the main focus of this thesis: freedom to select students, to make profit, and to charge fees to parents on top of the voucher. This explains why I opted for not using more recent data in any of the empirical analyses of this thesis.

4.4.1.2. Models

To enable comparison with my previous estimations, in this section I also estimated multinomial logistic regression models (ML models), where the dependent variable is a three-category variable indicating which school type children and adolescents in my sample attended at the point of measurement. To focus on the influence of parental socioeconomic background mediating the choice between a public school and a subsidised-private school, the omitted category (base outcome) of my estimations is attending a public school.

As explained in the data description and in contrast to Section 4.3, this section's analyses are based on a sample of individuals that were attending either primary or secondary school at the point of measurement. For that reason, my estimations here do not include information for the same person at both primary and secondary level. Nevertheless, as the dataset that I constructed comes from three waves of a Chilean national household survey (CASEN), there are many cases of siblings in my sample. Since siblings share all the main explanatory variables that I use to estimate my models (parental socioeconomic background, family characteristics and home location), it is important to guarantee that the multinomial logistic models account for intrafamily correlations. For that reason, the variance-covariance matrix was estimated assuming clustered standard errors.

In summary, similarly to Section 4.3, the three-category multinomial logit models I estimated in this section are the following:

$$Prob\,(Y = 1) = \frac{1}{1 + e^{X\,\beta_2} + e^{X\,\beta_3}}\ \ , for\ Y = 1 = public\ school$$

$$Prob\,(Y = 2) = \frac{e^{X\,\beta_2}}{1 + e^{X\,\beta_2} + e^{X\,\beta_3}}\ , for\ Y = 2 = subsidised - private\ school$$

$$Prob\,(Y=3)=\frac{e^{X\beta_3}}{1+e^{X\beta_2}+e^{X\beta_3}}\ ,for\ Y=3=fully-paid\ private\ school$$

$$where\ ,X=explanatory\ and\ control\ variables\ of\ the\ model$$

$$and\ \ \beta_j=estimated\ parameters\ for\ school\ type\ j,with\ j=\ 1,2,3$$

4.4.1.3. Variables

Explanatory Variables

In order to make the empirical analyses of this section comparable to those in Section 4.3, I constructed three out of four indicators of parental socioeconomic background (parental social class, parental social status and parental education), in a very similar way.

Following the previous work of Torche (2005b) and Espinoza and Núñez (2014), parental social class was introduced in my empirical models as a four-category variable as follows: (1) I+II+IIIa+b: service class and routine non-manual, (2) IVa+b: self-employed, (3) IVc+V+VI: skilled manual workers and farmers, and (4) VIIa+VIIb: semi and unskilled manual, and farm workers. All these categories were constructed using the father's occupation unless they were not living in the same household as their children, they were unemployed or inactive at the point of measurement. In all those cases, I used the mother's occupation.

In the case of social status, in the same way as in Section 4.3, I followed the approach of Chan (2010) and Torche (2007 and 2010a), who estimated scores for a hierarchy of 28 social-status groups that ranks from 1.92 to -1.42. However, in this case, when fathers were absent, unemployed or inactive, I used the

occupational information of mothers to estimate a social status score for their children.[57] In the case of parental education, following Bukodi and Goldthorpe (2012), this variable was constructed using the highest educational attainment of either father or mother, where the level of attainment was measured as the number of years of education completed. If only one parent was present, I used the highest educational level of that parent.

The last main explanatory variable that I included in the ML models was family income. As explained before, the CASEN datasets include a large number of income and earning variables, distinguishing labour income, non-labour income, public subsidies, economic rents or interests on capital investments, private transfers, etc. I believe that all these sources of income contribute to the financial and economic capacity of Chilean families to afford private (subsidised and non-subsidised) education for their children; therefore, I opted for using in my estimations a global measure of income that I have called 'total family income'[58]. It is worth noting that this income measure coincides with the one used in Chile to construct the official poverty and extreme poverty indicators. More precisely, the variable that I included in the ML models is the 'total per-capita family income', that I constructed by simply dividing the 'total family income' by the number of family members. Finally, as I expect that the impact of income on the probability of choosing a subsidised-private school rather than a public school would increase albeit at a decreasing rate, I opted for using a semi-log functional form and transformed this variable into its logarithm.[59]

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[57] The fact that I am using the information about maternal occupation when fathers are unemployed or inactive represents another important methodological difference with my analyses in Section 4.3 and also another arguable source of bias. CASEN, as a cross sectional study, only captures a snapshot of the moment. Thus, if at the moment of being surveyed, some fathers were unemployed or inactive by chance (i.e. not being working is not the most representative situation of these fathers), then using the occupation of mothers can produce bias. However, if mothers' occupations are correlated with fathers' occupations, as some studies that analyse homogamy in Chile suggest, then this bias may not be significant; for example, Torche (2010b) estimates that 48% of partnerships in Chile are homogamous in terms of educational attainment and 84% cross only one educational barrier. However, if we consider the situation of a student whose mother does not work (which, as reported in Section 4.3, is a common situation in Chile) and his father is unemployed, this observation will not be included in my estimations, which may produce a more serious kind of bias in my sample. The importance of this selection bias is proportional to the correlation between having a father and a mother that are unemployed or inactive at the point of measurement with social background variables. I do not face this problem in Section 4.3 because recall information on parental education collected by the CSP Survey guarantees that individuals report the most prevalent occupation of their parents during their infancy and adolescence.

[58] Aside from income, earnings and transfers, certain family assets also reflect the financial capacity of families, and one of the most important ones is property ownership. To account for this, CASEN provides the amount that property-owners would have to pay as a monthly rent to live in their dwellings if they were tenants and considers this amount as an income for their families. Therefore, the aggregate measure of family income that I use in my estimations includes this item too.

[59] I tried other possible functional forms for the variable total income per capita, but the best fitted models were those that included their logarithmic transformation.

The decomposition of parental social background into these four variables is relevant to the analysis of stratification within the Chilean School System because it makes it possible to find evidence of the underlying mechanisms behind the allocation of students across different school types. For example, following the arguments provided by Bukodi and Goldthorpe (2012), if the economic dimensions of family background (such as parental social class or income) are the most important determinants of school segregation of students, we can infer that the major constraint on the pursuit of equality within the school system is the financial capacity of families to afford private education. In contrast, if the socio-cultural dimension emerges as the main mediator of student stratification across school types, this means that the major barrier to achieving equality in the educational system does not really emerge from financial constraints. In that case, these barriers may be explained instead by the fact that more highly educated parents, who are more inclined to encourage their children to study and more likely to be directly involved in their career decisions, tend to choose the best quality schools for their children. As a result of this, children from highly educated parents will be likely to be concentrated in the same types of school. On the other hand, it may also be the case that parents from the most prestigious social status groups will do whatever is in their power to enrol their offspring in schools where they are surrounded by children whose parents are part of the same social networks, which are typically individuals who share their moral values, habits and preferences for cultural activities (homophily).

As explained in the introduction of this chapter, my second hypothesis for this section is that the economic dimensions of parental background (i.e. family income and parental class) should have become more important determinants of the type of school that their children attended after the introduction of the 'Shared Financing Law' in 1993. This result would be different from the findings of Section 4.3, which only found an increasing effect of parental education on school stratification of children in Chile after the voucher school system was implemented in 1981 but mainly before subsidised-private schools started charging fees to parents on top of the voucher.

It is important to note that the analyses of this section differ from those of Section 4.3 and Bukodi and Goldthorpe's (2012) article in that I measure the economic dimension of socioeconomic background by

using two different variables: family income and parental social class. Hence, it is important to reflect on the question of which aspects of families' economic and financial standing these two variables capture when introduced together in the same model. I argue that the variable of per-capita income that I constructed should reflect the level of current monetary resources that allows parents to pay for tuition fees and other expenses associated with schooling (e.g. transportation costs, school-material costs, meals, etc.) at the present moment. In contrast, if parental income is controlled for, parental social class should most likely provide a measure of wealth stability and security in the medium and long term.

Explained Variable

As in Section 4.3, the only explained variable in this section is the school type that children and adolescents attended at primary and second level in Chile, distinguishing between: (1) public schools, (2) subsidised-private schools and (3) fully-paid private schools. Therefore, I constructed a three-category variable containing these three school types. The very few students who reported attending a school type different from one of these three categories were left out of my empirical analyses.

Control Variables

Regarding control variables, the same variables that were included in Section 4.3 were introduced in the empirical models of this section. These variables are: sex, age of parents when the child started primary school, number of siblings, region of primary and secondary school attended, two-parent family vs. one- or no-parent family, and urban vs. rural area of primary and secondary school attended[60]. It is important to highlight that the inclusion of dummy variables accounting for the differences between all urban and rural areas within each region of Chile is very important for the purposes of this study. The attendance at a certain type of school is not only the result of parental wishes and aspirations (demand factor) but also of the availability of schools (and school types) within the relevant geographic area (supply factor). While we

[60] In the case of the indicator variable for biparental family vs. a single-parent or no-parent family, I found some cases of gay and lesbian couples with Children in the 2015 wave of CASEN Survey that I considered as biparental families when constructing this variable.

could fairly argue that the demand factor may not be dependent on the area where children and their families live, the supply factors are highly mediated by geographic location in Chile.

4.4.2. Results

4.4.2.1. Descriptive Statistics

Table 4.7 reports the distributions of students across school types and level of education (primary or secondary) that I estimated using the information of CASEN 1996, 2006 and 2015 for the three previously described birth-cohorts. Unsurprisingly, the figures account for a sustained increase in attendance at subsidised-private schools and a decrease in attendance at public schools, which is consistent with the information provided by the administrative records that I presented in Chapter 3.

Table 4.7: Distribution of individuals according to the type of school they attended at primary and secondary level in Chile, across birth cohorts: 1978-2007

Type of School Attended	Cohort 1 (1978-1987)	Cohort 2 (1988-1997)	Cohort 3 (1998-2007)	All cohorts (1978-2007)
Primary				
public	55.46%	51.29%	39.94%	49.45%
subsidised private	34.87%	43.50%	53.20%	43.24%
fully-paid private	9.67%	5.21%	6.86%	7.31%
Secondary				
public	51.55%	46.28%	35.65%	45.21%
subsidised private	36.53%	46.32%	56.45%	45.81%
fully-paid private	11.92%	7.40%	7.90%	8.98%
Primary + Secondary				
public	54.24%	49.37%	38.61%	48.02%
subsidised private	35.39%	44.58%	54.21%	44.11%
fully-paid private	10.37%	6.05%	7.18%	7.87%
observations	14,956	29,322	20,827	65,105

The distributions of the four main explanatory variables in this section across birth-cohorts estimated with the data of CASEN 1996, 2006 and 2015 are reported in Table 4.8. As expected, the average levels of parental education and parental social status increased across children's birth-cohorts and the proportion

of individuals in the top social class category (service class and routine non-manual workers) also increased. Concurrently, I find a reduction in the proportion of children with parents working in manual occupations.

Table 4.8: Descriptive statistics: means and standard deviations of parental socioeconomic background in Chile, across children birth-cohorts: 1978-2007

Variable	Cohort 1 (1978-1987)	Cohort 2 (1988-1997)	Cohort 3 (1998-2007)	All cohorts (1978-2007)
parental social class:				
service class and routine non-manual workers	26.05%	29.94%	32.57%	29.33%
self-employed	15.01%	14.97%	14.44%	14.83%
skilled manual workers and farmers	26.98%	24.89%	23.65%	25.27%
semi- and non-skilled workers and farm workers	31.96%	30.20%	29.34%	30.57%
per capita family income (2020 Chilean pesos)	221,140	258,183	314,654	261,289
	(368,941)	(433,016)	(362,437)	(393,832)
parental status	-0.078	-0.118	0.012	-0.067
	(0.751)	(0.725)	(0.740)	(0.740)
parental education (years)	10.738	11.637	12.600	11.597
	(3.828)	(3.401)	(3.076)	(3.548)
observations	14,956	29,322	20,827	65,105

Finally, I present the sample distribution and means of the control variables estimated with the information of CASEN 1996, 2006 and 2015 in Table 4.9. As expected, the age of parents when children started primary school moderately increases across their children's birth cohorts and the opposite occurs with the number of siblings.[61] Across the three birth-cohorts I use in this section, I also observe a slight rise in the proportion of students who attend secondary education and a slight decrease in the proportion of students that belong to two-parent families.

Table 4.9: Descriptive statistics: means and standard deviations of control variables, across individuals' birth-cohorts: 1978-2007

Variable	Cohort 1 (1978-1987)	Cohort 2 (1988-1997)	Cohort 3 (1998-2007)	All cohorts (1978-2007)
number of siblings	1.888	1.621	1.360	1.640
	(1.201)	(1.159)	(0.997)	(1.150)
parents' age when child started primary school	34.931	35.771	36.667	35.732
	(7.056)	(7.177)	(7.721)	(7.326)
proportion of cases in biparental families	98.42%	97.30%	96.54%	97.47%
proportion of male cases	51.25%	50.90%	51.97%	48.67%
proportion of urban cases	85.01%	86.31%	85.22%	85.55%
proportion of secondary school cases	30.92%	31.04%	32.35%	33.71%
observations	14,956	29,322	20,827	65,105

[61] Official records provide evidence that the total fertility rate has been decreasing in Chile from the early 1990s to the present (INE, 2014)

4.4.2.2. Multinomial logistic regressions

Main effect models

The results of my estimations for the main effects ML models are presented in Table 4.10. As in Section 4.3, I report RRRs, exp(β), rather than the estimated coefficients, β. As explained in Section 4.3, RRRs have a simpler interpretation than the coefficients because they account for the risk of any outcome – in this case attending a subsidised-private school – relative to the risk of attending a public school (the base outcome). Thus, the RRR can be described as follows:

$$\frac{Prob\ (Y = 2)}{Prob\ (Y = 1)} = e^{X\,\beta_2}$$

where βj and X are vectors of coefficients and explanatory (and control) variables respectively. More formally: $X = (x_1, x_2, x_3, \dots, x_k)$ and $\beta_j = (\beta_1^j, \beta_2^j, \beta_3^j, \dots, \beta_k^j)$

In concordance with the previous section, tables presented in this section include only the estimates of RRR for the probability of attending a subsidised-private school relative to attending a public one for the main explanatory variables. Given that I expect to find differences in social stratification across cohorts, I used the latest cohort, birth-cohort 3, as the base category in my analyses. Thus, birth-cohort 3 is the omitted dummy variable in all the ML models. Also, to be consistent with the estimations in Section 4.3, the base category for parental social class was category three: skilled manual workers and farmers (V +VI).

Table 4.10 presents five different specifications for the main effects ML models. First, it is possible to observe that the estimated RRR for the main effects of being born between 1978 and 1987 (birth-cohort 1) and between 1988 and 2007 (birth-cohort 2) provide strong evidence that, on average, the probability of attending a subsidised-private school increased throughout the period. This result is consistent with the information provided by official administrative records (MINEDUC, 2008 and 2017) that report a

systematic increase in the enrolment rates at subsidised-private schools and a systematic decrease in the enrolment rates at public schools.

Table 4.10: Effects of socioeconomic background on the probability of choosing a subsidised-private school vs. a public school at primary and secondary level; main effects: Relative Risk Ratios (base outcome: public schools)

VARIABLES	(1)	(2)	(3)	(4)	(5)
birth cohort = 1, 1978-1987	0.477***	0.634***	0.487***	0.622***	0.665***
	(0.0219)	(0.0296)	(0.0220)	(0.0297)	(0.0325)
birth cohort = 2, 1988-1997	0.626***	0.735***	0.652***	0.695***	0.753***
	(0.0232)	(0.0278)	(0.0241)	(0.0260)	(0.0286)
birth cohort = 3, 1998-2007 (omitted)					
parental class = 1, service class & routine non-manual workers	1.717***				0.908
	(0.0883)				(0.0566)
parental class = 2, self-employed	1.049				0.927
	(0.0551)				(0.0498)
parental class = 4, semi- & non-skilled manual workers and farm workers	0.717***				0.822***
	(0.0328)				(0.0386)
log (per-capita family income)		1.904***			1.440***
		(0.0555)			(0.0466)
parental status			1.949***		1.326***
			(0.0575)		(0.0544)
parental education (years)				1.165***	1.091***
				(0.00718)	(0.00795)
school level = 2, secondary	1.129***	1.053	1.120***	1.151***	1.078**
	(0.0395)	(0.0358)	(0.0386)	(0.0408)	(0.0376)
sex = 1, male	0.928**	0.922***	0.922***	0.918***	0.915***
	(0.0288)	(0.0285)	(0.0284)	(0.0288)	(0.0287)
zone = 1, urban	2.021***	1.933***	1.607***	1.661***	1.424***
	(0.0774)	(0.0743)	(0.0651)	(0.0658)	(0.0597)
number of siblings	0.870***	0.967*	0.883***	0.890***	0.938***
	(0.0147)	(0.0171)	(0.0150)	(0.0156)	(0.0170)
parent age when child started primary school	1.003	0.997	1.003	1.011***	1.005*
	(0.00244)	(0.00234)	(0.00237)	(0.00246)	(0.00246)
biparental family = 1, lived with both parents	1.646***	1.695***	1.548***	1.370***	1.470***
	(0.150)	(0.153)	(0.149)	(0.141)	(0.145)
constant	0.807	0.000371***	1.124	0.132***	0.00508***
	(0.114)	(0.000138)	(0.158)	(0.0209)	(0.00208)
fixed effects for region where attended school	YES	YES	YES	YES	YES
observations	65,105	65,105	65,105	65,105	65,105

Clustered-robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Second, the RRRs estimated for the probability of attending a subsidised-private school rather than a public school clearly suggest that the four dimensions of parental background are significant predictors of this probability. When introduced one by one in separate models (specifications 1 to 4) the coefficients associated with parental social class, parental income, parental social status and parental education are all significant at the 99% level and the direction of their effects is as expected. Particularly, the RRR of subsidised-private school attendance to public school attendance is 1.165 for one more year of parental education and 1.949 for an additional unit of the social status score. As explained in the methodological part of this chapter, these estimations are not strictly comparable to those conducted in Section 4.3;

however, it is worth noting that the coefficients estimated for the sociocultural variables here show a higher and more significant impact on the probability of attending a subsidised-private school.[62] Moreover, the RRR of attending a subsidised-private school rather than a public school is 1.904 for one more percent of family per capita income. In the case of social class, there are significant differences in the probability of attending a voucher school rather than a public school for students whose parents belong to the top class (service class and routine non-manual workers) and the bottom class (semi and unskilled manual workers and farm workers) compared to parents from middle social classes.

Third, when the four dimensions of parental background are introduced in a single model (specification 5), all of them, except for two out of three categories of parental social class, remain significant determinants of the probability of attending a subsidised-private school at the 99% confidence level. This result may be explained by the correlation between parental social class and parental income, reflecting the fact that both variables are accounting for the economic and financial situation of parents and families. However, in overall terms, these estimates reveal that the economic dimension as well as the socio-cultural dimension of parental background have strongly determined who – on average – has attended a subsidised-private rather than a public school in Chile during the post-reform period (children who started studying primary school between 1984 and 2015).

In summary, these findings suggest that the Chilean voucher school system displayed significant levels of socioeconomic segregation across school types, both by sociocultural parental characteristics and financial capacity of families, during the more than thirty years in which it has operated under a scheme that allowed selection of students and profit-making in the subsidised-private sector (including the last twenty years in which subsidised-private schools were also able to charge additional tuition fees).

[62] The coefficients estimated in Section 4.3 for the RRR associated with parental social status and parental education are 1.498 and 1.081 respectively for the period 1946-1993.

Interaction effect models

In order to determine whether there was an increase in student segregation across schools by socioeconomic parental background over the period in which subsidised-private schools were allowed to charge tuition fees, I ran interaction-effect ML models. These models include interactions between birth-cohorts and the four socioeconomic background variables of this section: parental social class, parental income, parental social status and parental education. Since my hypothesis is that, after 1993, the socioeconomic stratification of students across school types must have increased as a consequence of the 'Shared Financing Law', I decided to use the third birth-cohort as the reference category (i.e. the omitted one). This makes it possible to visualise directly the effects of parental social background for birth cohorts 1 and 2 relative to birth cohort 3 and determine whether these effects increased, did not change, or decreased over the observed period.

The estimated RRRs are reported in Table 4.11. The results of the ML models that include only one dimension of parental social background (specifications 1 to 4) provide evidence of increasing student segregation by parental social background across birth cohorts. In particular, it is possible to observe in each of these specifications that the positive and significant effect of parental income (specification 2), parental social status (specification 3) and parental education (specification 4) increases significantly with birth cohorts. In the case of parental social status and parental education, there are significant differences – at the 95% and 99% confidence levels respectively – in the effect of these variables on the probability of attending a subsidised-private school across birth-cohorts. This means that the stratification of students by parental education and parental social status increased systematically over time, cohort by cohort for the period 1984 - 2015. In the case of parental income (specification 4), there is also a significant difference – at the 90% confidence level – in the effect of this variable on the probability of attending a subsidised-private school between birth cohorts 1 and 3. In other words, parental income is a more important determinant of attendance at subsidised-private schools for children and adolescents in birth cohort 3 than for their counterparts in cohort 1. Although there is no significant evidence of a different effect of parental income on the probability of attending a subsidised-private school between birth cohorts 2 and 3, it is

possible to assert that there is evidence of increasing school segregation of students by total parental income during the whole period. In contrast to what was observed for the other three components of parental background, there is no evidence of a change in the importance of parental social class as a determinant of attendance at subsidised-private school (specification 1). This last result coincides with the findings of Section 4.3 that did not find robust evidence of increasing stratification of students by social class when analysing a sample of students who started primary school between 1946 and 1993.

Specification (5) presents the estimated RRRs for a model that includes the four components of parental background in interaction with birth-cohorts. This model also provides significant evidence that there has been an increase in the importance of the socio-cultural variables on the probability of attending a subsidised-private school rather than a public school. However, in the case of the economic components of parental background, this model does not provide significant evidence of a similar increase. This result does not mean that there has not been increasing stratification of students across school types by parental income (in fact, the evidence provided by specification 2 suggests the opposite). Rather, this increasing segregation is likely to have been mostly mediated by socio-cultural factors, like parental education and parental social status, that correlate with parental income and social class.

It is worth noting that my findings provide more evidence in favour of what previous studies that used different methodologies, different datasets and different explanatory variables have reported: the Chilean school system has become more socio-economically segregated in the post-1981 era (e.g. Hsieh and Urquiola 2003 and 2006, Elacqua 2006 and 2012, and Valenzuela, Bellei and de los Rios 2014). This study, however, goes beyond existing research in that its results also show that stratification by parental income, parental social status and parental education increased after voucher schools were granted permission to charge fees to parents in 1993.

Table 4.11: Effects of socioeconomic background on the probability of choosing a subsidised-private school vs. a public school at primary and secondary level; interaction effects: Relative Risk Ratios

VARIABLES	(1)	(2)	(3)	(4)	(5)
birth cohort = 1, 1978-1987	0.503***	2.520	0.479***	1.347*	0.516
	(0.0446)	(1.940)	(0.0224)	(0.215)	(0.452)
birth cohort = 2, 1988-1997	0.620***	1.166	0.642***	1.012	0.267
	(0.0410)	(0.857)	(0.0250)	(0.157)	(0.217)
birth cohort = 3, 1998-2007 (omitted)					
parental class = 1, service class & routine non-manual workers	1.894***				0.925
	(0.140)				(0.0813)
parental class = 2, self-employed	0.930				0.884
	(0.0708)				(0.0686)
parental class = 4, semi- & non-skilled manual workers and farm workers	0.737***				0.814***
	(0.0469)				(0.0538)
birth cohort=1 # parental class=1	0.870				0.960
	(0.114)				(0.150)
birth cohort=1 # parental class=2	1.050				0.947
	(0.134)				(0.123)
birth cohort=1 # parental class=4	0.921				0.952
	(0.114)				(0.123)
birth cohort=2 # parental class=1	0.874				0.975
	(0.0946)				(0.129)
birth cohort=2 # parental class=2	1.327**				1.171
	(0.149)				(0.139)
birth cohort=2 # parental class=4	0.989				1.065
	(0.0889)				(0.0987)
log (per-capita family income)		2.033***			1.350***
		(0.0937)			(0.0712)
birth cohort=1 # log (per-capita family income)		0.889*			1.074
		(0.0580)			(0.0822)
birth cohort=2 # log (per-capita family income)		0.962			1.105
		(0.0595)			(0.0767)
parental status			2.142***		1.471***
			(0.0923)		(0.0861)
birth cohort=1 # parental status			0.870**		0.855
			(0.0610)		(0.0859)
birth cohort=2 # parental status			0.884**		0.860*
			(0.0521)		(0.0728)
parental education (years)				1.212***	1.123***
				(0.0114)	(0.0125)
birth cohort=1 # parental education				0.934***	0.950***
				(0.0129)	(0.0163)
birth cohort=2 # parental education				0.970**	0.982
				(0.0127)	(0.0150)
school level = 2, secondary	1.128***	1.054	1.122***	1.153***	1.080**
	(0.0396)	(0.0359)	(0.0387)	(0.0409)	(0.0378)
sex = 1, male	0.928**	0.922***	0.922***	0.920***	0.917***
	(0.0288)	(0.0285)	(0.0284)	(0.0288)	(0.0287)
zone = 1, urban	2.014***	1.933***	1.608***	1.655***	1.417***
	(0.0773)	(0.0741)	(0.0650)	(0.0652)	(0.0590)
number of siblings	0.870***	0.967*	0.882***	0.888***	0.935***
	(0.0147)	(0.0171)	(0.0149)	(0.0155)	(0.0169)
parent age when child started primary school	1.003	0.997	1.003	1.011***	1.005*
	(0.00244)	(0.00234)	(0.00237)	(0.00246)	(0.00246)
biparental family = 1, lived with both parents	1.643***	1.707***	1.548***	1.361***	1.461***
	(0.150)	(0.155)	(0.149)	(0.140)	(0.143)
constant	0.802	0.000168***	1.134	0.0829***	0.00806***
	(0.115)	(9.54e-05)	(0.159)	(0.0152)	(0.00509)
fixed effects for region where attended school	YES	YES	YES	YES	YES
observations	65,105	65,105	65,105	65,105	65,105

Clustered-robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

4.4.2.3. Predictive probabilities analysis

With the aim of representing graphically how likely students from different social backgrounds access subsidised-private education and public education in Chile, as proposed by Bukodi and Goldthorpe (2012) and as I performed in Section 4.3, I ran a simplified version of the interaction effects models reported in specification 5. Based on the results of that simplified model, I produced plots with predicted probabilities for attending public and subsidised-private schools for certain ideal-typical individuals representing distinctive socioeconomic groups in Chile. As in Section 4.3, I transformed the four parental background variables: parental social class, parental income, parental social status and parental education into reduced categorical variables.

Given that, unlike my empirical analyses based on the CPS Survey in Section 4.3, I now include four main explanatory variables, I opted to create three instead of four categories for each component of parental background[63]. By combining these four three-category variables I obtained three different types of students that can be considered 'consistently privileged', 'middle privileged' or 'consistently unprivileged' according to each of the components of parental background.

Regarding social class, to re-group this variable, I followed an approach similar to the one performed in Section 4.3 that is intended to better discriminate between the extreme top and bottom social classes in Chile. However, I also took into account that, in comparison with the previous section, I am using younger birth-cohorts of children and parents in my empirical analyses, and that Chilean society as a whole experienced improved socioeconomic standards over the period of data collection. Thus, I decided to collapse social class into the three following categories: (1) I+II: service class, (2) IIIa+b + IVa+b + IVc + V+VI: routine non-manual, self-employed, farmers, and skilled manual workers, and (3) VIIa + VIIb: semi-skilled and unskilled manual workers, and farm workers.

[63] The reason to opt for constructing three-category variables instead of four-category variables is that, when creating types of individuals, I impose the requirement that they must belong to the same category in each of the four variables. However, if I had four categories and four variables, the condition of belonging to the same category in all of them would be so restrictive that it would be met by only a few observations (i.e. a very low proportion of individuals in my sample could be allocated in one of those four groups). This is why I decided to reduce the number of categories to three in this case.

In the case of parental income per-capita, I divided the distribution of total income per-capita (TIPC) into the following three categories: (1) TIPC in the top 20 per cent of the distribution, (2) TIPC in the central 50 per cent of the distribution (deciles four to eight), and (3) TIPC in the bottom 30 per cent of the distribution (deciles one to three).

In regard to parental social status, I aggregated the 28 hierarchical groups, distinguished by Torche (2007 and 2010a) for the Chilean society, into the following three broad categories: (1) groups 1 to 4 (containing the most prestigious professionals and associate professionals); (2) groups 5 to 21 (containing managers and a series of non-manual and manual semi-prestigious occupations); and (3) groups 22 to 28 (containing the least prestigious manual occupations as well as occupations associated with farming)[64].

Finally, in the case of parental education, I redefined the continuous variable as a three-category variable in the following way: (1) at least one parent has a degree-level certification; (2) at least one parent has more than eight years of formal education[65], but no parent has a degree-level qualification; (3) no parent completed more than 7 years of formal education[66].

Based on these new specifications for the four variables representing parental background, I ran a new ML model that includes all these variables, the interaction of each of them with birth-cohorts and all the control variables that were included in specifications 1 to 5 of Table 4.11. Then, I estimated predicted probabilities for three different types of hypothetical individuals that belong to the same category (1, 2 or 3) for all the four components of parental background: parental social class, parental income, parental social status, and parental education. Finally, I identified the resulting types of individuals as follows: (1) 'consistently privileged', (2) 'middle privileged', (3) 'consistently unprivileged'. Further details on the main characteristics

[64] I have included a description of Torche's status group classification, which provides a description of the types of occupations included in each category of social status, in Appendix A of this thesis.
[65] Eight years of education, which means having completed 'Basic School' in Chile, is equivalent to lower upper secondary school according to international standards (Source: OECD).
[66] Unlike what I did in Section 4.3, I decided to allocate individuals with less than seven years of education instead of five in the bottom category of parental education, because parents in the sample I used here are much younger than those included in the analyses of Section 4.3. This means that most of them studied after 1965, when an educational reform modified the number of mandatory years of education at both primary and secondary levels. For more details on this reform, see footnote 46.

of these three groups of individuals and their relative importance in the whole sample and by birth-cohort are reported in Table 4.12.

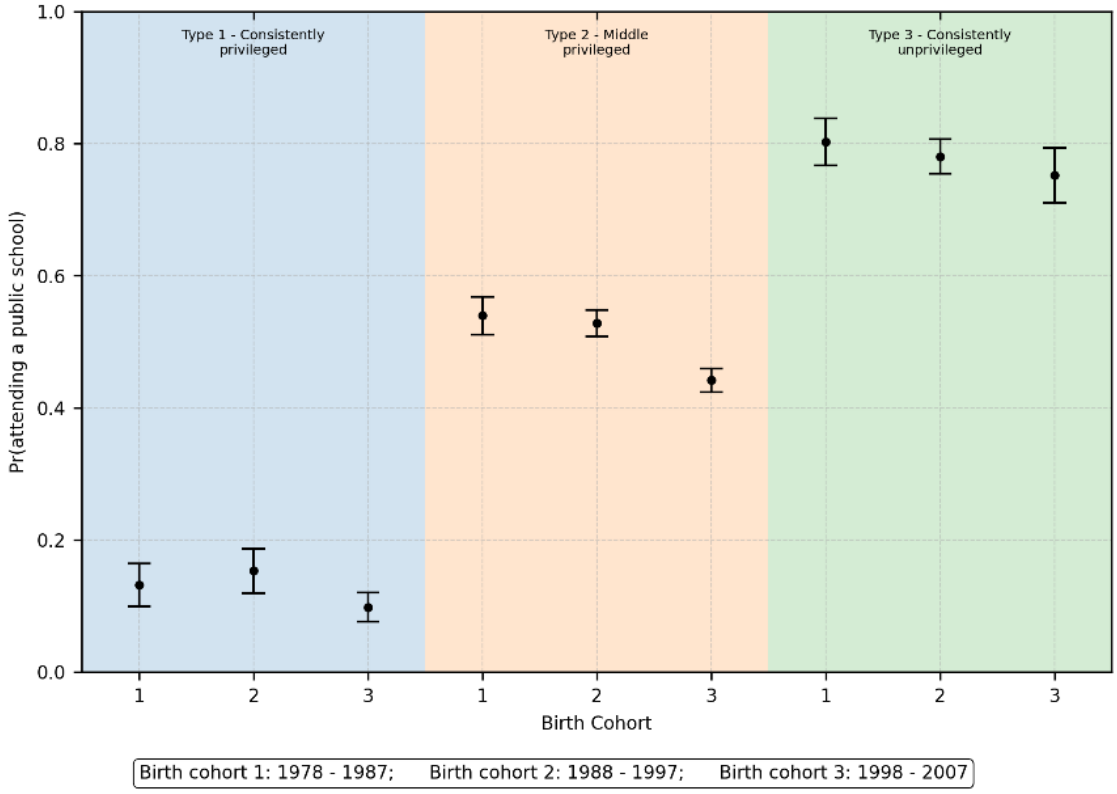
Table 4.12: Summary of types of hypothetical individuals

Type	Social background component				Type description	Illustrative case	Cohort 1 (1978-1987)	Cohort 2 (1988-1997)	Cohort 3 (1998-2007)	All cohorts (1978-2007)
	Class	Income	Status	Education						
1	1	1	1	1	Consistently privileged	parent with a professional or vocational diploma working for the service sector in areas such as sciences, education, health, business, law and others, and income in the top 20% of the distribution	3.81%	4.28%	5.85%	4.64%
2	2	2	2	2	Middle privileged	parent working either for the service sector, or as a skilled manual worker, with more than eight years of education (but no degree-level qualification) and income in the central 50% of the distribution	9.62%	12.38%	14.07%	12.50%
3	3	3	3	3	Consistently unprivileged	parent working on unskilled manual occupations, like domestic servant, cleaner or farm worker, with eight or less than eight years of education and income in the bottom 30% of the distribution	7.62%	4.04%	0.71%	4.10%
Total	1-3	1-3	1-3	1-3	All previous categories	All previous categories	21.05%	20.70%	20.63%	21.24%

Figure 4.5 shows the predicted probabilities of attending a public school for the three types of individuals explained below across birth-cohorts. As is customary, the mean value for each group is presented with its 95% confidence interval. The diagram indicates that the probability of attending a public school decreased over the period for the three types of individuals. However, the differences are only significant at the 95% level in the case of the middle-privileged group. For type-1 individuals ('consistently privileged'), the estimations show that individuals in birth-cohort 1 have a low predicted probability of attending a public school (close to 13% on average), which is higher than that obtained for individuals in birth-cohort 3 (around 10%); however, this difference is not statistically significant. Something similar is observed for type-3 individuals ('consistently unprivileged'). As expected, the predicted probability of attending a public school for type-3 individuals in birth cohort 1 is high (slightly over 80%), and although it is slightly lower for type-3 individuals in birth-cohort 3 (75%), this difference is not statically significant at the 95% level.

In contrast, we can observe that individuals who belong to the 'middle-privileged' group (type-2 individuals) experienced a significant decrease in their probability of attending a public school if we compare the estimates for birth cohort 1 with birth cohort 3. In fact, their predicted probabilities reduced from 54% to 44%, which is a statistically significant difference at the 95% confidence level.

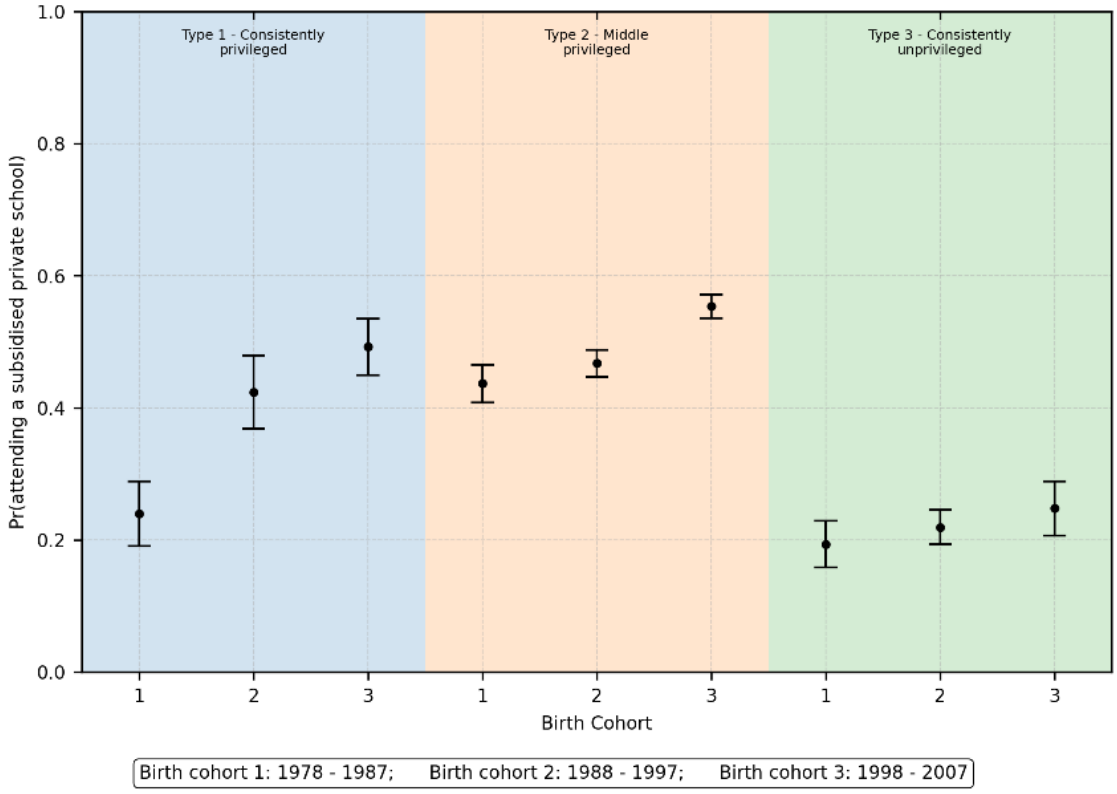
Figure 4.5: Predicted probabilities of attending a public school, by cohort and hypothetical individual type



The predicted probabilities of attending a subsidised-private school estimated for type-1, type-2 and type-3 individuals are presented in Figure 4.6. This diagram shows three important findings: first, as expected, the predicted probabilities of attending a subsidised-private school did not experience a significant increase across birth-cohorts for students who belonged to the least privileged category (type-3). Even though, on average, their probability of attending a subsidised-private institution increased from 19% to 24% during the period, this difference is not significant at the 95% level. Second, also unsurprisingly, students from the middle-privileged group (type-2 individuals) became more likely to attend a subsidised-private school over the relevant period. The predicted probabilities for individuals in this group are 44% and 55% for birth-cohorts 1 and 3 respectively, accounting for an eleven percentage-point difference that is significant at the 95% level. Third, I find evidence of a considerable increase in the probability that children from the most privileged group (type-1 individuals) attended subsidised-private institutions. While the predicted probability of attending a subsidised-private school for type-1 individuals in birth-cohort 1 is 24%, it increases to 49% for birth-cohort 3, which is a very significant difference of 25 percentage points. The last result can be confirmed by estimating predicted probabilities of attending a fully-paid private school for

this group (type-1 individuals or 'consistently privileged' students) across birth cohorts. These predicted probabilities are 63% and 41% for birth cohorts 1 and 3 respectively, representing a difference of twenty-two percentage points which is significant at the 95% level. This suggests that a proportion of children belonging to the most privileged groups in society switched from fully-paid private schools to subsidised-private schools over the analysed period.

Figure 4.6: Predicted probabilities of attending a subsidised-private school, by cohort and hypothetical individual type



The previous results provide very interesting evidence to help us to understand how the social composition of the student bodies changed after the implementation of the 'Shared Financing Scheme' in Chile. My estimations suggest that, in comparison with the pre-reform situation, the Chilean school system became more stratified in terms of the economic and socio-cultural composition of student bodies across the main three types of schools: public, subsidised-private and fully-paid private schools. In fact, the influence of parental income, parental social status and parental education on the probability of attending a subsidised-private school rather than a public school seems to have increased significantly when we compare students who started primary education between 1984 and 1993 with those who started primary school between 2004 and 2015.

The methodology I used also allows me to observe that amongst all the components of parental background, the socio-cultural variables, i.e. parental social status and parental education, appear to be the most important ones in explaining the segregation of students across school types. The last result may be surprising, and indeed contradicts my preliminary hypothesis that the economic and financial capacity of parents may have become the most important determinants of school-type choice after the 'Shared Financing Scheme' began to operate in Chile. Thus, a relevant question is why the socio-cultural characteristics of parents seem to have continued playing a more important role as determinants of school segregation of students in Chile than the economic and financial capacity of families after 1993, when many parents began to pay for subsidised-private education. This issue will be addressed in the conclusion of this section.

Finally, this empirical analysis suggests that the impressive increase in the enrolment rates in subsidised-private schools and the decrease in the enrolment rates in public schools in Chile are mainly explained by a massive migration of the middle classes from the public to the private voucher sector that, as reported in Section 4.3, started right after the voucher school system was established in 1981 and has kept going until the present. This phenomenon seems to have affected neither the most disadvantaged segments of the population nor the most privileged ones before 1993. However, since 1993, a number of Chileans from the most socially advantaged groups seems to have switched from fully-paid private schools to subsidised-private schools, while the socio-economically most disadvantaged groups have continued enrolling their children in public schools. Although the quantitative evidence reported here and in Section 4.3 does not allow me to completely understand the causal mechanisms behind these results, I try to provide some plausible explanations for these findings in the conclusion of this chapter based on prior quantitative and qualitative literature that has analysed school choice in the Chilean voucher school system during the 2000s and the first half of the 2010s.

4.4.3. Conclusions

In 1993, the Chilean congress introduced an important change to the Chilean voucher school system by enacting a law that is known as the 'Shared Financing Law'. Under the new system, private schools receiving public funding from the central government were given the right to charge tuition fees to parents on top of the state voucher. The current chapter aimed at investigating the possible effects of this new school arrangement on the socioeconomic segregation of primary and secondary students across school types in Chile.

Previous research tackling the consequences of the Chilean voucher school system on socioeconomic stratification of the student bodies had focused on the impact of the increased competition between subsidised-private and public schools, finding evidence of rising school segregation of students by parental socioeconomic status during recent decades. However, these studies were not designed with the aim of analysing the consequences of the 'Shared Financing Scheme' and did not investigate which parental characteristics in particular are the most relevant in explaining student segregation across different types of schools.

The first part of this chapter – specifically, Section 4.3 – evaluated the changes in the socioeconomic stratification of the Chilean school system before and after the 1981 reform by analysing how the role of social background – measured by three different components: parental social class, parental social status and parental education – affected the probability of attending a subsidised-private school rather than a public school for those students who started primary school between 1946 and 1993. That section concluded that the Chilean school system presented socioeconomic stratification even before the reform, but it became even more stratified in terms of parental education after the reform. However, this analysis did not allow me to obtain robust conclusions about the situation after the implementation of the 'Shared Financing Scheme', since my estimations were based on a sample of students who, for the most part, had completed secondary education before 1993.

To supplement the results in Section 4.3, I extended the analysis by studying a younger sample of students who either started school after the 'Shared Financing Scheme' was implemented or were attending school when this policy change occurred (specifically those who started primary school between 1984 and 2015). To identify whether this new modification to the voucher school system had a potential impact on school-type choice by socioeconomic background, following once again the suggestions of Bukodi and Goldthorpe (2012), I used a birth-cohort approach and a multidimensional measure of parental background to run multinomial regression models on a more recent dataset. In particular, I studied the effects of parental social class, parental income, parental social status and parental education on the probability of studying at a subsidised-private rather than at a public school and how much these effects have changed across the 'Shared Financing Scheme' era.

My hypotheses were: (1) if the introduction of tuition fees affected school segregation of students across school types, then we should observe that the importance of parental social background as a determinant of school-type choice increased over the period in which many schools started charging fees to parents; and (2) amongst all the components of parental socioeconomic background, the role of the economic and financial capacity of parents - measured as parental social class and parental income – should have become significantly larger during the period following the introduction of the Shared Financing Scheme.

The main results of this section are as follows. First, as expected, there is significant evidence that all components of parental background: parental social class, parental income, parental social status and parental education are important determinants of the school type that young Chileans attended between 1984 and 2015. In particular, these variables significantly explain the probability of attending a subsidised-private school rather than a public school over the observed period. Second, the probability of choosing a subsidised-private school instead of a public school became more dependent on parental characteristics when we compare the cohorts of students who were in school during the time in which the 'Shared Financing Scheme' began to operate with those who studied when this scheme was already in operation. The parental characteristics whose importance in explaining school type increased over this period were: parental income, parental social status and parental education. Third, in relative terms, the larger role of

socioeconomic background in determining who attends a subsidised-private school rather than a public school in the post-1993 period is mainly associated with the socio-cultural background of parents rather than with their short-term or long-term financial capacity.

Although these results largely coincide with those of Section 4.3, the fact that the socio-cultural background of parents has had a larger and more significant effect than the economic and financial capacity of families on school-type choice after the establishment of the 'Shared Financing Scheme' is a surprising finding. My empirical analyses of Section 4.3, which cover the period before and after the introduction of the voucher school system in Chile in 1981, mostly relied on post-1981 information measured during the period when subsidised-private schools were still not allowed to charge fees on top of the voucher. Therefore, it is logical that the stratification observed in the Chilean school system in that period had much more to do with parental levels of education than with social class or income. In effect, as I pointed out in the conclusion of Section 4.3, the 'winners' of the 1981 reform were highly educated parents who were in a much more privileged position than low-educated ones to benefit from the available information on schools to make a rational decision on their children's education. Thus, a relevant question is, why, even after 1993 – when many parents started paying for subsidised-private education – the socio-cultural characteristics of students seem to have continued playing a more important role than the economic and financial capacity of parents as determinants of school-type choice.

A possible answer to this question is that, even though parents whose children attended subsidised-private schools were mandated to co-pay for their children's education, the tuition fees were not excessively high for the middle classes. As reported in Chapter 3, the highest co-payment that subsidised schools could charge while still receiving a voucher from the central government was four times the value of the student voucher. Above this amount, the subsidised-private school would turn into a fully-paid private one. Despite this, the average monthly fee charged to parents in 2014 was close to $20,000 Chilean pesos, around US$39 in 2020 US dollars[67] and approximately half of the value of the voucher transferred from the central

[67] It is important to note that this average includes only schools that charge fees, so only positive values (no zero values) are considered in this calculation.

government to subsidised-private schools in that year. It is useful to compare this value with the average and median total income per-capita of families in Chile. According to the information of CASEN 2015, the mean and median values of total income per-capita in 2020 Chilean pesos for families with children studying at school were $314,654 and $208,799; this means that the average co-payment represents 7.5% and 11.3% of the mean and median total income per capita respectively for an average Chilean family in 2020[68]. As these values are not negligible, we should look for other possible explanations.

A very relevant plausible explanation is that the 'Preferential Subsidy Law' enacted in 2008 may have weakened the link between family income and access to subsidised-private schools. This means that the stratification of students by parental income across school-types produced by the 'Shared Financing Law' could have been in part reversed after 2008, which would have affected part of the second cohort and the whole third cohort of students in my empirical analyses.

Another aspect to consider is that, even though subsidised-private schools acquired the legal right to charge tuition fees in 1993, official figures report that many of them opted for not doing so. According to the information provided by the Ministry of Education, by 2014 approximately 60% of all subsidised-private schools (which represents around 32.5% of the primary and secondary national enrolment rates) were reported not to be charging fees to parents. That being said, as I pointed out in Chapter 3, when consulting different sources, I have detected somewhat contradictory information on the proportion of subsidised-private schools that charged tuition fees prior to 2015; therefore it is likely that the official reports underestimated these figures[69].

Unfortunately, the datasets that I used for my analysis do not distinguish between paid and free subsidised-private schools. Thus, it is possible to argue that the importance of the economic and financial situation of parents would appear as a larger and more significant determinant of stratification of students across

[68] Own calculations based on the information of CASEN 2015, administrative records of the Ministry of Education for 2014 and the variation in the national consumer price index to report all values in November 2020 Chilean pesos (or American dollars). It is important to note that I decided to report the official figures for 2014 instead of more recent information to explicitly avoid using data from the period after the 2015 reform that could be reflecting the first effects of having restricted the freedom of voucher schools to charge fees to parents, make profit and select students.
[69] See footnote 29 for more details on this.

different school types if we could divide schools into four categories instead of three, recognising the fact that paid and free subsidised schools are different. Future research on the consequences of the voucher school system in Chile on socioeconomic stratification of student bodies could try to focus on this aspect of segregation of students across school types if adequate data to explore this issue become available.

In any case, parental background variables correlate with each other, and the fact that the socio-cultural variables have mattered more than the economic ones in explaining the increase in stratification of students across school types does not mean that the latter are not important. It simply means that the increasing levels of primary and secondary student segregation in Chile, and more specifically the growing cleavage between public and subsidised-private schools that we observe for the period 1993 - 2015, seems to have been mainly driven by differences in parental education and social status.

The high importance of parental education leading to increasing stratification in the student bodies within the Chilean school system has been already discussed in Section 4.3 and emphasised by previous studies that analyse parental preferences for school attributes in Chile. As seen, in a competitive system where parents are completely free to choose schools and massive amounts of information on them are given to the public, the importance of educational attainment to be a 'good consumer of school education' is crucial. In this regard, the evidence of both quantitative (Gallego and Hernando, 2009; Elacqua, Schneider and Buckley, 2006) and qualitative (Bonal *et al.*, 2017, Hernandez and Raczynski, 2015, Gubbins, 2013) studies suggest that better educated parents are more likely to look at official indicators of school quality (SIMCE scores) than lower educated ones when choosing a school for their children. But, beyond this, there is a large amount of recent qualitative evidence pointing out that one of the main forces driving parental preferences for school types are social status concerns.

As mentioned in the conclusion of Section 4.3, some qualitative studies conducted in Chile have analysed the differences in school choice between parents whose children attended subsidised-private schools and those whose children attended public schools prior to 2015. These studies generally find that the former appreciate that subsidised-private schools charged them tuition fees and applied selection mechanisms

based on family background precisely because these practices act as barriers to the enrolment of students from low socioeconomic backgrounds. In particular, these parents report a series of prejudices against poor and socially disadvantaged children, who are considered to have bad habits and behaviours such as speaking in a more vulgar way, being involved in fights, repeating grades, consuming alcohol and drugs, and arguing with teachers, amongst others (Córdoba, 2014). The fact that public schools cannot discriminate against these children is seen as a problem by middle-class parents because they represent a threat to the cognitive, social and personal development of their own children (Hernandez and Raczynski, 2015). The perceived 'quality' of the student body seemed to be so relevant for these parents that they even identify the enrolment or expulsion of 'well-behaved' and 'badly-behaved' students as an overall improvement or worsening in school quality respectively (Córdoba, 2014). In this way, as reported by Gubbins (2013), being able to pay even a small amount of money for children's education has had a symbolic meaning for Chilean middle-class parents. Rather than seeing co-payments as a means to access higher quality education, these parents seem to perceive them as a way to obtain higher social status and social distinction in the Chilean society (Ibid: 174). In this sense, it is possible to argue that some Chilean parents choose schools in a way that reproduces the social closures of the society. As described by Kosunen and Carrasco (2016), in the highly market-oriented Chilean educational system, each family "competes to sustain and reproduce their social position". Moreover, these authors conclude that in Chile there is an "open discourse around promoting social distinctions and reproduction processes through educational choices" (Ibid: 187)[70].

Therefore, all these things considered, it is not surprising to find that the increased socioeconomic stratification of Chilean students within the school system has been mainly driven by socio-cultural factors between 1984 and 2015.

[70] The high importance of school choice in perpetuating social divisions within the society is not exclusive to Chile and coincides with the evidence provided by qualitative studies conducted in some developed countries in which elements of competition where introduced into the school systems (e.g. Van Zanten 2003, Jellison, 2002).

4.5. Conclusions Chapter 4

The main purpose of this chapter was to study the link between individuals' socioeconomic background and the school type where they studied both primary and secondary education in Chile between 1946 and 2015. This association has been reported as being very important since 1981, when a military dictatorship introduced a marked-based school reform, following the ideas of M. Friedman (1962). This reform aimed at promoting efficiency in the school system by giving parents freedom to choose a school for their children and making schools compete with one another to attract students. Competition was expected to make bad quality schools disappear and increase overall school quality. All public schools and those private schools that wanted to be part of this new scheme were prevented from charging tuition fees but received funding from the central government through a flat-rate per-student payment that is known as the 'voucher'. However, only private voucher schools, which are known in Chile as subsidised-private schools, were allowed to select students under any criteria of their preference in their admission processes and to be for-profit. Twelve years later, the Chilean congress passed an important bill known as the 'Shared Financing Law'. Under this new scheme, on top of the guarantees already provided to subsidised-private schools, they were given the right to charge tuition fees to parents on top of the state voucher. All these guarantees where in place until 2015, when a new law eliminated the possibility for subsidised-private schools to be profit-oriented and to implement discretionary selection practices. Currently, subsidised-private schools are still charging fees to parents, but the same law established a gradual elimination of these fees that will be completed in 2025.

A handful of empirical studies have shown that the Chilean voucher school system, which operated under the previously described rules between 1981 and 2015, increased the socioeconomic stratification of students across schools in the post-reform era. However, these studies did not investigate whether the school system already had high levels of socioeconomic stratification long before the reform and how much the 1981 reform contributed to increasing them. Also, these studies were not conducted with the purpose of trying to understand what aspects of socioeconomic background mainly explain the link between this variable and the type of school that Chilean families choose for their children. Moreover, these studies did

not explicitly attempt to understand to what extent the enactment of the 'Shared Financing Scheme' contributed to make the link between school-type choice and socioeconomic background stronger.

As explained in Section 4.3, I used a longitudinal Chilean study (the CSP Survey), supplemented with unpublished information that I personally retrieved from individual questionnaires, to try to determine whether the association between socioeconomic background and school-type choice increased after the 1981 reform. My results indicated that this was the case and that the main variable driving the strength of this relationship was parental education. Then, I repeated the same exercise on a younger sample for individuals that I constructed by merging three waves of the Chilean Socioeconomic Survey (CASEN). My results, which I presented in Section 4.4, also accounted for an increase in the role of socioeconomic background on school-type choice following the introduction of the 'Shared Financing Scheme' in 1993 that was partially explained by parental income, but mostly driven by parental education and parental social status.

The combined results of Section 4.3 and 4.4 make it possible to draw some overall conclusions for this chapter. First, there is evidence that the 1981 reform produced an increase in school segregation of students by socioeconomic characteristics of parents, and that the introduction of the 1993 'Shared Financing Scheme' contributed to making the socioeconomic differences of student bodies across school types even deeper. Second, the impressive expansion of subsidised-private providers of primary and secondary education in Chile was accompanied by a migration of middle-class students from public schools to private voucher schools, which occurred from 1981 to at least 2015. Third, students from the most disadvantaged social backgrounds have been 'untouched' by any of these reforms, and they have continued attending public schools from the introduction of the voucher school system until the present day. Fourth, even though students from the most privileged social backgrounds have remained concentrated in elite fully-paid private schools for most of the period, there is evidence that at least some of the students with these characteristics switched from fully-paid private schools to subsided voucher schools after the latter started charging fees to parents.

All these findings, as a whole, seem to indicate that after thirty-three years operating under competitive market-oriented rules (1981-2015), one of the most notorious overall effects of the Chilean voucher school reform was to produce a separating equilibrium result, where the middle-privileged classes gradually abandoned public schools to opt for subsidised-private education. Even though my empirical analyses are not causal and only allow me to infer some possible underlying mechanisms behind school-type choice, the joint analysis of the results in Sections 4.3 and 4.4, as well as the review of a series of qualitative and quantitative studies conducted in Chile, make it possible to hypothesise the following. Before the introduction of the 'Shared Financing Scheme', some middle-class parents seemed to have made use of their consumer's freedom as well as of the new evidence provided by SIMCE and other sources of information to choose the best possible school for their children. These parents benefited from their comparative advantages in being able to understand and process information about schools and their qualities in a competitive market, as well as benefitting from their better economic position in being able to afford the commuting costs associated with choosing a school that was not necessarily close to home. These advantages produced student segregation across school types, mainly by parental educational background. However, after 1993, when many of these schools began to charge fees to parents, attending a certain type of school seemed to have become a much more status-driven process, where middle-class parents found in school choice a way to promote and perpetuate their position in society. In other words, being able to afford tuition fees became the way to differentiate themselves from the poorest members of the society that could not pay for their children's education. Following Bourdieu's (1984) arguments, since 1993 Chilean parents seem to have behaved as if they "evaluated their reproductive functions and habitus" (Kosunen and Carrasco 2016: 187).

The last mechanism would help to understand why my results in Section 4.4 are consistent with seeing a small fraction of the most privileged members of the society switching from fully-paid private schools to subsidised-private schools in the post-1993 period. In fact, it is possible that after subsidised-private schools transformed into paid ones, some socially advantaged parents may have appreciated the advantages of paying lower tuition fees, while still sending their children to a paid school. At the same time, unlike the pre-1993 period, the tuition fee charged by subsidised-private schools would prevent their children from

mingling with the most socially disadvantaged – and potentially problematic – children. As these parents are also highly educated, they may have also been able to use the available information to search for subsidised-private schools that are high quality in terms of their students' performance in cognitive ability tests (SIMCE), and in terms of the socioeconomic composition of their student bodies (as suggested by Elacqua, Schneider and Buckley, 2006 and Gallego and Hernando, 2009, amongst others).

Even though the 1993 reform may have met the objective of reducing the gap between subsidised-private and fully-paid private schools in Chile (González *et al.*, 2004), it clearly produced a broader cleavage between public and subsidised-private schools. In fact, the evidence seems to reveal that the main losers of the 1981 and 1993 reform where the most disadvantaged children in Chilean society who have remained concentrated in public schools, while their better-off counterparts, in terms of parental social background, gradually migrated to the subsidised-private sector over the period 1981 to 2015. Thus, the 1981 reform, and its 1993 modification, seem to have had no effect in expanding opportunities for the most unprivileged children, whom, as many quantitative (Alves *et al.*, 2015; Gomez, Chumacero and Paredes, 2012; Gallego and Hernando, 2009) and qualitative studies (Bonal *et al.*, 2017; Hernandez and Raczynski, 2015; Elacqua and Fábrega, 2004) show, have continued to attend the public school closest to their home.

Even if public and subsidised-private schools offered the same quality of education, increasing social segregation and stratification across school types can be harmful for low socioeconomic background students concentrated in public schools if peer effects exist[71]. The extensive empirical literature on peer effects (Micklewright *et al.*, 2012; Ammermueller and Pischke, 2009; Nechyba, 2006; Epple and Romano, 1998, just to mention a few studies) suggests that classmates may have an important influence on students' performance at school; more specifically, children from lower educated social backgrounds can greatly benefit from the interaction with peers from more advantaged ones. The recent empirical literature on peer effects for Chile has in fact reported positive effects of student bodies' social and cultural background on

[71] Although the results of the extensive literature on the effects of school type on educational achievement, as measured by students' scores in the SIMCE test, are contested, most recent studies (Contreras, Sepulveda and Bustos 2010, Drago and Paredes, 2011, Lara, Mizala and Repetto, 2011) have found a slight difference in test scores in favour of subsidised-private schools compared with public schools, after controlling for students' social origins amongst other variables.

the educational achievement of the most socially disadvantaged children (Gutiérrez-Cofré, 2019; Canales and Webb, 2018; Alcalde, 2013; Cabezas, 2010; McEwan, 2003). Considering this evidence, the stratification of students by parental education across school types constitutes an important concern for education policy, especially because children that remained in public schools have been left only with the possibility of interacting with peers that are as socially disadvantaged as they are. The literature on peer effects, therefore, gives us reasons to believe that an educational system that concentrates all students from disadvantaged social backgrounds within the same school types may end up affecting the intergenerational reproduction of educational achievement and attainment and will, most likely, lead to reduced social mobility. This result can be exacerbated even more if, as I will analyse in Chapter 5, schools where the most socially advantaged students are enrolled tend to systematically provide a better quality of education. Thus, legislators and policy makers, for whom equality of educational opportunities is a concern, may want to avoid school system designs that perfectly reproduce the educational and social disparities of individuals in the next generation.

All in all, the Chilean experience with private providers of primary and secondary education and school-choice in a highly unregulated market seems to indicate that efforts to improve quality of education by introducing the principles of free competition may lead to increasing stratification of students by parental socioeconomic background. Even though the 'Shared Financing Scheme' further deepened the socioeconomic stratification of students across school types in Chile, it is important to highlight that this stratification had emerged long before some subsidised-private schools started charging tuition fees, and it is most likely related to the selection practices at these schools, to self-selection of students and their families, and to the eventual restrictions of being able to afford the indirect costs of choosing these schools rather than the local public school (such as transportation costs and special school materials).

In summary, while the middle classes became the 'winners' of the voucher school scheme, who gained access to the school of their preference and, perhaps, a better quality of education, children from disadvantaged social backgrounds were the 'losers' or rather the 'forgotten' ones. These children not only obtained no benefit from the freedom to choose a school but also suffered the consequences of being secluded in institutions where they interacted exclusively with peers whose social backgrounds resembled

their own. Future reforms, like the one initiated in Chile in 2015, should aim at making the advantages of school choice and competition available for all children regardless of their socioeconomic origin.

5. Medium-term impact of the voucher-school program in Chile: effects of subsidised-private schools on individuals' educational attainment, employment and earnings by the age of 25

5.1. Introduction

The main objective of this thesis is to contribute to the study of the effects of the 1981 Chilean voucher school reform. Since that year, this reform began funding some private schools by giving them a per-student subsidy, 'the voucher', that equalled the value of the per-student payment given to public schools with the purpose of setting-up a market-based school system where public and private schools could compete on an equal basis in order to attract students. Unlike public schools, subsidised-private schools were also given the right to be profit-oriented and to select students according to any criteria of their preference; furthermore, since 1993 they have been allowed to charge parents a co-payment on top of the voucher. Following Milton Friedman's ideas (Friedman, 1955 and 1962) about free school competition, the 1981 reform was expected to increase competitiveness in the school system, to improve allocation of resources and efficiency, and to promote a better-quality of education.

The first part of this thesis empirically analysed socioeconomic information about primary and secondary students in Chile since the 1940s finding evidence of an increase in social stratification across the three main school types - public, subsidised-private and fully-paid private schools - when comparing the period pre- and post-1981. In particular, I found that, after the reform, children from middle-privileged backgrounds, who traditionally attended public schools, started to increasingly attend subsidised-private schools, leaving their counterparts from more socially disadvantaged backgrounds attending public schools. I also found evidence that, following the establishment of the 'Shared Financing Scheme' in 1993 - the financing mechanism that allowed subsidised-private schools to charge parents a fee on top of the voucher - there was a further increase in the social stratification of students across public and subsidised-private schools in Chile.

Considering that a number of middle and working class families in Chile opted for subsidised-private schools regardless of the fact that many of them had to pay a fee for their children's education in the period

post-1993, it is natural to wonder whether these families made a rational decision. As seen in Chapter 3, unlike public schools, subsidised-private schools were not only allowed to charge student fees but were also able to select students under any criteria and to make profit. Therefore, from a policy efficiency perspective, we would expect to see better educational outcomes among individuals who attended subsidised-private schools than among those who attended public schools. Otherwise, the decision to choose a subsidised-private instead of a public school would be inefficient for two reasons. First, parents would be paying for a service that is not superior to free public education. Second, the Chilean state would be subsidising schools that, rather than implementing high quality teaching standards, may be simply creating a profit for their owners. This is why many studies in the last two decades have attempted to determine whether subsidised schools provided better quality education than public schools, most of them using students' achievement in standardised cognitive ability tests as a measure of school effectiveness.

The existing literature on the role of school type on student achievement, that I will describe in more detail in the next section of this chapter, has not been entirely conclusive about the quality of subsidised-private schools relative to public schools. Depending on the data, its aggregation level, its date of collection, the models used, and the control variables included, attending a subsidised-private school rather than a public school has been found to have no effect, a small positive effect, a large significant positive effect, or even a negative effect on students' test scores.

Another common characteristic of the literature that analyses the effect of school type on standardised test scores is the extended use of SIMCE test scores – the official instrument to measure student performance in Chile – as the dependent variable. This test is taken annually by students attending 4th grade and biannually by students attending 8th and 10th grade in all schools in Chile. Only a couple of articles (Contreras 2002; Contreras and Macias, 2002) have used other test scores as measures of educational achievement. Although there is a relative consensus on accepting SIMCE scores as a valid indicator of what students learn at school in Chile (Paredes and Pinto, 2009), I believe that its use as the only measurement of school effectiveness can be contested. In fact, given that school-level SIMCE scores are public and used as advertisements (Taut *et al.*, 2009), schools have a strong incentive to "teach for the test" (Aedo and

Sapelli, 2001), narrow the curriculum, and expel or reject students in order to increase their average scores (Meckes and Carrasco, 2010). The absence of large-scale data on school practices makes it impossible to test these hypotheses using quantitative methods; however, some qualitative evidence indicates that high scores in SIMCE are not always associated with positive student outcomes or high quality teaching techniques. For example, Valdes (2013) finds that a high level of reading comprehension in SIMCE does not correspond to good reading habits. On the other hand, Falabella (2014) reports that, teachers can feel forced to choose strategies and content according to what they believe will increase test scores, rather than what they consider most beneficial for the education of their students.

As a consequence, there are several reasons to believe that, measuring the quality of education received by students exclusively by using SIMCE scores may lead to an incomplete assessment of the consequences of having attended a subsidised-private school rather than a public school in Chile. Moreover, even if we accept that SIMCE scores are a good proxy measure of school quality, the existing literature on the effects of subsidised-private schools on these scores is not totally conclusive: it is not absolutely clear whether or not subsidised-private schools have provided substantially better quality education than their public counterparts when socioeconomic characteristics of students are taking into account.

It is my belief that, had subsidised-private schools really provided a better quality education than public schools, we should see an effect on medium-term students' outcomes, such as educational attainment, employment situation and earnings a few years after school graduation, in addition to students' scores in standardised tests. However, the extensive literature on the influence of school type on educational achievement while students are still at school in Chile contrasts significantly with the scarce attention that has been given to the potential effects of school type on other medium- or long-term outcomes.

For example, most of the literature intended to find the determinants of educational attainment in Chile has only included individual's social background as the main explanatory variable and disregarded the role of school-type choice at primary and secondary level. To the best of my knowledge, there is only one study that includes school type as a mediator variable in models analysing the role of social background on

educational transitions (Torche, 2005a). Moreover, when studying the effects of the 1981 reform, relatively few papers looked beyond educational outcomes and investigated the role of voucher schools on individual's earnings. In particular, these studies have analysed how labour market returns have changed in the country over several decades by comparing a sample of people who attended primary and secondary school before and after the 1981 reform, rather than focusing on the specific effects of school type later in life over the post-reform period.

Taking the weaknesses of the existing literature as a starting point, this chapter intends to broaden the knowledge about the effects of the 1981 reform in Chile. In particular, the main objective of this chapter is to compare the relative performance of subsidised-private and public schools in the post-reform era by using a set of outcomes that has not been widely studied thus far and will allow me to capture the medium-term effects of school-type choice. From a social policy perspective, and taking into account the results of Chapter 4, I have decided to focus specifically on the differential outcomes of individuals who attended either a public or a subsidised-private school; I did this because fully-paid private schools do not receive any funding from the government and, in any case, after the 1981 reform they just continued operating in the same way in which they were operating before.

In summary, this chapter will pursue the following three sets of research questions:

(1) Is there an effect of school type on the probability of having accessed post-secondary education and having obtained a post-secondary diploma by the age of 25 during the post-1981 reform period? In particular, is there an effect of school type on having accessed and having completed a university degree by that age?
(2) Is there an effect of school type on the probability of being in paid employment at the age of 25 during the post 1981-reform period?
(3) Is there an effect of school type on individuals' hourly earnings at the age of 25 during the post 1981-reform period?

For each of the questions in (1), (2) and (3), if the answer is positive then I add the following related questions. Have these school-type effects changed over the period of expansion of subsidised-private schools? Also, if these school-type effects exist, do they differ by school-level (primary vs. secondary education)? Finally, are these school-type effects different across individuals from different socioeconomic backgrounds?

In order to address these research questions, this chapter proposes, firstly, performing multiple regression analyses on Chilean large-scale data containing the educational and labour market trajectories of individuals along with their social backgrounds. These analyses will allow empirical insights into the nature and magnitude of the relationship between school type and educational and labour market outcomes, the mediation of social background in these relationships, and also possible changes to these relationships over time. Second, as there is selection in the sample of students who attended a subsidised-private school rather than a public school, trying to obtain consistent estimations of the average school-type effect on individuals' outcomes is one of the main concerns of this chapter. To address this issue, I make use of potential outcome models to estimate average treatment effects under the assumptions of selection on observable and unobservable individual characteristics (Cerulli, 2011 and 2015).

Since much of the literature on school efficiency claims that private voucher schools are equipped with better managerial capacities and fewer constraints than public schools (e.g. Chubb and Moe, 1988 and 1990 for the US, and Gallego, 2013; Paredes and Pinto, 2009 for Chile) and, especially, given that in Chile these schools were allowed to obtain additional funding by charging fees to parents since 1993, I expect to observe that the subsidised-private schools are more effective than public schools. Therefore, my first hypothesis is that graduates from subsidised-private schools should exhibit on average better educational and labour market outcomes by the age of 25 than their counterparts who attended public schools over the post-1981 reform period.

My second research hypothesis is that, once subsidised-private schools gained the ability to start charging additional fees on top of the voucher, if they reinvested their additional funds to improve school quality in

order to become more attractive to prospective students and their parents, the gap in effectiveness between subsidised-private schools and public schools should have increased over time. This is to say that I expect to see a mediating effect of the maturity of the reform on school-type effects favouring the performance of the subsidised-private sector relative to the public sector.

With respect to the possibility that the effects of attending a subsidised-private school are enhanced by students' socioeconomic background, I believe that the children of more educated parents have better chances to benefit from these schools' resources simply because they are more exposed to similar resources at home and are more familiar with them. Additionally, in Chapter 4, we saw that individuals from the most disadvantaged social backgrounds became increasingly concentrated in public schools following 1981, while individuals from the middle-classes increasingly migrated to subsidised-private education, which ended up making this group much more diverse over time. In fact, some empirical studies (Mizala and Torche, 2012; Salhgren, 2013) suggest that the diverse demand for subsidised-private education created a wide variety of subsidised-private schools that specialised in different niches of students. For example tuition-fee charging schools with rigorous admission processes would serve upper-middle privileged children, while free and less selective schools would serve lower-middle privileged ones. For these two reasons, my third hypothesis is that social background should be an important mediator of the effect of having attended a subsidised-private school on educational and labour market outcomes.

Finally, regarding the question of whether the effect of school type varies by school level (primary vs. secondary level), I hypothesise that having attended a better quality school at the secondary level must give students a larger advantage to achieve better educational and labour market outcomes at the age of 25. The reason for making this assumption is that the overall final marks obtained by students at secondary school in Chile are widely considered to be one of the major criteria used to screen applicants in post-secondary admission processes (Larroucau *et al.*, 2015). Consequently, the performance at secondary school should at least affect the chances of entering a tertiary education program and should, subsequently, affect individuals' employment and wage perspectives in the future. Therefore, in consonance with my first hypothesis, my

fourth and final hypothesis is that the positive effect of having attended a subsidised-private school should be reinforced if it occurred at the secondary level rather than at the primary level.

In addition to answering the three already presented sets of questions and testing my hypotheses, the second part of this chapter seeks to make a few broader contributions to the existing literature. First, this project intends to emphasise the importance of evaluating the performance of different school types by considering a set of educational outcomes that is broader than student achievement in standardised test scores. Indeed, I consider that a policy evaluation based exclusively on educational achievement may be too focused on the short term results of students, while an integral assessment should compare school performance by including a larger set of individual medium-term outcomes, such as educational attainment and labour market outcomes later in life.

Second, by performing an evaluation of this kind, I expect to produce useful information to feed into Chilean education policy. In fact, as mentioned in Chapter 3 and in the introduction of this thesis, one of the most important educational reforms introduced during the last term of President Michelle Bachelet (2014-2018) was the 'School Inclusion Act' which made three amendments to the 'General Law of Education'. These amendments, among other modifications to the Chilean school system, prohibited schools that receive state funding from selecting students, from imposing tuition fees on parents, and from making a profit. Even though these amendments were approved by the Chilean Congress in January 2015, they established a gradual implementation period that will only be totally completed by 2025. Therefore, it is still too early to start measuring the effects of this new reform to the Chilean educational system. While the political coalition that supported President Bachelet is in general satisfied with these amendments and expect that they will reduce the social stratification of students in the school system and enhance equality of educational opportunities, many factions of the opposing coalition, which is currently in power, argue that these changes may undermine subsidised-private education and threaten the overall quality of education in Chile. Moreover, in 2019, the current government of President Sebastian Piñera sent a bill to the congress with the intention of trying to reinstate some of the rights lost by subsidised-private schools during the Bachelet administration. Thus, the second part of this thesis will provide further evidence about

the relative performance of subsidised-private and public schools competing in a highly unregulated environment, which can enrich future policy debates on the advantages and disadvantages of re-establishing these rights.

Third, this chapter expects to make a more general contribution to the international literature on the effects of voucher school competition by looking at the medium-term effects of voucher schools based on the case of a country acknowledged for having implemented "perhaps the largest on-going voucher programme in the world" (Zimmer and Bettinger (2010), pp: 347); this also offers the unique possibility of analysing the consequences of its radical transition from a centrally controlled public-school system to one in which all students and their families were given total freedom to choose any private or public school of their preference (Hsieh and Urquiola, 2006). Moreover, as mentioned before, the combination of school vouchers with for-profit education and the rights granted to subsidised-private schools both to select students according to their own preferred criteria and to charge tuition fees to top-up the vouchers has been implemented by no other country apart from Chile. Therefore, the analysis of the effectiveness of the Chilean voucher school system can provide useful evidence to feed school policy-making around the globe and to enlighten the debate on market-based school reforms.

The rest of this chapter is organised as follows. Section 5.2 presents a literature review of the existent literature on the effects of the Chilean voucher schools on students' outcomes. Section 5.3 introduces the data and methods used in the second empirical part of this thesis. Sections 5.4 to 5.6 report and analyse the main results for the effects of attending a subsidised-private school rather than a public school in Chile on educational attainment, employment situation and hourly earnings by the age of 25. Finally, Section 5.7 summarises the main findings of the second part of this thesis and concludes.

5.2. Extant research on the effects of voucher school attendance in Chile

5.2.1. Chilean voucher schools and educational achievement

The literature analysing the impact of the Chilean voucher school system on students' performance may be classified into two different types. The first type has studied the role of voucher school competition on student's scores in standardised achievement tests over time. The second type, which is the larger, has aimed to determine the effect of attending a subsidised-private rather than public school on test scores. Since both types of evaluations have faced the methodological challenge of controlling for the selection bias produced by both the self-selection of students and their families, and selection mechanisms operating in private voucher schools, quasi-experimental methodologies are frequently used.

Regarding the first type of literature, Carnoy and McEwan (2003) use panel data of test results and the proportion of private schools at the municipal level from the early 1980s to the mid-1990s to estimate the potential effect of school competition on overall educational performance, and also on public school performance. The study finds that the effect of competition on test scores is modest but positive in the Metropolitan Region. These results seem to be driven by the performance of some public schools whose student's bodies are mainly the children of middle or low-educated parents. However, the authors observed that, in the rest of the country, where three-quarters of the national population lives, competition due to school vouchers had a slightly negative effect on student performance. In a different study, Hsieh and Urquiola (2003 and 2006) apply a difference-in-differences approach to study the role of the expansion of the subsidised-private sector on students' achievement. By using administrative records of municipalities from 1982 to 1996, the authors observed that the fast growth of the subsidised-private sector did not produce any increase in students' scores. Moreover, Auguste and Valenzuela (2006), using the information provided by the 2000 cohort of SIMCE data, investigated whether subsidised-private school competition has had an impact on students' scores. By using an instrumental variable approach, based on the distance to the nearest city as an instrument for the private market share, these authors find that private school competition has a significant effect on students' achievement. Therefore, the impact of increased school competition on educational achievement in Chile shows contested results (Sahlgren 2013).

The second type of study undoubtedly constitutes the most extensive in the literature on the effects of voucher schools in Chile. These studies use as dependent variables the scores obtained by students in the standardised tests, mostly the so-called SIMCE test. Regarding the methods used, they are diverse and include ordinary least squares (OLS), the two-stage Heckman model, propensity score matching, instrumental variable estimation, and hierarchical linear modelling. These studies also differ in terms of their unit of analysis, levels of aggregation of data, subjects analysed (mathematics, reading, science, amongst others), grades of participant students, period of reference, and control variables included in the models.

According to Drago and Paredes (2011), it is possible to distinguish between two generations of studies intended to determine the role of school type on student's achievement in test scores. The first generation was characterised by two methodological aspects: the smallest unit of analysis was schools rather than individuals, and OLS models were mainly used in the estimations. This generation of studies did not arrive at any substantive conclusions about the effect of school types on educational achievement. For example, Mizala and Romaguera (1998) conclude that the differences in scores across school types are very small and mostly insignificant. McEwan and Carnoy (2000) show that academic achievement is slightly lower in non-religious subsidised-private schools than in public schools, and this result is reinforced when they look at schools outside the capital region. The investigation conducted by Tokman (2002) reveals that subsidised-private schools are neither better nor worse than public schools, but public schools prove to be relatively more effective in teaching students from disadvantaged social origins. In contrast, Sapelli (2003) and Gallego (2002) claim that students from subsidised-private schools obtained significantly better test scores than pupils attending public schools even when taking into account the characteristics of their peers.

The second generation of studies that seek to explore the role of school type in student performance have been conducted by using information of SIMCE at student level, which became available in Chile since 2000 (Drago and Paredes, 2011). The most common methods used by these studies are Heckman-corrected OLS models or two-stage hierarchical linear models as well as propensity score matching to try to correct for the endogeneity of school choice and the heterogeneity of students across different school types.

Although the set of variables used as controls in this generation of studies present some differences, as they all look at SIMCE scores, most of them rely on a similar set of covariates.

As stated in the introductory section of this chapter, the results of the second-generation studies are also not entirely conclusive. A first group of articles observed that students attending subsidised-private schools perform significantly better than pupils at public schools (González *et al.*, 2002; Mizala and Romaguera, 2002; Anand, Mizala and Repetto, 2009). The second group provides evidence for a more modest difference in favour of subsidised-private schools (Sapelli and Vial, 2002; Mizala, Romaguera and Ostoic, 2004; García and Paredes, 2010; Lara, Mizala, and Repetto, 2011). The third group has reported no statistically significant differences between public and subsidised-private schools (Bellei, 2008; Contreras, Sepulveda and Bustos, 2010). Finally, a fourth group has found that public schools perform slightly better than subsidised private ones (McEwan, 2001; Manzi *et al.*, 2008).

In order to explain the disparities in these results, and to obtain a more robust conclusion about the relative performance in test scores of public and private-subsidised schools, Drago and Paredes (2011) conduct a meta-analysis of the 17 most influential studies in the field (including both the first and second generation studies). The results of their meta-analysis indicate that, on average, subsidised-private schools perform slightly, but significantly, better than public schools. The authors also show that the standard deviation between the reviewed studies is quite high. This highlights the sensitivity of the results to different specifications. Drago and Paredes also propose a robust specification by using as the dependent variable the scores of SIMCE 2008 in mathematics, and introducing into their models a set of controls that encompasses all the variables used in previous studies including school selection variables. By estimating OLS and two-level hierarchical linear models, they confirm the evidence in favour of a modest improvement in performance for subsidised-private schools in comparison to public schools. The study concludes that the fewer control variables introduced in models, the smaller the differences between both school types.

As previously seen, a very large number of studies investigates the role of school type when comparing students' SIMCE scores. However, I have only identified one study (Contreras, 2002) that addresses the same issue by using as a dependent variable the performance of students in the national standardised test for university selection that students took in 1998 (known in Chile at that time as the PAA test). This study conducts OLS and TSLS (two stages least squares) models to analyse whether there are significant differences in the 1998 PAA scores across school types. Contreras concludes that attending a subsidised-private school has a positive, albeit very small, impact on student's achievement.

A more recent study (Mizala and Torche, 2012) investigates the socioeconomic distribution of students' achievement within and between schools and across school types, rather than focusing on the differences in test scores between subsidised-private and public schools, because the authors argue that schools are very important units of social stratification in the Chilean system. By using SIMCE scores from 2002 and 2004 as the dependant variable, hierarchical linear models, and a correction for unobserved selectivity into schools, the authors find that a much larger proportion of the variance in socioeconomic characteristics of students comes from differences between schools in the subsidised-private sector compared with the public sector. Moreover, this study also reports that the association between the SES of the school and individual test scores is much larger in subsidised-private schools than in public schools. The authors conclude that there is a marked socioeconomic stratification of test scores in the Chilean school system

To conclude this section, it is important to emphasise that, despite the apparent dissimilar conclusions across the studies that attempt to understand the relationship between school type and educational achievement in Chile, they all agree that students' socioeconomic background has a very significant positive effect on test scores. However, socioeconomic background has not always been measured the same way, and can include a variety of variables, such as parental education (mother and/or father), a categorical variable indicating socioeconomic status (SES) of the family, family income, and some socio-cultural variables such as the number of books at home. More recent articles have also included a variable accounting for parental expectations on their children's performance.

5.2.2. Chilean voucher schools and educational attainment

In comparison with the role of school type on students' educational achievement while still at school, the evidence of the influence of school type on individual's educational trajectories in Chile is much scarcer. In fact, most of the studies that analyse individuals' educational attainment are mainly interested in the role of socioeconomic background on either educational choices or intergenerational educational mobility, rather than in understanding the effect of school type on these variables. Consequently, much of this literature does not include school type in empirical models even as a control variable. Despite this, what all this literature has in common is that, it finds a very strong association between socioeconomic characteristics of parents and the educational attainment of their children.

For example, as part of a bigger project on mobility of income and schooling in Chile, Celhay *et al.* (2010) study the influence of the educational attainment of household heads on the educational attainment of their children. By analysing data from a 10-year longitudinal study in Chile (1996-2006), the authors find a very strong association between the years of education completed by parents (or parental figures) and the years of education completed by their children in their adulthood. The study also interacts the relationship between parents' and their children's educational attainment with birth-cohorts, finding no evidence of a decline in the strength of the association between these two variables over time. On the other hand, Zubizarreta, (2009) uses the same dataset to investigate the effects of growing up in poverty in Chile. His results reveal that, being classified as poor during childhood, as well as the household income and the educational attainment of the head of household during childhood, are very significant determinants of the highest level of education reached by children ten years later.

With the purpose of analysing the link between individuals' social background and educational attainment over time, Marteleto *et al.* (2012) investigated trends in educational inequality for adolescents who grew up in the 1980s, 1990s, and the late 2000s in four Latin American countries, including Chile. Using three waves (1987, 1992 and 2009) of the cross-sectional Socioeconomic Chilean survey (CASEN), educational transition models, and a birth-cohort approach, the authors find that the effect of social origin has

weakened for school enrolment, completion of primary school, and the transition into secondary school in Chile. However, when they analyse private school enrolment in particular, rather than enrolment in any type of educational institution, they find that the association of these outcomes with social origin has increased over the same time period. Unfortunately, this study does not analyse transitions to higher educational levels.

Probably the most complete study on inequality of educational opportunity conducted with Chilean data is Torche (2005a). Using a cohort analysis based on the data of the 2001 Chilean Mobility Survey, this article studies the trends in educational stratification in Chile over the past 50 years, with a focus on the policy changes that occurred as a consequence of the 1981 reform. Aside from introducing variables on parental socioeconomic status to analyse their effect on educational transitions, this study includes dummy variables for the type of school that students attended as explanatory variables; i.e. whether the students attended a fully-paid private school, a subsidised-private school or a public school. The results of this article indicate that, "in line with international findings, there is 'persistent inequality' of educational opportunity across cohorts in Chile" (Ibid: 316), which is revealed by an unchanged effect of social background on the completion of secondary education and the transition to post-secondary education. However, Torche does find a small but significant increase in the effect of the father's education on the probability of entering secondary education for the two youngest cohorts, which coincides with the period in which the main market-oriented changes were introduced in the school system. The study also reveals a rise in the advantages associated with attending subsidised-private schools and paid private schools during and after the 1981 reform. In particular, the author reports a large improvement in the chances of graduating from secondary school for subsidised-private school students relative to public school students for the cohort that was most affected by the privatisation of education; however, she finds no change across cohorts in the benefits of studying in a private school (subsidised or non-subsidised) for the transition to post-secondary education.

Finally, Bravo *et al.* (2010) develop a structural dynamic model of school attendance and labour market decisions that they use to assess how the voucher-school reform affected school choice, educational

attainment, earnings, and labour market participation using the information from the first waves of the same longitudinal study I used in this thesis: the Social Protection Survey. In particular, these authors focused on the comparison between a sample of individuals who finished school before the 1981 voucher school reform and a younger sample who had the option to use school vouchers throughout their schooling careers. As described by the article, simulating individuals' educational and labour market choices with pre- and post-reform model parameters permits "a direct assessment of the effects of the reform as it operates through multiple channels over the life cycle" (Ibid: 89). Their estimations find that being exposed to the voucher school system over the 12 years of school education, produced a significant 3.6 percentage point increase in the rate of graduation from secondary education, 3.1 percentage point increase in post-secondary attendance and 1.8 percentage point increase in the completion of a college degree. Regarding the potential mediation of socioeconomic background on these results, the authors find that the average gains of the reform were not significantly different for students from poor and non-poor backgrounds.

5.2.3. Chilean voucher schools and labour market outcomes

To date, I have be able to identify only two studies that directly or indirectly investigate the effect of exposure to school vouchers on labour market outcomes in Chile over the post-1981 reform era; the first one is the article of Bravo *et al.* (2010) mentioned in the previous section. The simulations made by these authors based on their dynamic model indicate that, exposure to school vouchers over all individuals' school careers reduced labour market participation of 16 to 25 year-olds by around 2 percentage points. Regarding earnings, the same authors find that the monetary returns of both public and subsidised-private primary education increased in the post-1981 reform era; however, exactly the opposite occurs in the case of the returns for secondary education. Bravo *et al.* (2010) associate this effect with the fact that new the secondary subsidised-private schools that emerged after the reform were not as good quality as the ones that were already established. In terms of the distribution of earnings, the authors reported a very slight increase among lower earning percentiles and a decrease among upper percentiles, accounting for a very modest reduction of earning inequality in the post-1981 period.

Using the information of the International Adult Literacy Survey (IALS) for the period 1994 to 1998, Patrinos and Sakallariou (2011) attempt to understand the importance of schooling and non-schooling cognitive skills on adults' earnings in Chile using a binary instrumental variable based on the 1981 reform. The authors notice that, as a consequence of the voucher school reform and, despite the large decline in public spending on education over the 1980s in Chile[72], the average years of completed education peaked sharply for the group of individuals that were studying at school around and immediately after the 1981 reform[73]. Therefore, this peak can be seen as an exogenous shock affecting the number of years of education completed by these individuals and, consequently, can be used as an instrument for that variable. Patrinos and Sakallariou's estimations show that the "winners" of the 1981 reform where those who were studying at primary school at the moment the reform was implemented (individuals who were 6 to 13 years old in 1981) because, for this group, only a negligible part of their return to schooling is explained by ability bias. On the contrary, when the authors also analyse the group that were studying secondary education when the reform occurred (14 to 17 year-olds in 1981), the return to schooling decreases dramatically and the returns to cognitive ability significantly increases.

5.2.4. Summary of previous research findings

In general terms, this review of various evaluations of the effects of the Chilean voucher system allows me to conclude the following. First, most of the literature that investigates the effects of voucher schools in Chile focuses on the differentiated impact of attending a subsidised-private school rather than a public school on educational achievement, which has been largely measured by students' scores in the SIMCE test. However, despite the large number of articles analysing this issue, it is still difficult to make a definite conclusion on how much students test scores improved when they attended subsidised-private schools rather than public schools after controlling for selection on observable and unobservable characteristics of students; in fact, the results of these studies seem to be highly dependent on the methodologies and the

[72] Official figures show that between 1981 and 1990, public spending on education in Chile decreased from 4 to 2.6 percent of the GDP.
[73] Regarding the peak mentioned by these authors, Delannoy (2000) finds that enrolment rates in secondary education increased by 15%, while those at post-secondary education level increased by 42 percent over the 1980s.

data used. Second, in addition to calculating average effects for the whole population, very few of these evaluations have included interaction effects between school type and individual socioeconomic characteristics as determinants of student performance. Third, the evidence from some qualitative literature - which I describe in the introductory section of this chapter - suggests that there are reasons to believe that SIMCE scores may not truly reflect the relative quality of different school types, pointing out the convenience of also looking at other outcome variables. Finally, very little empirical literature has focused on the role of school type on outcomes different from the educational achievement of students when still at school, such as educational attainment, employment situation or earnings later in life. In fact, the few articles that have analysed these topics are based on comparisons of educational and labour market outcomes of all individuals before and after the 1981 school reform, rather than on a comparison between the outcomes of subsidised-private schools and public schools over the post-reform period. Moreover, these studies have paid little or no attention to the potential interaction effects between school types and social background on their analysed outcomes. Consequently, I believe that studying in detail the combined role of school type and individuals' social background on individuals' educational and labour market outcomes seven years after secondary school graduation, entails a valuable contribution to the literature on voucher schools in Chile.

5.3. Data and methods

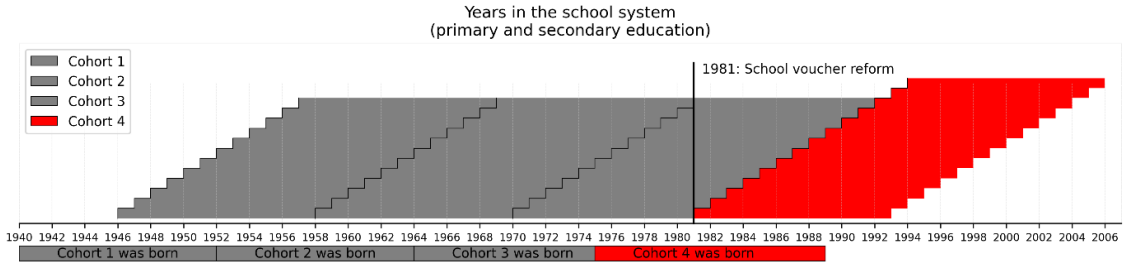
5.3.1. Data description

To answer the three sets of research questions described in the introductory section of this chapter, I rely on the same nationally representative longitudinal study that I used in Section 4.2: the Chilean 'Social Protection Survey' (CSP Survey). The information contained in this study allowed me to put together a large set of individual data on social and family background, school choices, and educational and labour market trajectories for a representative sample of individuals who started primary school between 1981 and 1994 (birth-cohort 1975-1988). This group of people corresponds to those who started attending primary school from the exact year that the voucher school reform was implemented onwards and are all possible

to observe at the age of 25[74]. It is important to mention that most of the information on school choices I use is recall information, as the youngest individuals interviewed by this survey are 16 years old and most of them joined the sample at an older age.

Figure 5.1 illustrates the sample of individuals that I am using in this chapter compared with the much larger sample that I used in Chapter 4. As in Figure 4.1, every tier of the stepped diagram represents the approximate period of time in which individuals began and finished school, considering that the ages for starting and completing school in Chile are around 6 and 17 years old respectively (both inclusive). In this chapter I am interested in analysing the educational and labour market trajectories of those who studied over the period following the 1981 reform; therefore, birth cohorts 1, 2 and 3, which were part of my analyses in Chapter 4, (and are marked in grey in Figure 5.1) are now left out and I only focus on birth-cohort 4 (which is coloured in red). However, birth-cohort 4 in this chapter is slightly larger than the one in Chapter 3; this is because of the addition of individuals who started attending school in 1994 and 1981. The latter will allow me to observe potential changes in students' outcomes since the first year of implementation of the reform. Consequently, this chapter will be based on a single 14-year birth-cohort, which is reflected by the two additional tiers of the red stepped diagram.

Figure 5.1: School progression by birth cohort: comparison of the sample of individuals used in Section 4.2 with the sample of individuals used in this chapter



Also, in contrast to what I did in Chapter 4, this chapter only focuses on those students who attended either a public or a subsidised-private school in the post-reform period. This means that I am leaving out of my

[74] The Social Protection survey was run by the Chilean Ministry of Labour and Social Protection between 2004 and 2015 on a biennial or triennial basis. The last wave was conducted in 2015 and, unfortunately, there has been no attempt to continue this longitudinal study since that year.

analyses the children who attended fully-paid private schools, either at primary or secondary level. The reason for this methodological decision is that I am only interested in understanding the educational and labour market trajectories of those who were directly affected by the policy changes introduced in 1981. The fully-paid private school sector, which is characterised by very high tuition fees and financial autonomy from the state, has been operating the same way for many decades in Chile and the legislation affecting this sector was not really altered by this reform. In other words, fully-paid private schools do not receive direct public funding, while the new private voucher schools that emerged with the 1981 reform started to receive funding (the 'voucher') that could have otherwise benefited public schools. Also, as seen in Chapters 3 and 4, since 1981, fully-paid private schools have been systematically covering the children from around the top 10% most highly privileged families in the country.

Finally, in addition to the already explained reduction of my sample, in order to identify school-type effects on the outcomes of interest for a homogenous group of people, my empirical analyses for this chapter only include individuals who at least finished secondary education. In practice, this means that I removed from my sample all people with incomplete secondary education by the age of 25. In program evaluation jargon, this sample restriction guarantees that all individuals were exposed to comparable treatments: having satisfactorily completed 12 years of education either in public schools, subsidised schools or a combination of both. This is to say that the relevant sample for this chapter varies only in terms of the kind of treatment that individuals received - the type of school they attended at primary and secondary education levels - but they do not vary in terms of exposure time or length of these treatments.

5.3.2. Variables

5.3.2.1. Main explanatory (or treatment) variables

Following the previous discussion, I created my main explanatory variables for this chapter in three different ways. First, I constructed a four-category variable indicating the track that each student followed at primary and secondary school. This is: public-public, private-public, public-private and private-private, where the first school corresponds to the school type attended at the primary level and the second

corresponds to the school type attended at the secondary level (to simplify the terminology, I am referring to subsidised-private schools simply as 'private'). Second, to summarise this information in a more compact way, I also created two dummy variables that collapse the trajectories already described. The first takes the value 1 if the individual ever attended a private school (either at a primary or secondary level) and zero otherwise. The second takes the value 1 if the individual attended a private secondary school and zero if they attended a public secondary school. It is important to remember that all individuals in the sample have completed at least secondary education by the age of 25.

5.3.2.2. Outcome variables

Regarding my outcome variables, I decided to focus on the educational attainment, employment situation and wages at the age of 25 because most people in Chile have completed their formal educational training by that age, but it is still an age close enough to graduation from secondary education to observe an effect of school type on my selected outcomes. Moreover, although there are some good theoretical reasons to measure labour market participation and earnings at a later point[75], in practice I could not observe occupational information for a sizable sample of individuals who attended school in the post-reform era later in life because the Social Protection Survey has not collected any additional data since 2015.

To measure educational attainment by the age of 25, I focused on whether my sample of secondary school graduates had both started and completed either a post-secondary education program in general - which includes both academic and vocational degrees - or specifically university education by that age. More precisely, I constructed four dummy variables indicating whether each individual in my sample had accessed and graduated from post-secondary education and university by the age of 25[76].

[75] Typically, individuals still have not consolidated their positions in the labour market at the age of 25 and also, unemployment rates tend to be very high among individuals younger than 29 in comparison with other age groups. This is why, having been able to measure both employment situation and earnings by the age of 30 or 35 would probably have been a more adequate methodological option if the data had been available.

[76] It is important to mention that the set of questions I had to use to determine whether students had graduated by the age of 25 was much larger than the set of questions I used to determine whether they had started post-secondary studies by that age and, unfortunately, not all individuals answered those questions. This explains why the sample size for the variables accounting for graduation is slightly smaller than the sample size for the variables accounting for access to post-secondary studies.

To account for the employment situation of individuals at the age of 25, I produced a dummy variable indicating whether each person had any paid occupation over the year he/she turned 25 years old, including part-time and full-time occupations, as well as employed and self-employed occupations. To avoid confusing lack of employment with inactivity associated with being in education or training, this variable was constructed by excluding all those people who reported studying full-time at the age of 25. This only resulted in a very small reduction in my sample size because only 8% of the 14% of individuals in the original sample who reported studying at the age of 25 were doing it full-time[77]. People who did not report having serious health conditions preventing them from working at the age of 25 and who were not enrolled in any full-time post-secondary studies were included in the sample.

Finally, to measure earnings at the age of 25, I constructed a labour income measure based on the variable 'earnings from the main occupation'. In practice, I added up all the monthly earnings from individuals' most important occupation over the year they turned 25 and divided it by the number of yearly working hours they reported to obtain an hourly wage from the main occupation. As individuals turned 25 years old in different years, all the earnings were transformed into 2015 Chilean pesos (2015 was the last year in which I had data from the CSP Survey). In order to facilitate the interpretation and comparability of the effects of school type on earnings through different specifications, I constructed the log of this variable as my main explained variable[78].

5.3.2.3. Control variables

Regarding control variables, the models explaining both educational attainment, employment situation and earnings at the age of 25 included a similar set of variables to the ones I used in the first part of my thesis. The most important ones are those accounting for individuals' social background: parental education,

[77] More details on these calculations can be found in Section 6.1.1.

[78] Although the log transformation is a very common practice in studies based on the effects of variables on either individual or household incomes (especially those involving small sample sizes) neither the OLS nor the potential outcome models I use in Section 5.6 really require this transformation. However, in contrast, the Heckman models that I use to produce results that control for selection bias in labour market participation do require the assumption of normally distributed errors and, consequently, the log-transformation is necessary. In order to present results that were fully comparable across different methods, I opted to use the log-transformed income variable for all models and specifications I present in Section 5.6.

parental social class and parental social status (as suggested by Bukodi and Goldthorpe, 2012). Also, in order to control for the characteristics of individuals' families over the period that individuals were attending school, I included the following covariates: number of siblings, parental age at the moment individuals started primary school and a dummy variable for biparental family. Moreover, I also constructed a dummy variable indicating whether the individual had a working mother because previous studies of labour market participation suggest that having a working mother can have a positive effect on the labour market participation of children, particularly if the children are female. However, I finally used this variable only as a covariate in the model that corrects for selection bias in the estimation of the effects of school trajectories on earnings (first-stage of Heckman's correction models; Heckman, 1979) because this variable turned out to have an insignificant effect on the employment situation of individuals at the age of 25, and there were not good theoretical reasons to include it in any other models.

With the purpose of testing the hypothesis of whether the increased competition in the voucher school system led to better outcomes, I also constructed the following variables: 'age of the reform (i.e. number of years since the reform was implemented) at the moment that individuals started primary school' and the indicator variable 'started secondary education in 1993 or later'. 1993 is a relevant cutting point because it is the year when the so-called 'Shared Financing Scheme' started operating in Chile, meaning that subsidised-private schools were allowed to charge fees on top of the voucher. As these two variables measure time progression along the post-reform period, they are highly correlated, so I included only the first one in my main effect regression analyses. However, in some cases, I present the results for interaction effects models that include the second variable when they were observed to be more significant.

Although my longitudinal dataset, unfortunately, does not include any measure of individuals' cognitive development at early ages, I decided to include in a few regression models the variable 'overall mark of individuals in secondary education'. This overall mark, which is known as NEM in Chile, is the average of individual marks in examinations that Chilean students take over their four years of secondary school (grades 9th to 12th). I am aware that the inclusion of this variable is problematic when the goal is to identify a causal relationship between school type and both educational and labour market outcomes at the age of

25; in fact, the type of school that an individual attended at a primary, and especially at a secondary level, presumably has an effect on this variable. In the case of the potential outcome models, as suggested by Wooldridge (2010), variables introduced as controls must not have a clear causal link with the main explanatory variable because this would violate the ignorability assumption that is key to the identification of these models (Ibid, p.909). Moreover, even in the case of simple regression models, introducing appropriate controls can increase the likelihood that the estimated coefficients can be interpreted causally. For Angrist and Pischke (2009), good controls are variables that "we can think of as having been fixed at the time the regressor of interest was determined" (Ibid, p.64). Despite these arguments, I think it is interesting to use the overall individual mark at high school as a control in a few specifications, not to infer causal relationships but to observe correlations that help to better understand potential mechanisms mediating the relationship between school type and the outcome variables. This is also the case of the variable 'number of years of education completed by the age of 25' that I only introduced as a control in the simple regression models explaining both employment and earnings at the age of 25[79].

Finally, a variable that is highly correlated with earnings in Chile is the region where people work. In particular, in those regions where industrial clusters have been established - like the mining ones in the north of Chile - or in the areas in which financial markets are highly concentrated - like the region in which the country's capital is situated - earnings are on average considerably higher than in the rest of the country. Also, some agricultural areas in the central-southern area of Chile tend to be systematically poorer than the average region. Therefore, I think it is important to include in my models for earnings a variable that accounts for region, and I run some specifications that include this variable with the sole purpose of understanding correlations and observing mechanisms. However, it would not be correct to introduce this variable in models that try to understand causality, as the type of school that individuals attended could also have had an effect on migration; for instance, students who attended a subsidised-private school in a remote region of Chile may be more likely to migrate to the capital region and then receive a higher salary. To deal with this problem, but to also account for the disparities in earnings between different regions of the

[79] It is worth remembering that my sample only includes individuals who completed secondary education. Therefore, the variable 'number of years of education completed by the age of 25' ranges between 12 and 20 years.

country, as suggested by Wooldridge (2010), I decided to include as a control in the potential outcome models the region where individuals attended secondary school instead of the region where individuals were working at the age of 25. That variable is highly correlated with the region where individuals work at the age of 25 but it is not contemporary to the outcome.

5.3.3. Estimation Methods

5.3.3.1. Multiple Regression Models

As mentioned in the description of variables, to try to observe correlations and understand the mechanisms mediating the relationship between school type and my three outcomes of interest, I start the analysis sections for these three outcomes by presenting multiple regression models. I estimated logistic regressions for the four educational attainment outcome variables and the employment situation of individuals, and both OLS and Heckman selection models (Heckman, 1979) for hourly earnings at the age of 25 using all the control variables explained in Section 5.3.2. In addition to the main effect models, I also estimated the interaction effects of the treatment variables with some key control variables. This makes it possible to observe whether the association between school-type trajectories and individual outcomes is mediated by individuals' social and family background, the area where they attended school, the age of the reform at the moment they started primary education, and other relevant covariates, as well as helping to decide which ones are relevant for inclusion in the potential outcome models.

5.3.3.2. Potential outcome models to estimate average treatment effects (ATEs)

The Chilean voucher school model, implemented in 1981, gave students and their parents freedom to select any subsidised-private or public school of their own preference without any geographic restriction; however, it also allowed schools to implement any admission mechanism (including prior school marks, cultural background, financial situation of families, family demographics, etc). Therefore, the allocation of children at schools presents both self-selection and school-selection. Ergo, in the jargon of public-policy evaluation, the allocation to treatment was not random. This poses a challenge to adequately estimate the

'private-voucher school effect' on educational attainment and labour market outcomes. If a simple linear or logistic regression analysis finds a significant relationship between school type and individuals' outcomes, we cannot be certain that this is only a correlation and, in consequence, it cannot be interpreted causally. Fortunately, potential outcome models offer a better estimation strategy based on simulations that deal with the problem that we cannot observe the same individual in both scenarios: being treated and being untreated (i.e. having attended a subsidised-private school and a public school). These models can not only provide a consistent estimation of average treatment effects (ATEs) when the selection to treatment can be fully explained by observable individual characteristics, but also when some unobservable characteristics may be influencing both the treatment and the outcomes. In fact, we can easily think of some unobservable characteristics such as ambition, motivation, inherent ability, and others that might have a role in both the choice to attend a subsidised-private school, and educational and labour market outcomes. If this is the case, there will be endogeneity affecting the estimations and, as a consequence, the coefficients estimated this way will be biased and inconsistent. Choosing the most adequate estimation strategy, therefore, strongly depends on our assumptions about the potential role of unobservable characteristics. Consequently, I tried to identify methods that appropriately estimate the average treatment effects of school type on my outcomes of interest under the two following assumptions: i) selection on observable characteristics of individuals, and ii) endogeneity or selection on unobservable characteristics of individuals.

Estimation of ATEs under the assumption of selection on observables

When researchers try to find the causal relationship between a treatment 't' and an outcome variable 'y', they face the fundamental "missing observation problem" (Holland, 1986) which states that we cannot observe the same individual in the situation of being treated and untreated at the same time, but only in one of these two situations.

Rubin, (1974; 1977) developed a potential outcome model based on the fact that, for every person we can observe:

$$y = y_0 + t(y_1 - y_0). \quad (1)$$

Where y_0 is the individual's outcome without the treatment, y_1 is the individual's outcome with the treatment, and t is an indicator variable that takes the value 1 if the individual was treated and the value 0 if the individual was untreated. Rubin proved that, when a treatment has been set up in such a way that individuals were randomly allocated into the either treatment group (t=1) or non-treatment group (control group or t=0) the simple difference of the outcome means between these two groups provides an unbiased estimation of the average treatment effect (ATE). In fact, by taking the expectation of y conditional on t=1 in equation (1), we obtain that: $E(y_1 \mid t=1) = E(y_1)$ and $E(y \mid t=0) = E(y_0)$. Then, subtracting both, we obtain:

$$E(y \mid t = 1) - E(y \mid t = 0) = E(y_1 \mid t = 1) - E(y_0 \mid t = 0) = E(y_1) - E(y_0) = ATE. \quad (2)$$

However, very rarely in social sciences do we observe randomised controlled trials and the allocation of individuals into treatment is often by selection or self-selection depending on a number of covariates, x. Therefore, we need to use some hypotheses or assumptions to reliably estimate causal effects in this context. Potential outcome models help to deal with this problem. Rosenbaum and Rubin (1983) proved that under the hypothesis of selection on observables[80], the knowledge of x may be sufficient to identify the causal parameters of t on y if we rely on the assumption of "conditional independence". This assumption states that, conditional on the knowledge of x (observable characteristics of individuals), y_1 and y_0 are independent of the treatment, t. In other words, once the knowledge of the factors affecting the sample selection are taken into account, the condition of randomisation is restored.

In practice, we need a weaker assumption than conditional independence to estimate our causal model, this is the so-called "conditional mean independence" (CMI) or independence only on the mean. Formally, this means that: $E(y_1 \mid x, w) = E(y_1 \mid x)$ and $E(y_0 \mid x, w) = E(y_0 \mid x)$. Using this assumption, and taking into account the expectation of the potential outcome model of equation (1) conditional on x and t, we obtain that the ATE can be estimated as follows:

[80] It is important to observe that although much of the literature on program evaluation refers to this hypothesis as 'selection on observables' (for instance, Cerulli, 2011 & 2015), Wooldridge (2010) notes that this selection can also depend on unobservables if they are independent of the covariates of the model and the outcome under every possible treatment (and non-treatment).

$$ATE(x) = E(y \mid x, t = 1) - E(y \mid x, t = 0) = E(y_1 \mid x) - E(y_0 \mid x) = m_1(x) - m_0(x) . \quad (3)$$

Then, we only need to select a method to estimate $m_1(x)$ and $m_0(x)$ in equation (3) and obtain the average treatment effect. This can be done parametrically (e.g. via regression adjustment, differences in differences, etc) or non-parametrically (e.g. reweighting, matching, etc).

Amongst the possible alternatives, I chose two to perform my estimations: regression-adjustment (RA) and inverse probability weighting (IPW). IPW uses weighted averages of the observed outcome variable to estimate means of the potential outcomes for each treatment group. The weights are the inverse of the estimated probability that an individual receives a treatment level. The IPW estimator models the probability of treatment without making any assumptions about the functional form of the outcome model. In contrast, RA estimators, fit separate regressions for each treatment level and use averages of the predicted outcomes over all the data to estimate the potential outcomes. This means that, the RA estimator models the outcome without any assumption about the functional form of the probability of treatment.

Because of their "double-robustness" property, the literature recommends the use of estimation procedures that include elements of both RA and IPW (Wooldridge, 2010). This is the case of the augmented-inverse-probability-weighted estimators (AIPW) and the inverse-probability-weighted with regression-adjustment estimators (IPWRA). The AIPW estimator is an IPW estimator that includes an augmentation term that corrects the treatment model when it is incorrectly specified (Rubin and van der Laan, 2008). The IPWRA estimator uses the inverse probability weights to estimate missing-data corrected coefficients that are subsequently used to compute the potential outcomes. (Wooldridge 2007 and 2010). The "double-robustness" property of AIPW and IPWRA means that only the treatment model or the outcome model needs to be correctly specified for the estimation to be consistent. In this chapter, I will present the effects of school type on educational and labour market outcomes by the age of 25 under the assumption of

selection on observables using AIPW and IPWRA as well as simply using IPW and RA independently to test the robustness of these results[81].

Estimation of ATEs under the assumption of selection on unobservables

Although IPW, RA, AIPW and IPWRA help to obtain a consistent estimate of ATEs under the assumption of selection on observable characteristics of individuals, as explained above, they do not produce a consistent estimate when the selection is on unobservable characteristics. In that case, we need an estimation method that can provide consistent estimates in the presence of endogeneity. To deal with this difficulty, I used the control function approach suggested by Wooldridge (2008, 2010) that allows the ATEs to be estimated based on potential outcome models, exactly as explained before, but taking the possible endogeneity into consideration. In very simple terms, the control function approach performs a two-stage estimation that includes the residuals from the treatment model in the models for the potential outcome. A correct identification strategy for this estimation method requires the inclusion of at least one instrumental variable in the treatment model that is sufficiently strongly correlated with the treatment assignment once the other covariates have been controlled for, but is unrelated to the unobserved individual heterogeneity (Wooldridge, 2010). Therefore, the appropriateness of this methodology for my estimations relies on the existence of at least one good instrument.

Unlike other two-stage estimation methods based on instrumental variables, the control function approach developed by Wooldridge allows the outcome variable to be linear, fractional or probabilistic. Therefore, I chose this approach because it allows me to identify ATEs under selection on unobservables for the educational attainment outcome variables without needing to assume a linear probability model. Moreover, this approach produces ATEs that are directly comparable with those obtained by the abovementioned

[81] Although the literature suggests that AIPW and IPWRA estimators are superior to using IPW and RA separately because of the double-robustness property, it is not easy to claim which of the two double robust methods provides us with a more reliable estimation of ATEs in the context of selection on observable characteristics of individuals. The AIPW method produces an efficient estimation of the variance and covariance matrix based on a semi-parametric correction that is similar to the Cramer-Rao bound approach for linear models. IPWRA does not implement this correction, so its variance is, theoretically, less efficient. However, the fact that one additional estimation step is required to implement this correction means that a larger sample error is introduced into the model. This is the reason why I present the estimations, based on these two methods, as being equally reliable. Moreover, as we will see in Sections 5.4, 5.5 and 5.6 of this chapter, their results tend to be quite similar.

methods based on the assumption of selection on observables: AIPW and IPWRA. The only limitation of the control function approach is that, unlike these methods, it has only been developed for dichotomous treatments. This means that, in practice, I cannot implement this method to estimate the effects of the four potential school-type trajectories on the outcome variables and can only obtain results for the dichotomous treatment variables described in Section 3.2.1.

Regarding the selection of an exogenous regressor or instrumental variable, it is certainly not easy to find a variable that correlates with the school type that individuals attended at primary and/or secondary level and does not theoretically correlate with the individual unobserved heterogeneity. However, to measure the stratification of students' achievement in test scores in the Chilean voucher school system, Mizala and Torche (2012) proposed a two-step model based on the number of private and public schools per-square kilometre in students' municipality as an instrument. Following this approach, I decided to use the supply of subsidised-private schools in a relevant geographic area during the time individuals started attending school as an instrument. This made it necessary to get administrative data of school supply in Chile. As my sample of interest includes individuals who started primary school between 1981 and 1994, and secondary education between 1989 and 2002, it would have been optimal to gather the information of school supply since 1981 by year, educational level (primary vs. secondary) and geographical location. Unfortunately, the Ministry of Education in Chile does not have consolidated registers of schools in the country for the 1980s[82]. For this reason, I decided that I would measure school supply at the moment that each individual started secondary school and would use that information as an instrument. Even though this means that I cannot instrumentalise school-type choice at the primary level, it at least guarantees that the information that I use to construct my instrumental variable reflects the school supply available for parents and students in a relevant geographical area when most individuals were transitioning from primary to secondary education.

[82] When I heard that the data for the 1980s were not available, I tried two alternative methods to obtain these data. First, I visited the archives of the Ministry of Education in Chile and attempted to recover budget documents containing the information of transfers from the central government to schools, from which it was possible to indirectly observe the number of schools per region, province and school type. However, these documents were unfortunately missing for many years during the 1980s. Second, I went to the National Library in Chile to access phone books from the 1980s, expecting to be able to recover a list of schools per region and ideally municipality based on schools' telephone numbers. However, not all phonebooks where available there either. Therefore, I realised that it would be very difficult and time consuming to construct a reliable registry of schools for each year for the 1980s, which is why I just decided to only construct an instrument for school-type attendance at the secondary level.

The data collected by the CSP Survey includes the region and zone (urban vs. rural) where individuals attended school. These variables allowed me to merge the information I obtained from the Ministry of Education with my panel of individuals. Although the exact municipality where individuals attended primary and secondary school was also part of the questionnaire in the 2002 and 2004 waves of the CSP Survey, the datasets unfortunately do not contain this information. In order to be able to construct an instrument aggregated at a smaller geographical level than the combination of region and zone, I used information about the province where individuals were born. Then, if at the time of attending primary and secondary school, they were still living in the same region and zone where they were born, I constructed instruments for each individual by determining the number of subsidised-private schools operating in that province and zone in the year they started secondary school. Of course, this requires us to assume that individuals remained in the same province. The obvious issue with this procedure is that I can only construct an instrument for individuals who did not migrate to a different region from the time they were born until they graduated from secondary school, which is the case for around 90% of my sample. This means that my attempt to control for selection on unobservable characteristics of individuals is unfortunately only valid for individuals who remained in the same region over their whole childhood and adolescence. Although this is not ideal, it is the best approach I could implement considering the data limitations I faced. It is important to remember that, as reported, the voucher school system gave parents and students total freedom to choose a school of their own preference regardless of the school location; since a municipality is a relatively small geographical area, and a region is a very large one, I thought it was likely that many individuals were willing to spend both time and money commuting a reasonable distance within the same province to attend the school of their preference.

A different instrumental variable that I constructed, but later decided not to use, was the religious orientation of individuals, measured as an indicator variable for whether the individual actively participates in a church, religious group or club. Many existing international evaluations of the effects of private, private-voucher or charter schools on students' performance have used similar instruments to correct for the

selection of students into these schools because religious families tend to choose them for their children[83]. In the case of Chile, Gallego (2006 and 2013) used the number of catholic priests per person in 1950 as an instrument for the entry of catholic and non-catholic voucher schools after 1981 with the purpose of investigating the effects of voucher school competition on educational outcomes. Given these precedents, and the fact that by 2002 approximately 32% of all subsidised-private schools were catholic[84], I reasoned that this instrument could be correlated enough with attendance to a subsidised-private school, when controlling for the other covariates, and not necessarily correlated with the unobserved individual heterogeneity. One of the potential problems with constructing this instrument was that the CSP Survey only asks respondents this question when they are adults. Therefore, the participation in a church or a religious group could arguably be the result of the school type that the individual attended at a primary and/or secondary level, which would invalidate this instrument for the purposes of this research. However, on the other hand, we could also argue that religious beliefs are formed during childhood and in most cases prevail throughout individuals' lives. Assuming the latter, I constructed the instrumental variable and evaluated its properties for use in my models. However, unlike the other instrumental variable 'the supply of subsidised-private schools in the relevant area where individuals started secondary school', this variable proved to have very little correlation with school type and even the sign of the correlation turned out to be the opposite of what I expected, which was the final reason why I decided to leave it out of my analyses[85].

[83] For instance, Patrinos (2013) uses information on whether parents take religiosity into consideration when choosing a school as an instrument for independent school attendance in the Netherlands, while Levin (2004) uses children' religious associations to compare the performance of students in municipal and catholic schools in the same country. In the US, many studies including Hoxby (2003), Greene and Kang (2004) and Cohen-Zada (2009) have used catholic population shares as an instrument for paying private school shares to analyse the effects of school competition on school performance.

[84] Own calculations based on Pasalacqua (2004) and Ministry of Education, MINEDUC (2003). I provide the proportion for 2002 because it is the closest year to 2004 (the latest year when individuals in my sample completed secondary school) in which the Chilean Catholic Church reported national statistics about catholic schools.

[85] A comparison of the correlation of both instrumental variables with the treatment variables is provided in Appendix B of this thesis.

5.4. Analysis: effects of school-type choice on educational attainment by the age of 25

5.4.1. Results

This section presents descriptive statistics, logistic regression analyses and potential outcomes models that account for the associations between individuals' school-type trajectories and their educational attainment by the age of 25. For simplicity, throughout this section, I will refer to subsidised-private schools simply as 'private schools' because fully-paid private schools are completely left out of these analyses. Moreover, when referring to school-type trajectories, both in tables and in the body text, the first school type mentioned before the hyphen corresponds to the one that individuals attended at the primary level and the second one, after the hyphen, corresponds to the school type that individuals attended at the secondary level.

5.4.1.1. Descriptive statistics

Access to post-secondary and university education

The descriptive statistics reported in Table 5.1 clearly show an association between the school-type trajectory followed by students who completed secondary school and their access to post-secondary education and university by the age of 25. As expected, the highest proportions of access to post-secondary education in general, and university in particular, are found amongst those who attended a private school at both levels, followed by those who attended a private school at least at some point during their school careers and finally by those who only attended public schools. However, the largest difference in access rates among these four groups is the one between individuals who always studied at public schools and the other trajectories. Interestingly, for those whose school paths combine both private and public schools, having attended a private school at secondary level rather than at primary level does not seem to make a difference to their ability to access post-secondary education. On the contrary, the rate of access to

university is somewhat higher among those who attended a public secondary and a private primary school (32.03%) than among those who attended a private secondary and a public primary school (28.09%)[86].

Table 5.1: Number and proportion of students that accessed post-secondary education and university studies by the age of 25 by school-type trajectory

School-type trajectory (primary - secondary)	Access to post-secondary education by the age of 25						Access to university by the age of 25					
	Did not access		Accesed		Total		Did not access		Accesed		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Public-Public	520	61.47%	326	38.53%	846	100%	702	82.98%	144	17.02%	846	100%
Private-Public	69	45.10%	84	54.90%	153	100%	104	67.97%	49	32.03%	153	100%
Public-Private	117	43.82%	150	56.18%	267	100%	192	71.91%	75	28.09%	267	100%
Private-Private	114	36.31%	200	63.69%	314	100%	204	64.97%	110	35.03%	314	100%
Total	820	51.90%	760	48.10%	1,580	100%	1,202	76.08%	378	23.92%	1,580	100%

Graduation from post-secondary and university education

Table 5.2 reproduces the analysis of Table 5.1 but considers post-secondary and college graduation by the age of 25. We can see that the school-type trajectory that individuals followed is also associated with their rates of graduation by the age of 25 in Chile. Again, we see that those who attended a private school at some point experienced much higher graduation rates than their counterparts who always studied at a public school. It is important to notice that, graduation rates for the group who studied primary education in a private school and secondary education in a public school are higher than those who followed the opposite trajectory. Even more interestingly, in the case of graduation from post-secondary education in general, the proportion of graduates from the combined trajectory private-public (33.78%) is even higher than the proportion of graduates from the private-private trajectory (32.99%), although the difference is not large. However, we do not observe the same pattern in the case of university graduates[87].

[86] Considering these results, I collapsed this information into the dichotomous treatment variables 'attended a private school at any level', and 'attended a private secondary school' and recalculated the proportion of individuals who accessed post-secondary education and university by the age of 25. These calculations are reported in Appendix C (Table C-1 and Table C-2).

[87] Given that in the case of post-secondary and university graduation by the age of 25, having attended a subsidised-private school at any point of the school career is what it seems to make a difference for individuals; therefore, I also collapsed this information into the dichotomous variables 'attended a private school at any level', and 'attended a private secondary school' and recalculated these proportions for them. The results can be found in Appendix C (Table C-3 and Table C-4)

Table 5.2: Number and proportion of students that graduated from post-secondary education and university by the age of 25 by school-type trajectory

School-type trajectory (primary - secondary)	Post-secondary graduation by the age of 25						University graduation by the age of 25					
	Did not graduate		Graduated		Total		Did not graduate		Graduated		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Public-Public	652	81.09%	152	18.91%	804	100%	752	93.53%	52	6.47%	804	100%
Private-Public	98	66.22%	50	33.78%	148	100%	120	81.08%	28	18.92%	148	100%
Public-Private	177	71.66%	70	28.34%	247	100%	209	84.62%	38	15.38%	247	100%
Private-Private	195	67.01%	96	32.99%	291	100%	231	79.38%	60	20.62%	291	100%
Total	1,122	75.30%	368	24.70%	1,490	100%	1,312	88.05%	178	11.95%	1,490	100%

5.4.1.2. Logistic regressions

Models for access to post-secondary and university education

The results of the logistic regressions for access to post-secondary education and college are reported in Table 5.3 and Table 5.4 respectively. As we know for certain that we have selection on observable characteristics of students at the very least, I am focusing my analysis here on the significance and direction of the estimated coefficients rather than on their magnitudes. The logistic regressions were conducted by first adding gender and the social background variables, followed by family context variables, location and time related variables. Finally, as explained in the section on variables in this chapter, I also included the variable 'average global mark at secondary school', although it is important to remember that this variable could also be significantly explained by individuals' school-type trajectories; ergo, the coefficients estimated for the school-type trajectories after including this variable need to be interpreted with caution. For example, if private schools congregate students from the most socially advantaged backgrounds and, as expected, social background correlates with students' performance at school, we can of course anticipate better marks for the trajectory private-private than in other trajectories. As marks at the secondary education level also play an important role in accessing and completing post-secondary education, we should expect to see that adding this regressor has the effect of ameliorating the predicted effects of school types on educational attainment by the age of 25. In an extreme case, if the only things that matter in being able to access and complete post-secondary education are captured by these marks, the predicted effect of school

type on educational attainment could even become insignificant. Keeping this in mind, it is still interesting to test whether the school-type effects persist over and above these marks.

For most of the specifications presented in Table 5.3 and Table 5.4 (except for the case of access to post-secondary education when I control for a large number of covariates), having attended a private school at either primary or secondary level makes a positive and significant difference to the probability of having accessed these educational institutions by the age of 25 compared to having never attended a private school. All the control variables, regardless of their significance, have the expected signs. The only exception to this, is the variable 'always attended school in the capital region' in the model for access to university that, contrary to intuition, exhibits a significant and negative coefficient. I explore this issue further by using interaction effects models later in this section. Moreover, as anticipated, socioeconomic background variables, especially parental education, play an important role in explaining access rates.

Table 5.3 and Table 5.4 also show that the age of the reform when individuals started primary school has a positive and significant coefficient after controlling for all the other covariates. This could be interpreted as evidence that the access to post-secondary and university education significantly improved for all individuals over the post-reform period, regardless of their school-type trajectory, which coincides with the evidence of a large expansion of the tertiary education sector in the country during the same period. It is also important to note that, the impact of the trajectories public-private and private-private on the access to post-secondary education by the age of 25 are significantly greater than the impact of the trajectory public-public even after controlling for the overall mark at secondary school. The same occurs with the three trajectories that include having attended a private school at least at one level (private-public, public-private and private-private) on the probability of accessing university by the age of 25: they all have a significantly larger impact on this outcome than the trajectory public-public, over and above the effect of the overall secondary school mark.

Table 5.3: Logistic regressions for the probability of having accessed post-secondary education by the age of 25: main effects

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
school type trajectory = 0, public-public (omitted)									
school type trajectory = 1, private-public	0.664***	0.664***	0.443**	0.337*	0.302	0.282	0.290	0.287	0.275
	(0.177)	(0.177)	(0.186)	(0.188)	(0.190)	(0.192)	(0.193)	(0.193)	(0.195)
school type trajectory = 2, public-private	0.715***	0.715***	0.676***	0.692***	0.692***	0.666***	0.654***	0.656***	0.587***
	(0.142)	(0.142)	(0.148)	(0.150)	(0.151)	(0.152)	(0.154)	(0.154)	(0.157)
school type trajectory = 3, private-private	1.029***	1.032***	0.767***	0.735***	0.730***	0.688***	0.691***	0.687***	0.656***
	(0.137)	(0.137)	(0.143)	(0.145)	(0.146)	(0.147)	(0.151)	(0.152)	(0.153)
sex = 1, male		0.0727	-0.0161	-0.00909	0.00324	0.00507	0.00498	0.00469	0.113
		(0.103)	(0.108)	(0.109)	(0.110)	(0.111)	(0.111)	(0.111)	(0.114)
parental education			0.171***	0.117***	0.115***	0.123***	0.125***	0.124***	0.126***
			(0.0161)	(0.0182)	(0.0183)	(0.0190)	(0.0191)	(0.0191)	(0.0193)
social status score				0.658***	0.377***	0.355**	0.379**	0.386***	0.430***
				(0.107)	(0.143)	(0.145)	(0.148)	(0.148)	(0.150)
parental social class = 2, IVa+b: Self-Employed					-0.311	-0.317	-0.290	-0.274	-0.253
					(0.216)	(0.218)	(0.220)	(0.220)	(0.222)
parental social class = 3, V+VI: Skilled Manual and Farmers					-0.566***	-0.567***	-0.542**	-0.528**	-0.484**
					(0.210)	(0.213)	(0.214)	(0.214)	(0.216)
parental social class = 4, VIIa+IVc: Semi & Unskilled manual and Farm workers					-0.644***	-0.622***	-0.609***	-0.604**	-0.532**
					(0.231)	(0.234)	(0.235)	(0.235)	(0.238)
number of siblings						-0.118***	-0.116***	-0.110***	-0.109***
						(0.0388)	(0.0388)	(0.0390)	(0.0389)
parental age when child started primary school						0.0246***	0.0244***	0.0242***	0.0244***
						(0.00719)	(0.00721)	(0.00722)	(0.00727)
biparental family = 1, lived with both parents						0.229	0.225	0.236	0.206
						(0.175)	(0.175)	(0.176)	(0.177)
attended school in the capital region = 1, always attended school in the capital region							0.00778	0.0116	0.0244
							(0.118)	(0.119)	(0.120)
zones where attended primary & secondary school = 2, urban-rural							1.125	1.116	1.172
							(0.921)	(0.925)	(0.932)
zones where attended primary & secondary school = 3, rural-urban							0.693	0.704	0.782
							(0.640)	(0.642)	(0.653)
zones where attended primary & secondary school = 4, urban-urban							0.409	0.441	0.509
							(0.607)	(0.610)	(0.621)
age of the reform when started primary school								0.0334*	0.0387**
								(0.0193)	(0.0196)
average global score at secondary school									0.690***
									(0.129)
constant	-0.467***	-0.503***	-2.097***	-1.430***	-1.001***	-1.911***	-2.364***	-2.541***	-6.558***
	(0.0706)	(0.0870)	(0.178)	(0.204)	(0.260)	(0.420)	(0.720)	(0.730)	(1.062)
Observations	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5.4: Logistic regressions for the probability of having accessed university studies by the age of 25: main effects

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
school type trajectory = 0, public-public (omitted)									
school type trajectory = 1, private-public	0.832***	0.832***	0.575***	0.516**	0.486**	0.456**	0.518**	0.518**	0.520**
	(0.196)	(0.196)	(0.206)	(0.208)	(0.209)	(0.211)	(0.213)	(0.214)	(0.218)
school type trajectory = 2, public-private	0.644***	0.644***	0.573***	0.585***	0.580***	0.569***	0.645***	0.651***	0.524***
	(0.164)	(0.164)	(0.172)	(0.173)	(0.174)	(0.175)	(0.178)	(0.179)	(0.184)
school type trajectory = 3, private-private	0.966***	0.967***	0.659***	0.638***	0.626***	0.592***	0.708***	0.701***	0.648***
	(0.150)	(0.150)	(0.157)	(0.159)	(0.159)	(0.160)	(0.167)	(0.168)	(0.172)
sex = 1, male		0.0117	-0.0942	-0.0851	-0.0811	-0.0786	-0.0589	-0.0707	0.0743
		(0.120)	(0.126)	(0.127)	(0.128)	(0.129)	(0.129)	(0.130)	(0.134)
parental education			0.205***	0.152***	0.149***	0.151***	0.151***	0.151***	0.151***
			(0.0193)	(0.0224)	(0.0224)	(0.0226)	(0.0228)	(0.0229)	(0.0232)
social status score				0.505***	0.314*	0.298*	0.300*	0.319*	0.362**
				(0.118)	(0.166)	(0.168)	(0.170)	(0.171)	(0.174)
parental social class = 2, IVa+b: Self-Employed					-0.0988	-0.0999	-0.0886	-0.0484	-0.0188
					(0.231)	(0.234)	(0.235)	(0.237)	(0.242)
parental social class = 3, V+VI: Skilled Manual and Farmers					-0.201	-0.201	-0.234	-0.200	-0.144
					(0.231)	(0.234)	(0.237)	(0.239)	(0.244)
parental social class = 4, VIIa+IVc: Semi & Unskilled manual and Farm workers					-0.508*	-0.491*	-0.529**	-0.535**	-0.448
					(0.260)	(0.263)	(0.266)	(0.268)	(0.275)
number of siblings						-0.140***	-0.140***	-0.121**	-0.121**
						(0.0492)	(0.0493)	(0.0499)	(0.0501)
parental age when child started primary school						0.0182**	0.0174**	0.0169**	0.0188**
						(0.00831)	(0.00834)	(0.00839)	(0.00858)
biparental family = 1, lived with both parents						0.172	0.174	0.227	0.183
						(0.212)	(0.213)	(0.215)	(0.219)
attended school in the capital region = 1, always attended school in the capital region							-0.381***	-0.363***	-0.347**
							(0.137)	(0.138)	(0.141)
zones where attended primary & secondary school = 2, urban-rural							-0.307	-0.340	-0.224
							(1.326)	(1.338)	(1.362)
zones where attended primary & secondary school = 3, rural-urban							0.279	0.352	0.505
							(0.826)	(0.838)	(0.865)
zones where attended primary & secondary school = 4, urban-urban							0.139	0.264	0.438
							(0.780)	(0.792)	(0.818)
age of the reform when started primary school								0.103***	0.117***
								(0.0223)	(0.0230)
average global score at secondary school									1.021***
									(0.152)
constant	-1.584***	-1.590***	-3.618***	-3.008***	-2.757***	-3.294***	-3.293***	-3.927***	-10.01***
	(0.0915)	(0.109)	(0.234)	(0.265)	(0.312)	(0.487)	(0.896)	(0.922)	(1.330)
Observations	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Since all coefficients presented in Table 5.3 and Table 5.4 were estimated in relation to the reference school-type trajectory public-public, I reproduced the estimations that include all covariates that are not contemporary to the outcomes (specification 8), but changing the school-type trajectory of reference. These estimations can be found in Appendix D (Table D-1 and Table D-2). In the case of access to post-secondary education, I find no evidence that the impact of trajectories public-public and private-public are significantly different from one another at the 90% confidence level or that the impact of the trajectories public-private and private-private are statistically different from one another at the same confidence level. Therefore, there are reasons to argue that having attended a private school at the secondary level makes a difference for individuals to enter any post-secondary educational program with respect to having attended a public secondary school. In contrast, it does not seem to be the case that having attended a private school only at the primary level increases students' chances of starting post-secondary studies in comparison with having always attended a public school. In the case of access to university, the results are different. The coefficients estimated indicate that what makes a significant difference in the probability of having been enrolled in a university program by the age of 25 is having studied in a private school either at the primary or the secondary level, in comparison with never having attended a private school. In other words, I do not find that the trajectory private-private increases the chances of students to access university more than the trajectories that combine a public and a private school at the 95% confidence level.

One of the hypotheses of this thesis is that the impact of school type on the access to post-secondary education, and more particularly university studies, can be mediated by some individuals' characteristics. To explore this possibility, I run logistic regression models that interact school-type trajectories with all the social background variables (parental education, parental social status and parental social class) and all the covariates that turned out to be significant in the main effect models presented in Table 5.3 and Table 5.4, which are: the dummy variable for having always attended school in the capital region, the age of the reform when students started primary school, and individuals' overall mark at secondary school. For simplicity, I am only commenting here on the results of interaction effects that were significant and robust to different specifications, but the regression tables can be found in Appendix D.

First, contrary to my previous beliefs, I did not find many significant interaction effects between socioeconomic background and school-type trajectories for either the access to post-secondary education or university by the age of 25. As reported in Table D-3 and Table D-4, the only exception to this was social status. In particular, for the probability of having accessed a post-secondary education institution, the only significant positive interaction I found was between individuals' social status and the trajectory private-public. This indicates that the individuals from more cultured backgrounds may have had an advantage to accessing post-secondary studies relative to their counterparts from other cultural backgrounds who followed the same school trajectory. As I will explain in more detail in the conclusion of this section, a plausible explanation for this result could be that a non-negligible subset of the students who followed this school-type path may have come from upper middle-class families that opted for enrolling their children in one of the large traditional public secondary schools that exist in Chile. These schools are typically in great demand because they are very good quality and receive students from a wide diversity of social backgrounds. In this context, we could expect that those in the position to make a better use of this trajectory to transit to tertiary education were students from higher social statuses. In the case of the interaction effect of school-type trajectories and social status on the probability of accessing university studies by the age of 25, I find a similar pattern of positive interactions, albeit with lower magnitude, for the trajectory private-public but also for the trajectory private-private. The latter reflects that, unsurprisingly, the children of those with more cultured backgrounds make a better use of private education to enter a university program.

To test my hypothesis that subsidised-private schools became relatively more effective than public schools after the introduction of the 'Shared Financing Scheme', I run logistic regressions including the interaction of school trajectories with two variables accounting for the maturity of the reform; these variables are: the age of the reform when students started primary school and a dummy variable indicating whether the individuals started secondary education after 1993 (the year when subsidised-private schools were allowed to charge fees to parents on top of the vouchers). The results of these estimations, which are reported in Table D-5 and Table D-6 in Appendix D, provide some evidence (only at 10% level of confidence and before controlling for students' marks) that the likelihood of accessing university for those students coming

from the trajectory private-private may have decreased after the introduction of the 'Shared Financing Scheme' in 1993. However, I do not observe the same pattern for those who followed the trajectory public-private. In any case, these results do not provide support for the hypothesis that student fees may have made the subsidised private educational sector more successful at helping students to access university.

Apart from trying to test my research hypothesis, the interaction effect analyses provide some other relevant findings. For instance, the interaction effects of school-type trajectories with the indicator variable for whether individuals always attended school in the capital region on the probability of accessing a post-secondary educational institution or a university by the age of 25 are presented in
Table D-7 and Table D-8 respectively. We already saw in the main effect models that the coefficients associated with this indicator variable are negative and significant in the case of university access. It is interesting to see, that this result is mainly driven by those who attended a private secondary school, and more particularly, those who followed the trajectory public-private. It is possible that having attended a secondary subsidised-private school in a region other than the capital region in Chile, gave a relative advantage to those students in comparison with their counterparts who lived in the capital region because universities in Santiago and its surroundings tend to be more selective than universities located in other regions. For example, the minimum scores on cognitive ability tests to access selective bachelor's programmes in the capital region tend to be higher[88].

Finally, it is interesting to observe how the interaction of secondary school marks with school-type trajectory affects the probability of having accessed university studies by the age of 25. Table D-9 shows a positive interaction effect between marks and the trajectory private-public (although only at 10% level of significance) that persists after controlling for all family, location and social background variables. This result may be a reflection of the same phenomenon I described for Table D-3 and Table D-4, which is that a considerable number of the students who followed this school trajectory may have attended high quality public secondary schools, such as the so-called 'emblematic lyceums'. Although these schools reportedly

[88] It is important to mention that in Chile, unlike in many European countries, it is not common for universities to offer student accommodation with subsidised rents. This, in addition to the high tuition fees, means that very often undergraduate students stay living with their parents and families until they graduate.

give students lowers marks on average than other schools, students who graduate from these schools are on average more successful at entering university programs than students from subsidised-private schools (Rivera and Guevara, 2016).

Models for graduation from post-secondary and university education

Having analysed the association between school-type trajectories and the likelihood of having accessed post-secondary education and, more particularly, a university by the age of 25, we now study the relationship between the same school-type trajectories and the likelihood of having graduated from those studies by the same age. Table 5.5 and Table 5.6 show the results of the logistic regressions for graduation from post-secondary education and university, respectively. To be consistent with the models explaining access to post-secondary and university education, I controlled for a set of covariates that account for individuals' social background, family context, geographical location and period of school studies. As we can see in these tables, all significant coefficients associated with these covariates have the expected sign.

Table 5.5: Logistic regressions for the probability of having graduated from post-secondary education by the age of 25: main effects

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
school type trajectory = 0, public-public (omitted)									
school type trajectory = 1, private-public	0.783***	0.792***	0.604***	0.547***	0.516**	0.512**	0.520**	0.522**	0.514**
	(0.196)	(0.196)	(0.202)	(0.203)	(0.205)	(0.206)	(0.208)	(0.208)	(0.210)
school type trajectory = 2, public-private	0.529***	0.532***	0.469***	0.474***	0.468***	0.450***	0.426**	0.424**	0.317*
	(0.167)	(0.168)	(0.171)	(0.172)	(0.173)	(0.173)	(0.176)	(0.176)	(0.179)
school type trajectory = 3, private-private	0.748***	0.739***	0.510***	0.486***	0.477***	0.461***	0.459***	0.463***	0.396**
	(0.154)	(0.154)	(0.160)	(0.161)	(0.162)	(0.163)	(0.168)	(0.168)	(0.171)
sex = 1, male		-0.343***	-0.419***	-0.416***	-0.416***	-0.415***	-0.421***	-0.421***	-0.306**
		(0.123)	(0.126)	(0.127)	(0.128)	(0.128)	(0.129)	(0.129)	(0.132)
parental education			0.126***	0.0777***	0.0744***	0.0791***	0.0816***	0.0825***	0.0808***
			(0.0182)	(0.0214)	(0.0215)	(0.0218)	(0.0219)	(0.0219)	(0.0221)
social status score				0.465***	0.137	0.116	0.155	0.150	0.167
				(0.116)	(0.159)	(0.160)	(0.162)	(0.162)	(0.164)
parental social class = 2, IVa+b: Self-Employed					-0.491**	-0.501**	-0.463**	-0.476**	-0.465*
					(0.232)	(0.234)	(0.235)	(0.236)	(0.239)
parental social class = 3, V+VI: Skilled Manual and Farmers					-0.658***	-0.666***	-0.620***	-0.633***	-0.606**
					(0.230)	(0.232)	(0.234)	(0.235)	(0.238)
parental social class = 4, VIIa+IVc: Semi & Unskilled manual and Farm workers					-0.725***	-0.715***	-0.693***	-0.698***	-0.645**
					(0.257)	(0.259)	(0.261)	(0.261)	(0.265)
number of siblings						-0.0529	-0.0505	-0.0549	-0.0533
						(0.0450)	(0.0451)	(0.0452)	(0.0451)
parental age when child started primary school						0.0165**	0.0166**	0.0168**	0.0180**
						(0.00816)	(0.00820)	(0.00820)	(0.00834)
biparental family = 1, lived with both parents						0.160	0.147	0.137	0.119
						(0.204)	(0.204)	(0.204)	(0.207)
attended school in the capital region = 1, always attended school in the capital region							0.0883	0.0822	0.113
							(0.134)	(0.134)	(0.136)
zones where attended primary & secondary school = 2, urban-rural							0.662	0.689	0.730
							(1.130)	(1.128)	(1.138)
zones where attended primary & secondary school = 3, rural-urban							0.737	0.734	0.805
							(0.809)	(0.808)	(0.820)
zones where attended primary & secondary school = 4, urban-urban							0.219	0.200	0.304
							(0.775)	(0.775)	(0.785)
age of the reform when started primary school								-0.0274	-0.0230
								(0.0220)	(0.0223)
average global score at secondary school									0.796***
									(0.145)
constant	-1.456***	-1.301***	-2.492***	-1.939***	-1.424***	-2.090***	-2.419***	-2.285**	-6.965***
	(0.0901)	(0.104)	(0.209)	(0.243)	(0.297)	(0.473)	(0.886)	(0.892)	(1.250)
Observations	1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5.6: Logistic regressions for the probability of having graduated from university by the age of 25: main effects

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
school type trajectory = 0, public-public (omitted)									
school type trajectory = 1, private-public	1.216***	1.221***	0.940***	0.910***	0.862***	0.833***	0.904***	0.908***	0.922***
	(0.254)	(0.254)	(0.264)	(0.264)	(0.266)	(0.268)	(0.272)	(0.273)	(0.280)
school type trajectory = 2, public-private	0.967***	0.968***	0.879***	0.892***	0.879***	0.874***	0.906***	0.911***	0.713***
	(0.227)	(0.227)	(0.235)	(0.235)	(0.236)	(0.237)	(0.240)	(0.240)	(0.248)
school type trajectory = 3, private-private	1.323***	1.317***	0.995***	0.982***	0.964***	0.942***	1.035***	1.030***	0.935***
	(0.204)	(0.204)	(0.211)	(0.212)	(0.213)	(0.214)	(0.222)	(0.222)	(0.228)
sex = 1, male		-0.233	-0.344**	-0.337**	-0.341**	-0.331*	-0.334*	-0.347**	-0.168
		(0.165)	(0.170)	(0.171)	(0.172)	(0.173)	(0.174)	(0.174)	(0.181)
parental education			0.202***	0.153***	0.147***	0.148***	0.151***	0.151***	0.144***
			(0.0255)	(0.0309)	(0.0308)	(0.0309)	(0.0312)	(0.0312)	(0.0314)
social status score				0.404***	0.0842	0.0814	0.116	0.129	0.137
				(0.152)	(0.215)	(0.217)	(0.218)	(0.219)	(0.225)
parental social class = 2, IVa+b: Self-Employed					-0.333	-0.321	-0.267	-0.241	-0.225
					(0.299)	(0.302)	(0.304)	(0.305)	(0.314)
parental social class = 3, V+VI: Skilled Manual and Farmers					-0.422	-0.411	-0.389	-0.358	-0.332
					(0.303)	(0.307)	(0.310)	(0.311)	(0.323)
parental social class = 4, VIIa+IVc: Semi & Unskilled manual and Farm workers					-0.877**	-0.844**	-0.875**	-0.878**	-0.823**
					(0.353)	(0.356)	(0.362)	(0.364)	(0.378)
number of siblings						-0.127*	-0.124*	-0.111	-0.109
						(0.0675)	(0.0675)	(0.0682)	(0.0686)
parental age when child started primary school						0.0147	0.0146	0.0144	0.0185
						(0.0111)	(0.0112)	(0.0112)	(0.0117)
biparental family = 1, lived with both parents						0.0771	0.0689	0.103	0.0694
						(0.281)	(0.283)	(0.284)	(0.291)
attended school in the capital region = 1, always attended school in the capital region							-0.176	-0.148	-0.0870
							(0.180)	(0.181)	(0.185)
zones where attended primary & secondary school = 2, urban-rural							0.572	0.524	0.684
							(1.521)	(1.535)	(1.568)
zones where attended primary & secondary school = 3, rural-urban							0.519	0.579	0.756
							(1.121)	(1.130)	(1.162)
zones where attended primary & secondary school = 4, urban-urban							-0.250	-0.163	0.0983
							(1.072)	(1.082)	(1.110)
age of the reform when started primary school								0.0746***	0.0871***
								(0.0287)	(0.0296)
average global score at secondary school									1.378***
									(0.204)
constant	-2.671***	-2.566***	-4.613***	-4.055***	-3.568***	-3.921***	-3.733***	-4.180***	-12.47***
	(0.143)	(0.160)	(0.328)	(0.378)	(0.430)	(0.647)	(1.219)	(1.244)	(1.793)
Observations	1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The most salient finding in Table 5.5 and Table 5.6 is that, having attended a subsided private school at any level is associated with significantly higher graduation rates from any post-secondary education programme and, in particular, from a bachelor's degree with respect to having studied both primary and secondary education in a public school. We can also see that these effects persist after controlling for all the sets of covariates and even after controlling for the overall school marks at secondary school.

Another interesting finding in Table 5.5 and Table 5.6 is that, as already observed in the descriptive statistics, having attended a private school at primary level and a public school at secondary level is associated with higher post-secondary graduation rates than having always attended a private school with and without controlling for all the covariates (although these differences are not statistically significant, as we will see shortly). A plausible explanation for these findings is the same I provided for the models for access to post-secondary and university education; the group who followed the trajectory 'private-public' is the smallest of all and likely to be composed of a large number of students from competitive traditional secondary public schools in Chile. Like all public schools in Chile, these schools are free but tend to be chosen by talented students from all social backgrounds because they are well known for being high quality. Also,

since these schools are normally highly oversubscribed, they often need to use selection procedures. I believe that, if an individual who studied in a private primary school, meaning that his/her parents can possibly afford a secondary subsidised-private school, opted for a public school at the secondary level, it is likely that he/she attended a good quality public school, which could explain these findings. However, in the case of the effect of school-type trajectories on the likelihood of having graduated from a university degree by the age of 25, the trajectory private-private shows a larger impact than the trajectory private-public in all specifications, which is a less surprising result.

To better understand which trajectories are the ones making a difference for individuals' graduation rates, I re-estimated the main effect models that include all covariates that are not contemporary to the outcomes (specification 8 in Table 5.5 and Table 5.6) but changed the school-type trajectory of reference. These estimations are reported in Table E-1 and Table E-2 in Appendix E. As we can clearly see in these tables, there is statistically no difference between any of the coefficients estimated for the impact of school trajectories that include a private school, at any level, on the probability of being a either a post-secondary or a university graduate by the age of 25; however, they are all significantly larger than the coefficients estimated for the trajectory public-public. Simply put, I find evidence that attending a private school at any level has a positive and significant effect on the chances of students to graduate from post-secondary education by the age of 25, but do not find substantial evidence that any of the school paths containing at least one private school is more effective than the others.

In order to see whether school-type trajectories have differential effects on graduation rates by the age of 25 across certain key characteristics of students, I also run interaction effect models for school-type trajectories with these variables. In particular, I produced interaction models with all the covariates that appeared to be significant in Table 5.5 and Table 5.6; this includes all social background variables, overall marks at secondary school and the age of the reform when individuals started primary school. From all the analysed interactions, only the latter appeared to be significant and robust to different specifications; therefore, I am only presenting these results in this section and the corresponding tables can be found in Appendix E.

As reported in Table E-3 and Table E-4, there is a significant positive interaction (at the 90% significance level) between the effect of the trajectory private-public and the age of the reform on the probability of both having graduated from post-secondary education and having completed at least a bachelor's degree by the age of 25. This means that individuals who studied primary school at a private school and secondary school at a public school, significantly improved their chances of having been awarded a vocational or an academic degree by the age of 25 over the post-reform period. However, I do not find the same tendency for any of the other school trajectories analysed.

Summary of findings for access to and graduation from post-secondary and university education

The extensive analyses of main effect and interaction effect models for the influence of school-type trajectories on the probability of having accessed and completed a post-secondary educational program by the age of 25, which I presented in this section, allow me to conclude many important points. First, it seems that, having attended a private school at any level is the key variable improving individuals' chances of both having accessed university studies and having graduated from any post-secondary educational institution, including a university, by the age of 25. In other words, the exact school-type trajectory does not seem to be significantly relevant in explaining educational outcomes at the age of 25, as long as it includes attendance at a private school at any point. The only exception to this is for the case of access to post-secondary education by the age of 25 where apparently having attended a private school at the secondary school level plays the most significant role.

Considering the above realisation, I estimated main effects models for the four outcomes and the dichotomous explanatory variables 'attended a secondary private school', and 'attended a private school at any level'. A summary of the results of the estimated coefficients for having attended a private school at secondary level and at any level on all the educational outcomes by the age of 25 are shown in Table 5.7 and Table 5.8 respectively.

Table 5.7: Main effects of having attended a secondary subsidised-private school on educational outcomes by the age of 25: logistic regression coefficients

OUTCOMES	(1)	(2)	(3)	(4)	(5)
1) Model for access to post-secondary education by the age of 25 (N=1,580)	0.778***	0.664***	0.632***	0.622***	0.575***
	(0.106)	(0.113)	(0.114)	(0.118)	(0.119)
2) Model for access to university studies by the age of 25 (N=1,580)	0.668***	0.507***	0.489***	0.567***	0.480***
	(0.120)	(0.128)	(0.128)	(0.134)	(0.137)
3) Model for graduation from post-secondary education by the age of 25 (N=1,490)	0.505***	0.368***	0.353***	0.332**	0.247*
	(0.122)	(0.128)	(0.128)	(0.132)	(0.134)
4) Model for graduation from university by the age of 25 (N=1,490)	0.887***	0.703***	0.695***	0.733***	0.590***
	(0.162)	(0.169)	(0.170)	(0.174)	(0.180)
controls for social background	NO	YES	YES	YES	YES
controls for family demographics	NO	NO	YES	YES	YES
controls for time and geographical location	NO	NO	NO	NO	YES
controls for secondary school overall mark	NO	NO	NO	NO	YES

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5.8: Main effects of having attended a subsidised-private school at any school level on educational outcomes by the age of 25: logistic regression coefficients

OUTCOMES	(1)	(2)	(3)	(4)	(5)
1) Model for access to post-secondary education by the age of 25 (N=1,580)	0.836***	0.627***	0.596***	0.589***	0.547***
	(0.103)	(0.110)	(0.111)	(0.115)	(0.116)
2) Model for access to university studies by the age of 25 (N=1,580)	0.825***	0.581***	0.556***	0.643***	0.576***
	(0.121)	(0.129)	(0.129)	(0.135)	(0.138)
3) Model for graduation from post-secondary education by the age of 25 (N=1,490)	0.679***	0.482***	0.468***	0.462***	0.393***
	(0.122)	(0.128)	(0.128)	(0.132)	(0.134)
4) Model for graduation from university by the age of 25 (N=1,490)	1.180***	0.914***	0.896***	0.961***	0.854***
	(0.174)	(0.181)	(0.182)	(0.187)	(0.192)
controls for social background	NO	YES	YES	YES	YES
controls for family demographics	NO	NO	YES	YES	YES
controls for time and geographical location	NO	NO	NO	YES	YES
controls for secondary school overall mark	NO	NO	NO	NO	YES

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Although, as we know, the estimated coefficients cannot be interpreted causally and must only be seen as correlations, it stands out that, regardless of the covariates introduced in the models, they are all positive and significant. As expected, I obtained larger coefficients for the treatment 'having attended a private school at any level' than for the treatment 'having attended a secondary private school' for all the educational outcomes, except for the access to post-secondary education when I control for covariates. I also found larger correlations for the models explaining graduation from university with respect to the other models; however, it is important to keep in mind that this group is likely to be the most affected by the problem of lack of a valid counterfactual group to make straightforward comparisons.

Another important finding of the analyses presented in this section is that, among the individuals included in the sample I analysed (who were born between 1975 and 1988), those who were born later seem to have experienced better chances of accessing to and graduating from post-secondary education in general and university studies in particular at the age of 25, regardless of their school-type trajectory. This coincides

with the period of large proliferation of new tertiary education providers in Chile. Regarding how time modified the effect of different school-type trajectories on educational outcomes, I found that the trajectory private-public became more effective than the other three trajectories in terms of graduation rates over time. In contrast, the trajectory private-private seems to have become comparatively less effective than the others in terms of the rate of access to university over time.

Finally, I did not find any evidence that subsidised-private schools provided better chances to access and graduate from post-secondary education to the most socially disadvantaged individuals in Chile - compared with their more advantaged counterparts - during the 24-year period following the implementation of the voucher school reform in 1981. As reported, when I look at the interaction effects of school-type trajectories with parental education and parental social class, I do not find significant and robust effects for any of the four educational outcomes under analysis. In contrast, I do find significant interaction effects of parental social status with: (1) the trajectory private-public for the access to both post-secondary and university studies by the age of 25, and (2) the trajectory private-private for the access to university at the same age. Nevertheless, all these interactions were positive, meaning that these school paths seem to have been more effective amongst the children of high-status parents. Therefore, if any, they made post-secondary education more accessible for children that are better-off rather than for the most socially disadvantaged.

5.4.1.3. Estimation of ATEs under the assumption of selection on observables

As discussed in the prior section, the results obtained from simple regression models cannot be interpreted as causal given all the problems of selection on observable and perhaps unobservable characteristics of individuals. Therefore, in this section I use potential outcome models to estimate more adequate average treatment effects (ATEs) under selection on observables. As explained in the methodological section of this chapter, I do this by using inverse probability weighting models (IPW), regression adjustment models (RA) and those that combine these two and are considered as double-robust (AIPW and IPWRA). Given that the latter are two-stage models (i.e., they involve the estimation of both outcome models and selection

models), and I am reporting results for four educational outcomes by the age of 25, I have opted for only reporting the ATEs and the estimated potential outcome means for the untreated individuals (POMs) in the main body of this chapter and report all the rest of the estimated coefficients in Appendix F.

The analysis of multiple regressions presented in the previous section provided evidence that the influence of school-type trajectories on the four outcomes can be summarised by the influence of two dichotomous variables indicating whether individuals attended a private school at the secondary level or whether they attended a private school at any level. Therefore, I am only presenting the results for these two dichotomous treatment variables.

All the ATEs reported in this section were estimated using a logistic regression for both the treatment model and the outcome model. Regarding the specification of the treatment model, as suggested by Cattaneo *et al.* (2013), I used the Bayesian information criterion to choose the control variables. This criterion suggested the inclusion of the social background variables along with the number of siblings, the age of parents when the child started primary school and the indicator variable for always attended a school in the capital region. I kept the same specification for the three different estimation methods that involved the estimation of inverse probability weighting (IPW, AIPW and IPWRA) and for the two dichotomous treatment variables.

To choose the control variables for the outcome models, I decided to include the regressors that appeared to be robustly significant in most of the main effect models presented in the previous section, except for the overall mark obtained in secondary school; as previously mentioned, the inclusion of variables that could also be caused by the treatment, violates the assumptions that allow the identification of the average treatment effect models (Wooldridge, 2010). All these things considered, I opted for including the following control variables in all the outcome models: the three social background variables, number of siblings, the age of parents when the child started primary school and the age of the reform when the child stated primary school. Again, I kept the same specification for the three different estimation methods that involve

adjusting a regression for the outcome model (i.e., RA, AIPW and IPWRA) and for the four educational outcome variables.

The estimated ATEs that I report in the upper panel of Table 5.9 and Table 5.10 are measured as the difference between the average potential outcome of attending a private school at the secondary level and the average potential outcome of not doing so. In the lower panel of these tables, I report the ATEs as the difference between the average potential outcome of attending a private school at one or more levels and the average potential outcome of not doing so.

Regarding access to post-secondary and university studies by the age of 25, my results show that, having attended private school, either at secondary level or at any level, has a positive and significant impact on these outcomes at 99% level of confidence, regardless of the method used to calculate these effects. In fact, even the methods that omit either the selection model (RA) or the outcome model (IPW) produce very similar estimates. As shown in the upper panel of Table 5.9, I observe that attending a private secondary school produces around a 14% increase in the likelihood of accessing post-secondary education, from a baseline of 43%. Also, it produces around a 10% increase in the likelihood of accessing university education, from a baseline of 21%. The results are fairly similar to the ones I obtained for the treatment of attendance at a private school at any level. As reported in the lower panel of Table 5.9, attending a private school at one or more school levels increases the chances for individuals to access post-secondary studies by around 13% from a baseline of 42% and raises the chances to enter university also by around 10% from a baseline of 19%. These results also confirm my previous observations that attendance at a private school at the secondary level has a slightly larger effect than attendance at a private school at any school level on the access to a post-secondary study program. However, as seen, the results for the access to university do not follow the same trend, with estimated ATEs for attending a private school at any level being slightly larger (except for the case of the IPW estimation) than the ATEs for attending a private school at the secondary level. In summary, as we anticipated, even after controlling for selection on observable characteristics of students we observe an important and significant effect of private vouchers schools on the access to higher education.

Table 5.9: Average Treatment Effects (ATE) of subsidised-private school attendance on the probability to have accessed post-secondary education and a university by the age of 25 - results for the IPW, RA, AIPW, and IPWRA models

School-type trajectory (primary - secondary)	Estimate	Access to post-secondary education				Access to university			
		IPW	RA	AIPW	IPWRA	IPW	RA	AIPW	IPWRA
attended a secondary private school	POMs	0.436*** (0.0157)	0.430*** (0.0154)	0.433*** (0.0158)	0.433*** (0.0157)	0.210*** (0.0134)	0.208*** (0.0129)	0.208*** (0.0132)	0.208*** (0.0132)
	ATEs	0.145*** (0.0255)	0.138*** (0.0247)	0.142*** (0.0255)	0.142*** (0.0254)	0.099*** (0.0226)	0.080*** (0.0211)	0.096*** (0.0222)	0.0960*** (0.0222)
attended a private school at any school level	POMs	0.428*** (0.0176)	0.421*** (0.0169)	0.423*** (0.0176)	0.424*** (0.0174)	0.192*** (0.0149)	0.192*** (0.0141)	0.189*** (0.0147)	0.190*** (0.0145)
	ATEs	0.126*** (0.0250)	0.129*** (0.0241)	0.127*** (0.0249)	0.126*** (0.0248)	0.099*** (0.0216)	0.088*** (0.0205)	0.099*** (0.0213)	0.098*** (0.0211)
observations		1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Aside from reporting the ATEs, I estimated the distributions of potential outcomes for both treated and untreated individuals under the assumption of selection on observable characteristics of individuals with the double-robust models: AIPW and IPWRA. This facilitates the ability to make a broader comparison of the estimated outcomes beyond just looking at the mean. These distributions are shown in Figure 5.2 and Figure 5.3. While Figure 5.2 illustrates the results for the likelihood of having accessed post-secondary education by the age of 25, Figure 5.3 illustrates the results for the likelihood of having accessed university studies by the same age. In both cases, the left-hand side panels show the distributions for the treatment 'attended a private school at the secondary level' and the right-hand side panels present the distributions for the treatment 'attended private school at any level'. Also, while the upper panels report the results obtained by AIPW, the lower panels report the results obtained by IPWRA estimation methods.

In the case of the likelihood to access post-secondary education by the age of 25, the distributions for those students who never attended a private school have a peak at around 0.3 and tend to be skewed right, while the distributions for those who attended a private school have a peak close to 0.6 and are much more symmetric. These results are consistent regardless of which of the two treatments or two methods of estimation are used. Regarding the likelihood of having accessed university studies, the distributions for those who studied and those who did not study at a private school are right skewed. However, the distributions for those who attended private schools at either secondary level or any level present less heavy tails and are more peaked towards lower values than the distributions for those who only attended public schools (with peaks around 0.10 vs. 0.15 respectively).

Figure 5.2: Estimated distributions for the likelihood of having accessed post-secondary education by the age of 25 - results for the double-robust AIPW and IPWRA models

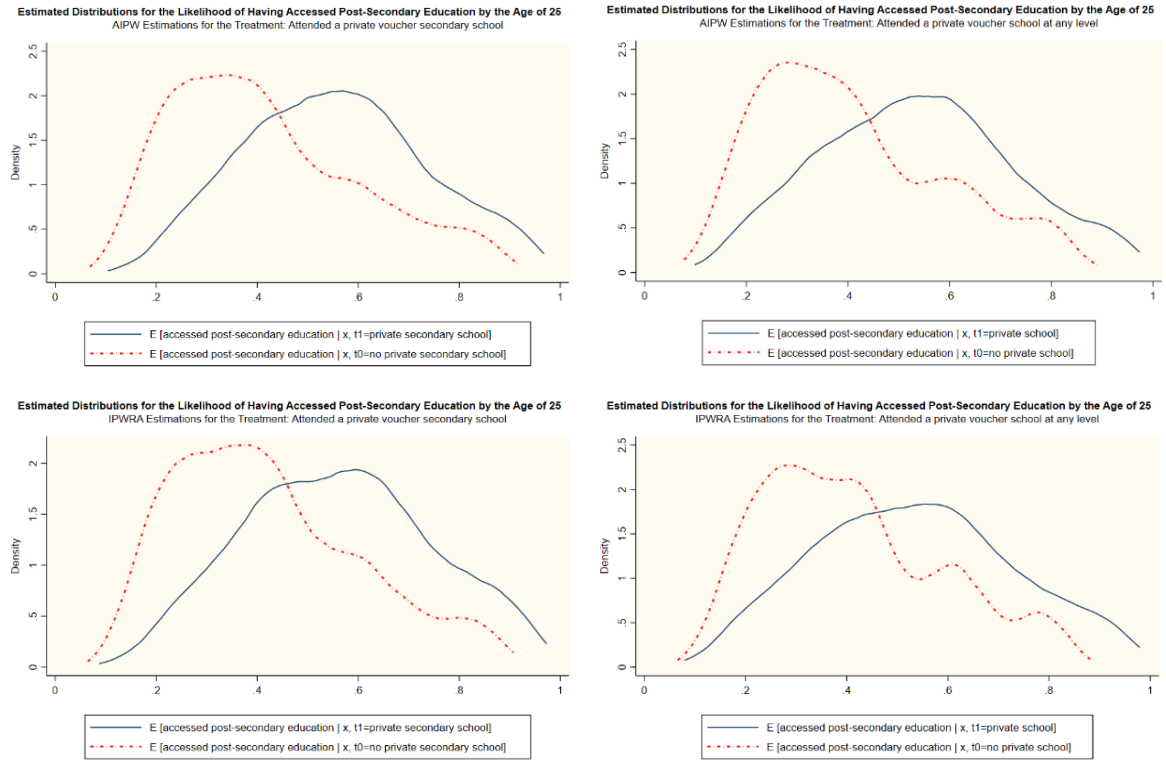


Figure 5.3: Estimated Distributions for the likelihood of having accessed university studies by the age of 25 - Results for the double-robust AIPW and IPWRA models

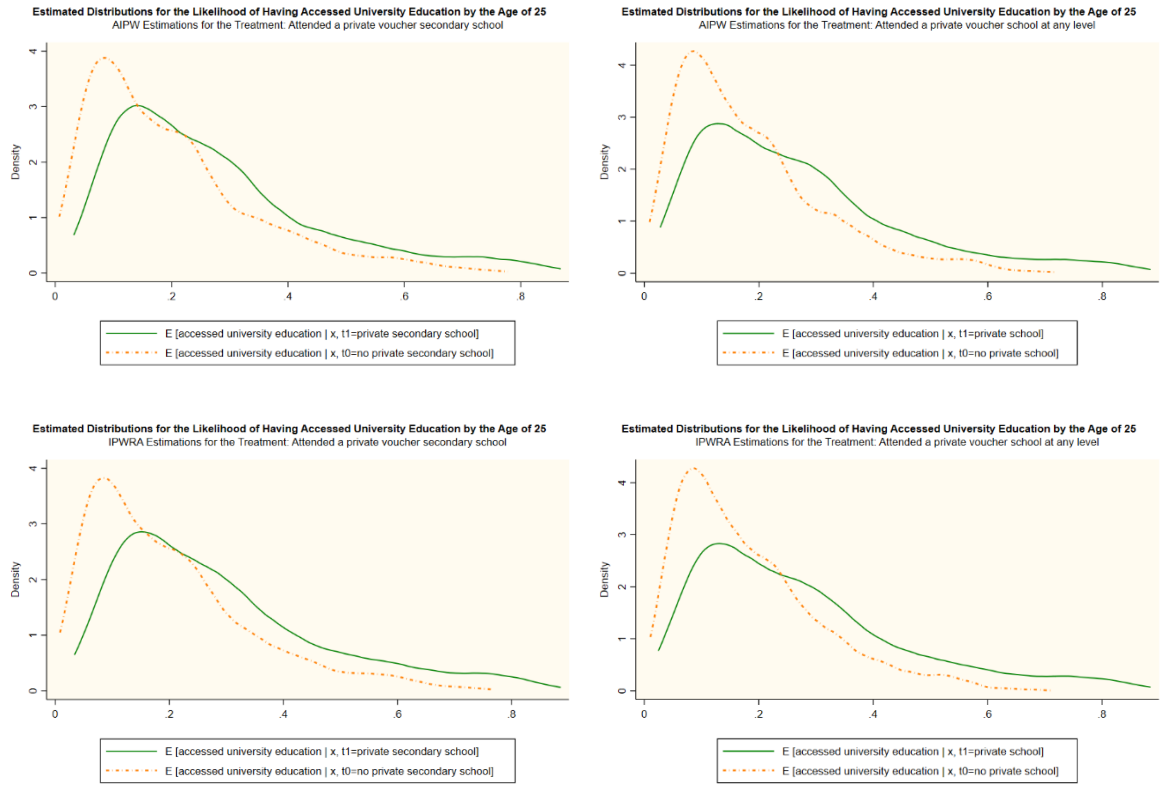


Table 5.10 displays the results for graduation from post-secondary or university studies by the age of 25. We again observe that having attended a private school rather than a public school has a positive and significant effect (at 99% level of confidence) on the likelihood of graduation over and above individuals' social and family background, and regardless of the estimation method chosen. The estimated ATEs are naturally lower than those estimated for the access to post-secondary education and university. As summarised by the upper panel of Table 5.10, my estimations suggest that the likelihood of having graduated from post-secondary education and from a university by the age of 25 are increased by having attending a private secondary school by 7% from a baseline of 23%, and around 8% from a baseline of 9% respectively. As shown in the lower panel of Table 5.10, having attending a private school at any level increases the likelihood of having graduated from post-secondary studies and having obtained a university diploma by the age of 25 by around 8% from a baseline of 21% and around 9% from a baseline of 9% respectively. These results confirm my previous observations that the treatment of attendance at a private school rather than a public school at any school level produces slightly larger ATEs than the attendance at a private school at the secondary level in the case of graduation rates. Moreover, as seen, attending a private school exhibits a slightly stronger effect on graduation from a university by the age of 25 than on graduation from any higher educational institution by that age.

Table 5.10: Average Treatment Effects (ATE) of subsidised-private school attendance on the probability to have graduated from post-secondary education and university by the age of 25: Results for the IPW, RA, AIPW, and IPWRA models

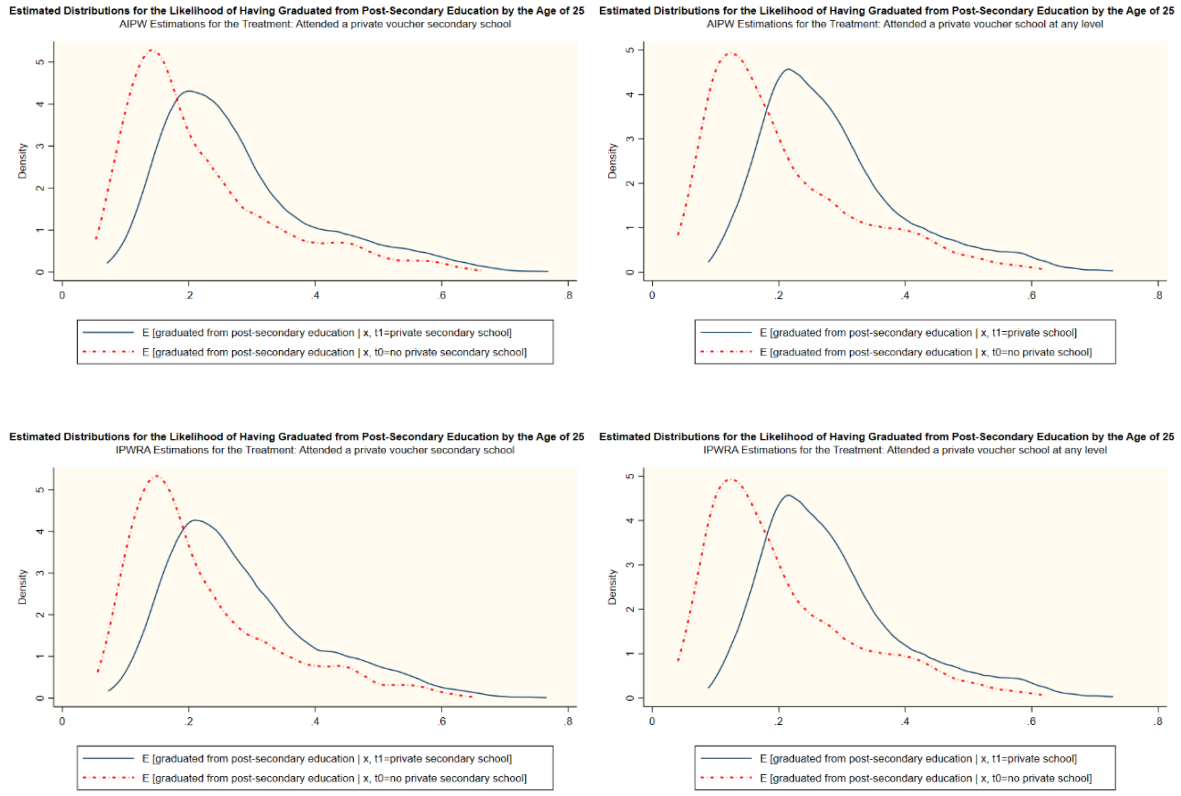
School-type trajectory (primary - secondary)	Estimate	Graduation from post-secondary education				Graduation from university			
		IPW	RA	AIPW	IPWRA	IPW	RA	AIPW	IPWRA
attended a secondary private school	POMs	0.229***	0.224***	0.226***	0.227***	0.095***	0.093***	0.094***	0.094***
		(0.0141)	(0.0137)	(0.0140)	(0.0140)	(0.0101)	(0.00969)	(0.00995)	(0.00994)
	ATEs	0.067***	0.0630***	0.066***	0.066***	0.078***	0.069***	0.077***	0.076***
		(0.0245)	(0.0231)	(0.0243)	(0.0242)	(0.0190)	(0.0175)	(0.0187)	(0.0187)
attended a private school at any school level	POMs	0.216***	0.210***	0.212***	0.213***	0.078***	0.078***	0.077***	0.078***
		(0.0160)	(0.0150)	(0.0158)	(0.0156)	(0.0109)	(0.0105)	(0.0109)	(0.0109)
	ATEs	0.079***	0.081***	0.081***	0.080***	0.087***	0.082***	0.087***	0.085***
		(0.0238)	(0.0224)	(0.0235)	(0.0234)	(0.0175)	(0.0166)	(0.0174)	(0.0174)
observations		1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

It is important to observe whether the effects estimated on the means reflect the differences in other parts of the distributions. Therefore, as shown in Figure 5.4 and Figure 5.5, I estimated the full distributions for the probability of having graduated from post-secondary education and university by the age of 25, for treated as well as untreated individuals, using the double-robust methods, AIPW and IPWRA.

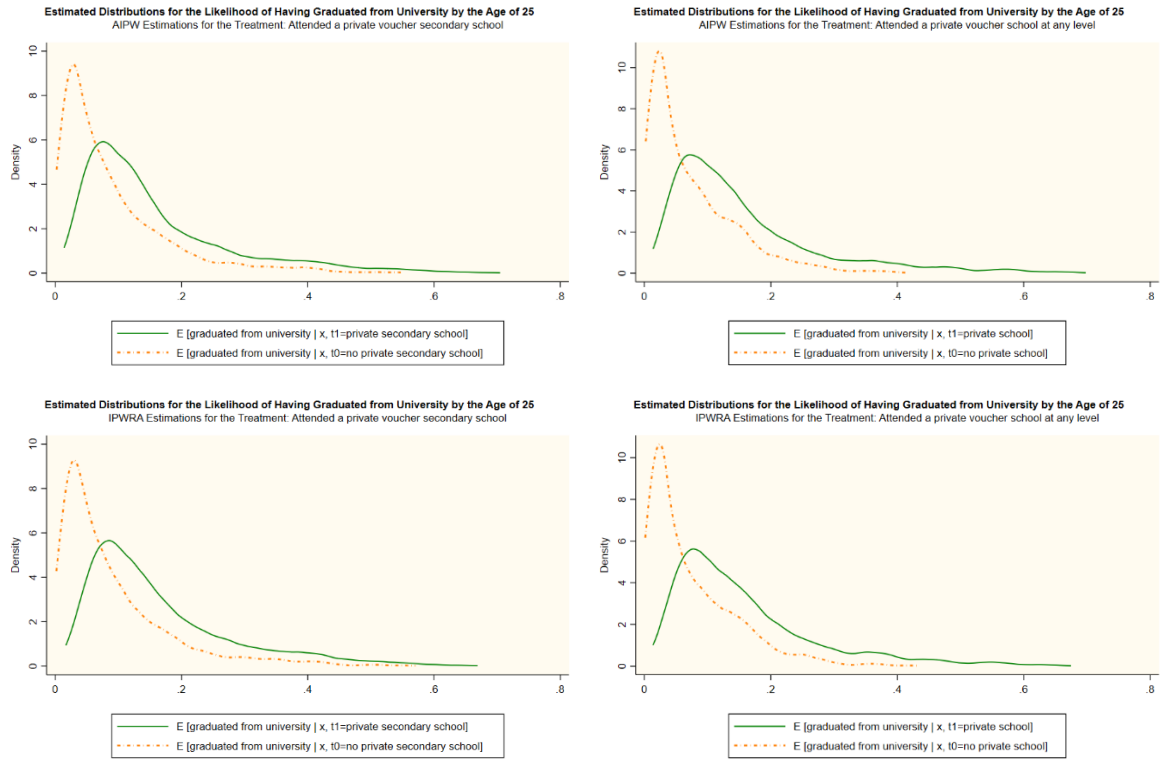
Figure 5.4 displays the results for the likelihood of having graduated from post-secondary education at the age of 25, and Figure 5.5 the results for the likelihood of having obtained a university degree by the same age. In both cases, the left-hand side panels show the distributions for the treatment 'attended a private school at the secondary level' and the right-hand side panels present the distributions for the alternative treatment 'attended a private school at any level'. Again, the upper panels present the results obtained by the AIPW estimator and the lower panels present those obtained by the IPWRA estimator.

Figure 5.4: Estimated distributions for the likelihood of having graduated from post-secondary education by the age of 25 - results for the double-robust AIPW and IPWRA models



As Figure 5.4 and Figure 5.5 show, regardless of the two different treatments, two different outcomes, and two estimation methods used, all the estimated distributions for the likelihood of having graduated from higher education by the age of 25 are right skewed. This reflects that a large proportion of secondary school graduates did not obtain a post-secondary education diploma by the age of 25. However, we can see that the tails of the distributions for the individuals who attended a private school at either secondary level, or any level, are always heavier than those for individuals who never attended one of these schools.

Figure 5.5: Estimated distributions for the likelihood of having graduated from university by the age of 25 - results for the double-robust AIPW and IPWRA models



In the specific case of the likelihood of graduation from any post-secondary educational institution by the age of 25, the tails of the distributions for those who attended and those who did not attend a private school converge at higher values of this likelihood, even though they never intersect. We can also see that in the case of university graduation, all distributions for students who never attended a private school reach a higher peak much closer to 0 than the distributions for those who attended a private school at some point. Therefore, we can conclude that, aside from obtaining significant ATEs for the role of subsided private schools in accessing and completing higher education, the whole distributions reflects an advantage for these individuals in comparison to those who only attended public schools over their school trajectories, after controlling for selection on observable individual characteristics.

5.4.1.4. Estimation of ATEs under the assumption of selection on unobservables

As explained in the methodological section of this chapter, the estimation of ATEs under the assumption of selection on unobservable characteristics of individuals makes it necessary to find at least one variable

that highly correlates with the treatment but not with the unobservable individual heterogeneity, i.e. an instrumental variable. The results of the previous section found larger ATEs for three out of four outcomes for the attendance at a private school at any level than for the attendance at a private school at the secondary level. However, the limitations I faced when collecting the necessary information to produce a reliable instrumental variable, meant that I was only able to construct one for the attendance at a private school at the secondary level. Consequently, in this section I can only analyse the impact of having attended a private school at the secondary level on educational attainment by the age of 25.

It is also important to remember that the additional assumptions that I needed to make in order to merge the information of the CSP Survey with the administrative records of the Ministry of Education, produced an important reduction of almost 19% in the size of my sample. As already explained in the methodological section, this sample size reduction is due to the necessity of keeping in the sample only individuals who have lived in the same region from when they were born until they completed secondary school. Ergo, this sample cannot be seen as representative of the whole country's population, but only of those who never migrated to a different region before finishing secondary school.

The ATEs I presented in the previous section for the binary treatments were based on the IPW, RA, AIPW and IPWRA methods and were performed using a logistic regression for both the outcome and treatment models. The endogenous regression adjustment (ERA) that I introduce in this section to estimate ATEs under the assumption of selection of unobservable individual characteristics is based on a control-function approach that only allows for a probit regression in both models. Therefore, to facilitate comparisons, I present the ATEs estimated with ERA along with new estimations of ATEs obtained with the AIPW and IPWRA methods. These estimations include the instrumental variable in the selection equations and, unlike the ones reported in the previous section, were performed using probit models for both the outcome and selection equations on the reduced sample of individuals.

Table 5.11 displays the results for the ATEs of having attended a secondary private school on the access to post-secondary education and university by the age of 25. The estimations performed by the endogenous

regression adjustment estimator (ERA) found positive, albeit non-significant, effects. In particular, the ERA estimator predicts that, having attended a private school at the secondary level increases the likelihood of having accessed post-secondary education and of having started university studies by the age of 25 by only 4 percentage points from a baseline of 35%, and 4 percentage points from a baseline of 12% respectively; however, there is no evidence that either of these effects are significantly different from zero. Although we could think that the insignificance of the estimated coefficients could be explained by a problem of underpower (as the sample size decreased from 1,580 to 1,283 observations), the ATEs obtained by the AIPW and IPWRA methods are still positive and significant. Indeed, their magnitudes are comparable to those obtained in the previous section regardless of the inclusion of the instrument as an additional regressor in the selection equation, the reduced sample size, and the different regression model (probit).

Table 5.11: Average Treatment Effects (ATE) of attending a secondary subsidised-private school on the probability to access post-secondary education and university by the age of 25: results for the AIPW, IPWRA and ERA models.

School-type trajectory (primary - secondary)	Estimate	Access to post-secondary education			Access to university		
		AIPW	IPWRA	ERA	AIPW	IPWRA	ERA
attended a secondary private school	POMs	0.422*** (0.0175)	0.421*** (0.0175)	0.349*** (0.0463)	0.201*** (0.0146)	0.201*** (0.0145)	0.122*** (0.0115)
	ATEs	0.147*** (0.0284)	0.147*** (0.0284)	0.042 (0.103)	0.101*** (0.0251)	0.101*** (0.0251)	0.045 (0.0473)
observations		1,283	1,283	1,283	1,283	1,283	1,283

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In order to determine whether the correction for selection on non-observable characteristics of individuals provides better estimates than the models that only correct for selection on observable attributes, I run Wald tests for endogeneity. As explained before, the control-function approach of ERA estimates the correlation between the unobservables of the assignment to treatment and the unobservables of the potential-outcome models. If no correlation is found, then there is no evidence of endogeneity. The Wald tests, therefore, are tests for the null hypothesis that the unobservables of both models are uncorrelated. Failure to reject this null hypothesis means that the estimations obtained without the correction for endogeneity are preferred because they have the right standard errors. The p-values I obtained for these tests were 0.13 and 0.19 for the model of access to post-secondary education and university respectively; therefore, I cannot reject the null hypothesis of no endogeneity. Based on these results, we can argue that,

in most cases, the results of the estimations by AIPW and IPWRA should be more reliable than those obtained by the ERA estimator.

Table 5.12 summarises the results for the ATEs of having completed secondary education in a private school on graduation from post-secondary studies and university studies by the age of 25. These results are similar to those I found for the access to higher education; while the ATEs estimated by the ERA estimator are smaller and not significantly different from 0, the ATEs estimated by the AIPW and IPWRA estimators are very similar to those I presented in the previous section, regardless of the reduced sample size, the inclusion of one additional regressor, and the different model. In particular, the AIPW and IPWRA estimators find a significant effect close to 7 percentage points for the likelihood of having graduated from any post-secondary educational institution by the age of 25 from a baseline of around 22%. In contrast, the ATE obtained by the ERA estimator is close to 4 percentage points with a baseline of 17%; however, this effect is not significant. In the case of graduation from university by the age of 25, the double-robust estimators predict that the effect of having attended a private secondary school on this outcome is also significant and close to 9 percentage points from a baseline of 9%. Meanwhile the ERA estimator predicts an effect of 4 percentage points from a baseline of 5% but this effect is not significant either.

Table 5.12: Average Treatment Effects (ATE) of attending a secondary subsidised-private school on the probability to graduate from post-secondary education and university by the age of 25: results for the AIPW, IPWRA and CFE models

School-type trajectory (primary - secondary)	Estimate	Graduation from post-secondary education			Graduation from university		
		AIPW	IPWRA	ERA	AIPW	IPWRA	ERA
attended a secondary private school	POMs	0.221*** (0.0155)	0.221*** (0.0154)	0.169*** (0.0302)	0.089*** (0.0108)	0.087*** (0.0108)	0.053*** (0.00832)
	ATEs	0.069*** (0.0269)	0.070*** (0.0269)	0.0381 (0.0806)	0.091*** (0.0212)	0.092*** (0.0213)	0.039 (0.0287)
observations		1,205	1,205	1,205	1,205	1,205	1,205

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

I also performed Wald tests on the coefficients of the control term to determine the appropriateness of the correction for non-observable characteristics of individuals and obtained p-values of 0.31 and 0.06 for the models of graduation from post-secondary education and graduation from university respectively. This means that, in both cases, I cannot reject the null hypothesis of non-endogeneity at 95% confidence level;

however, I could reject this hypothesis only in the case of graduation from a university at the 90% level of confidence.

Based on these results, the correction for selection on non-observable characteristics of individuals, which I implemented with the best instrumental variable I could build, does not prove to provide, in general, better estimates of the ATEs than those obtained through the methods that only correct for selection on observable characteristics of individuals[89]. Therefore, I cannot reject the hypothesis that the double robust estimators provide me with better estimations of the ATEs of having attended a private school on both access and graduation outcomes measured by the age of 25.

5.4.2. Conclusions

The evidence I have analysed in this section suggests that there is a significant average effect of having attended a subsidised-private school, rather than having attended only a public school, on the probability of having accessed and graduated from post-secondary education and university by the age of 25. Specifically, I found that having attended a subsidised-private school at the secondary level increases the likelihood of accessing and completing post-secondary studies by the age of 25 by around 14% and 7% respectively, and increases the likelihood of having entered university and obtained a university degree by the same age by around 10% and 8 % respectively. I also find that having attended a subsidised-private school at any level raises the likelihood of having started and completed post-secondary studies by the age of 25 by 13% and 8% respectively, while improving the probability of having entered university and obtained a bachelor's degree by 10% and 9% respectively. Although these results were robust to different model-specifications and estimation methods (IPW, RA, AIPW and IPWRA), it is important to highlight that they were obtained by constructing a theoretically valid counterfactual based on observable characteristics of individuals.

[89] It is worth remembering that the double robust methods still produce consistent estimation in the presence of unobservable individual characteristics that correlate neither with the models' covariates nor with the outcomes for both treated and untreated individuals.

Although I tried to introduce a correction for the potential effects of having unobservable characteristics of students affecting both school-type choice and individual outcomes at the age of 25, the regression adjustment I introduced to control for endogeneity did not reject the null hypothesis of no endogeneity at the 95% confidence level. However, it is important to take into account that this correction was based on an instrument constructed under, perhaps, questionable assumptions, and may not have been strong enough. All in all, and despite the methodological concerns about the validity of my instrument, the evidence of this section suggests that having attended a primary or a secondary subsidised-private school in the post-reform era significantly increased students' chances of accessing and completing post-secondary studies in Chile.

Concerning the question of whether certain school-type trajectories became increasingly better than others, even though I can only try to draw a conclusion on this based on correlations, the interaction effects that I observe in logistic regression models do not provide evidence that subsidised-private schools produced increasingly better educational attainment over time relative to public schools. If any, I found some evidence that the influence of the trajectory private-private on the access to university was slightly reduced over time in comparison with all the other trajectories (particularly after 1993, when the 'Shared Financing Scheme' was established). In the case of graduation rates, only the mixed trajectory private-public showed a significant increasing impact relative to the other trajectories over time. In summary, this suggests that the period of expansion of the subsidised-private sector, which coincided with the time when these schools started charging tuition fees, did not trigger a better performance of subsidised-private schools compared with public schools. This result echoes the findings of Mizala and Torche (2012) who find that tuition fees paid by parents at subsidised-private schools did not make any difference to test scores after controlling for the socioeconomic background of schools' student bodies. Also, my findings resemble the reflections of Bravo *et al.,* (2010) who posits that the secondary subsidised-private schools that emerged over the period of the massive expansion of the Chilean subsidised-private sector were of lower quality compared with the pre-existing ones.

Determining the impact of school competition on educational outcomes for the whole system over time was not one of the purposes of this thesis and, in any case, I cannot really test this hypothesis without an adequate methodology. However, the correlations I observed suggest that the chances of accessing and completing post-secondary studies increased over the observation period for everyone, regardless of the school-trajectories they followed. This can be associated with the rapid expansion that the tertiary education system experienced in Chile during the 1990s and 2000s, which enabled it to absorb a much larger demand for post-secondary studies. In fact, between 1990 and 2005, the enrolment rates in higher education in Chile increased by 150% (Gallegos, 2014). Therefore, regardless of any eventual increase in the general quality of the school system, it is not surprising that an increasing number of secondary school graduates gained access to tertiary education over this period.

Finally, the descriptive evidence presented in this chapter does not suggest that subsidised-private schools gave better chances to access and complete a post-secondary education program by the age of 25 to the most socially disadvantaged children who attended them in comparison with the most advantaged ones. The interaction effects of the school trajectories that include a subsidised-private school at any level with social background variables turned out not to be significant in most cases. However, in the few cases where these interactions were significant, they operated in exactly the opposite direction. For instance, the trajectory private-public as well as the trajectory private-private had a larger effect on the chances of having been enrolled at a university by the age of 25 for students with highest levels of parental social status. Exactly the same occurred for the private-public trajectory in the case of access to any post-secondary educational institution by the age of 25. Therefore, I could not find any piece of evidence suggesting that having been enrolled at a subsidised-private school improved, in particular, the chances of the most socially disadvantaged children to access and complete a higher education program.

In summary, this section's results report that those individuals who studied either primary, secondary or both school levels at a subsidised-private school had better chances to pursue and complete further studies after secondary school graduation relative to those who studied both levels at a public school, after controlling for family and socioeconomic individual characteristics. Despite this, I did not find evidence of

an increase in the gap in educational attainment between subsidised-private and public schools over time favouring the subsidised-private sector, but perhaps the opposite. I also found some evidence that students with higher parental social status are those who may have benefitted the most from attending a subsidised-private school.

5.5. Analysis: effects of school-type choice on employment situation at the age of 25

5.5.1. Results

This section presents descriptive statistics and logistic regression analyses for the association between individuals' school-type trajectories and the likelihood of having a paid occupation at the age of 25. As explained in the section on variables, to be consistent with my estimations on earnings, my definition of paid-occupation considers all sorts of occupations, including part-time and full-time as well as employed and self-employed occupations. As in Section 5.4, in this section I will also refer to subsidised-private schools simply as 'private schools' because fully-paid private schools are not considered in the empirical analyses of Chapter 5. Moreover, when referring to school-type trajectories, both in tables and in the body text, the first school type mentioned before the hyphen identifies the school type that individuals attended at the primary level and the one after the hyphen identifies the school type that individuals attended at the secondary level.

5.5.1.1. Descriptive statistics

Before presenting descriptive statistics accounting for the potential association between school-type choice and the likelihood of having a paid occupation at the age of 25, it is important to take note of the sample I selected for the analyses presented in this section. The information from the Social Protection Survey allowed me to identify the employment situation at the age of 25 of 1,404 individuals who attended school in the post-1981 reform period and had a level of education equal to or higher than secondary graduation. As reported in Table G-1 of Appendix G, 6.3% of these individuals (89 people) did not report any paid

occupation during the year they turned 25 years old. However, 17 of those who were not working declared themselves to be studying. Given that those 17 individuals were presumably studying full-time, I decided to exclude them from my analyses. This means that the group of individuals I used to model the effects of having attended a subsidised-private school on the likelihood of having a paid occupation by the age of 25 is composed of 1,387 individuals that either only worked, worked and studied, or neither worked nor studied at that age.

Table 5.13 presents the descriptive information for the association between the school-type trajectory followed by students who completed secondary school and their employment situation at the age of 25. As we can anticipate from the previous paragraph, only 5.2% of the individuals did not declare any occupation over that year[90]. Regarding the school-type trajectory followed by them, although the lowest proportion of individuals who were not working over the year they turned 25 comes from the private-private trajectory - as we would have expected - the group with the lowest rate of occupation comes from the trajectory public-private. However, the differences in these proportions amongst the four groups are not very large[91].

Table 5.13: Number and proportion of students that were working at the age of 25 by school-type trajectory

School-type trajectory (primary - secondary)	Employment situation at the age of 25					
	Not working		Working		Total	
	N	%	N	%	N	%
Public-Public	39	5.15%	719	94.85%	758	100%
Private-Public	6	4.80%	119	95.20%	125	100%
Public-Private	15	6.41%	219	93.59%	234	100%
Private-Private	12	4.44%	258	95.56%	270	100%
Total	72	5.19%	1,315	94.81%	1,387	100%

[90] Even though 5.2% of unemployment and inactivity reflects very high levels of employment for 25 year-olds in Chile for the period 2002 to 2015, it is important to remember that this variable was constructed in harmonisation with the earnings variable. As I was interested in capturing any hourly earnings from any occupation reported over the year that the individual turned 25, even if the individual worked for only one month over that year, I would consider him/her as having an occupation. This harmonisation is needed because it allows me to estimate the effects of subsidised-private schools on earnings with a selection bias correction, as proposed by Heckman (1979). I will present those estimations in the Section 5.6 of this chapter.

[91] Table G-2 and Table G-3 of Appendix G present the same information as Table 5.13; however, the school-type trajectories have been collapsed into the two dichotomous treatment variables already explained in Section 5.3 and 5.4: 'attended a private school at any level' and 'attended a secondary private school'. These tables also suggest that the school type that individuals attended over their school careers had a very small influence on the probability of having a paid occupation by the age of 25.

5.5.1.2. Logistic regressions

To explore the potential relationship between individuals' trajectories across different school types and their employment situation at the age of 25, I run logistic regression models similar to those in Section 5.4 for educational outcomes at the same age. In this case, I also focus my analysis on the significance and direction of the estimated coefficients rather than on their magnitudes, as they cannot be interpreted as casual effects. Table 5.14 presents a series of specifications for this model that controls for gender, social background, family demographics, location, time related variables, the overall mark at secondary school and the number of years of education completed by the age of 25. Although the two last control variables could also be thought of as being caused by the individuals' school-type trajectories, it is relevant to highlight that I have included them as covariates in these models only with the purpose of trying to understand the mechanisms behind the potential effect of school-type trajectories on individuals' employment situation by the age of 25. Aside from these control variables, as I mentioned in the methodological section of this chapter, I added three additional indicator variables to these models which have the potential to explain labour market participation, especially amongst women: having had a working mother, being married by the age of 25, and having had children by that age.

The main finding in Table 5.14 is that there is no evidence of an association between the school-type trajectory followed by individuals and the likelihood of having a paid occupation at the age of 25. The estimated coefficients for all school trajectories other than public-public are not significant at either 5% or 10% significance level and even exhibit inconsistent signs across all the specifications. Regarding the association between the covariates included in these models and the likelihood of being working at the age of 25, the variable that shows the strongest correlation is gender. In particular, men at the age of 25 are much more likely to be working than women at the same age. The social background variables in general exhibit no significant association with this outcome variable; however, it is interesting to observe that, the children of skilled manual workers and independent farmers appear to be more likely to be working at the age of 25 than all their counterparts from other social class backgrounds. Having always attended school in the capital region seems to be positively correlated with the employment situation of individuals, and I also

find a positive and robust effect of the variable 'age of the reform when the individual started primary school'. The latter reflects a sort of 'cohort effect' on the likelihood of being working at the age of 25, with individuals from younger cohorts being more likely to be working than those from older cohorts.

Table 5.14: Logistic regressions for the effects of school-type trajectory on the probability of being working at the age of 25: main effects

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
school type trajectory = 0, public-public (omitted)											
school type trajectory = 1, private-public	0.0731	0.0544	-0.0164	-0.0365	0.0250	0.00930	-0.0717	-0.118	-0.130	-0.241	-0.325
	(0.450)	(0.460)	(0.465)	(0.472)	(0.468)	(0.473)	(0.475)	(0.496)	(0.496)	(0.499)	(0.527)
school type trajectory = 2, public-private	-0.233	-0.282	-0.311	-0.311	-0.306	-0.289	-0.452	-0.370	-0.406	-0.472	-0.383
	(0.314)	(0.320)	(0.322)	(0.322)	(0.324)	(0.327)	(0.336)	(0.344)	(0.340)	(0.345)	(0.355)
school type trajectory = 3, private-private	0.154	0.257	0.149	0.142	0.170	0.189	0.0286	0.0314	0.00406	-0.129	-0.151
	(0.338)	(0.346)	(0.349)	(0.349)	(0.348)	(0.347)	(0.363)	(0.372)	(0.368)	(0.366)	(0.364)
sex = 1, male		2.305***	2.280***	2.280***	2.255***	2.264***	2.275***	2.286***	2.335***	2.312***	2.289***
		(0.404)	(0.404)	(0.404)	(0.405)	(0.402)	(0.405)	(0.407)	(0.416)	(0.419)	(0.439)
parental education (years)			0.0527	0.0475	0.0555	0.0402	0.0424	0.0437	0.0418	0.0201	0.0137
			(0.0329)	(0.0358)	(0.0377)	(0.0382)	(0.0391)	(0.0395)	(0.0396)	(0.0426)	(0.0450)
social status				0.0624	0.236	0.273	0.308	0.303	0.332	0.233	0.248
				(0.241)	(0.303)	(0.305)	(0.322)	(0.321)	(0.318)	(0.315)	(0.301)
parental class=2, self-employed					0.218	0.250	0.287	0.349	0.391	0.486	0.482
					(0.458)	(0.465)	(0.478)	(0.481)	(0.484)	(0.487)	(0.497)
parental class=3, skilled manual workers and farmers					0.920*	0.935*	1.034**	1.112**	1.159**	1.238**	1.123**
					(0.493)	(0.510)	(0.523)	(0.525)	(0.524)	(0.520)	(0.527)
parental class==4, semi & non-skilled manual workers and farm workers					0.452	0.441	0.501	0.532	0.578	0.680	0.504
					(0.532)	(0.549)	(0.563)	(0.553)	(0.549)	(0.534)	(0.541)
number of siblings						0.0292	0.0280	0.0436	0.0462	0.0577	0.0660
						(0.0946)	(0.0953)	(0.0945)	(0.0973)	(0.0958)	(0.0998)
parent age when child started primary school						-0.0240	-0.0241	-0.0232	-0.0229	-0.0272*	-0.0316**
						(0.0151)	(0.0152)	(0.0148)	(0.0147)	(0.0144)	(0.0141)
biparental family = 1, lived with both parents						-0.220	-0.254	-0.191	-0.186	-0.243	-0.320
						(0.365)	(0.376)	(0.377)	(0.378)	(0.375)	(0.383)
working mother = 1, has a working mother						0.0612	0.0153	0.0445	0.0596	0.0300	-0.00629
						(0.267)	(0.273)	(0.276)	(0.276)	(0.273)	(0.280)
school in the capital region = 1, always attended a school in the CR							0.465	0.529*	0.522*	0.528*	0.568*
							(0.296)	(0.302)	(0.303)	(0.305)	(0.302)
zones where attended primary & secondary school = 2, rural & urban schools							1.654	1.447	1.466	1.339	1.745*
							(1.014)	(1.008)	(1.008)	(0.959)	(0.981)
zones where attended primary & secondary school = 3, only urban schools							0.974	0.863	0.900	0.908	1.311
							(0.923)	(0.901)	(0.898)	(0.845)	(0.882)
age of the reform when child started primary school								0.239***	0.241***	0.236***	0.190***
								(0.0510)	(0.0515)	(0.0544)	(0.0540)
overall secondary school mark									0.305	0.133	0.289
									(0.300)	(0.311)	(0.321)
number of years of education at the age of 25										0.337***	0.260**
										(0.122)	(0.121)
married = 1, married at the age of 25											-1.088***
											(0.273)
children = 1, has children at the age of 25											-0.389
											(0.270)
constant	2.914***	2.280***	1.818***	1.885***	1.395**	2.507***	1.405	0.537	-1.261	-4.306*	-3.420
	(0.164)	(0.175)	(0.325)	(0.381)	(0.581)	(0.953)	(1.267)	(1.291)	(2.273)	(2.577)	(2.647)
observations	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Amongst the contemporary covariates, unsurprisingly, the variable that appears as having an important influence on the probability of having an occupation at this age is the number of years of education completed by individuals by the age of 25, with more skilled individuals being much more likely to be working. Moreover, being married at the age of 25 correlates with a reduced likelihood to be working at the age 25, which is explained by the fact that most of those who did not report any paid occupation at the age of 25 in my sample were women[92]. Regarding the role of children, even though the estimated coefficient has the expected negative sign, it does not appear to be significant at 95% confidence level. The same is

[92] In fact, 90.3% of the individuals in my sample who declare themselves not to have worked over the year they turned 25 years old are female and only 9.7% are male.

observed for the non-contemporary variable 'having had a working mother', which presents positive but insignificant coefficients in all specified models, except for the specification that includes all covariates.

Since I did not have any significant effects of school-type trajectories on the probability of having a paid occupation over the year that individuals turned 25 years old, I ran similar models for the dichotomous treatments 'attended a private school at the secondary level' and 'attended a private school at any level'. The results of these estimations are summarised in Table 5.15. Unsurprisingly, I did not find a significant association between these treatments and individuals' employment situation at the age of 25 either, regardless of the set of control variables chosen.

Table 5.15: Main effects of having attended either a secondary subsidised-private school or a subsidised-private school at any level on the probability of being working at the age of 25: logistic regression coefficients

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
school type trajectory = 0, attended a public secondary school (omitted)							
school type secondary level = 1, attended a private secondary school	-0.0527	-0.0780	-0.0566	-0.160	-0.189	-0.274	-0.225
	(0.250)	(0.262)	(0.262)	(0.282)	(0.278)	(0.281)	(0.285)
school type trajectory = 0, never attended a private school (omitted)							
ever in a private school = 1, attended a private school	-0.0206	-0.0616	-0.0493	-0.175	-0.202	-0.302	-0.288
	(0.243)	(0.258)	(0.259)	(0.281)	(0.275)	(0.273)	(0.278)
controls for social background	NO	YES	YES	YES	YES	YES	YES
controls for family demographics	NO	NO	YES	YES	YES	YES	YES
controls for time and geographical location	NO	NO	NO	YES	YES	YES	YES
controls for secondary school overall mark	NO	NO	NO	NO	YES	YES	YES
controls for educational attainment at the age of 25	NO	NO	NO	NO	NO	YES	YES
controls for marriage and children at the age of 25	NO	NO	NO	NO	NO	NO	YES

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Given that all the estimated models for the main effects of school trajectories on the likelihood of having a paid occupation at the age of 25 appear to be insignificant, I do not present results for interaction effects models in this section. For the same reason, I do not estimate average treatment effects based on potential outcome models in this section either.

5.5.2. Conclusions

In this short section, I analysed the relationship between school-type trajectories and employment situation of individuals at the age of 25, finding no significant association between having attended a subsidised-private school, rather than a public school, at any school level and the likelihood of being working at that

age. Therefore, I find no evidence that school type has an effect on having a paid occupation at the age of 25 for those who attended school in the post-reform era and can reject this section's hypothesis.

On a precautionary note, the way I identified whether an individual was working at the age of 25, as well as the fact that I excluded people who were studying full time at this age, meant that my measure of employment produced a very small number of people being either unemployed or inactive at this age, which is close to 5% of the whole sample. For the purposes of this research project, this outcome variable must be consistent with the way I measure earnings at the age of 25 in the next section, which considers any hourly income associated with individuals' main occupation received at any point during the year each individual turned 25 years old. Nevertheless, had I constructed this variable in a different way - such as by taking into account the information on employment situation over the exact month each individual turned 25 - I could have perhaps arrived at a different conclusion. However, my dataset does not include the exact date of birth of individuals, but only the year of birth, which prevents me from presenting those calculations.

Despite the fact that these results are not significant, they make it possible to observe that there is a handful of variables that play an important role on the probability of being working at any point over the year individuals turned 25. These variables are gender, region where individuals attended school (differentiating between the capital region and the others), educational attainment at the age of 25, and being married at the same age. Therefore, these variables are good candidates for being introduced as regressors in the first-stage equations when performing a correction for selection bias in models explaining earnings at the age of 25, as suggested by Heckman (1979). These estimations will be presented in Section 5.6.

5.6. Analysis: effects of school-type choice on hourly earnings at the age of 25

5.6.1. Results

This section presents descriptive statistics, linear regressions and potential outcome models to study the relationship between individuals' school-type trajectories and their average earnings at the age of 25. As in the two previous result sections, individuals who studied in fully-paid private schools are left out of these analyses, and I refer to subsidised-private schools simply as 'private schools'. Likewise, every time I describe school-type trajectories, the first school type mentioned before the hyphen refers to the school type that individuals attended at the primary level and the second one mentioned after the hyphen refers to the school type that individuals attended at the secondary level.

5.6.1.1. Descriptive statistics

The descriptive statistics reported in Table 5.16 show the association between the school-type trajectory followed by students who completed secondary school and their hourly earnings at the age of 25. As previously mentioned in Section 5.5, only individuals with non-zero earnings were considered in this analysis and, to compare earnings obtained in different years, all of them are expressed in 2015 Chilean pesos.

Not surprisingly, individuals who attended a private school at both primary and secondary level earn on average more than those who attended a public school at any level. However, what we already observed in the case of educational attainment by the age of 25 also occurs here: individuals that attended a private school at the primary level and a public school at the secondary level earn more on average than those who followed the opposite trajectory, i.e. attended a public primary school and a private secondary school.

Although this may sound counter-intuitive, I think it reinforces my hypothesis that a large number of talented upper-middle class students followed the trajectory private-public[93].

Table 5.16: Average hourly earnings of individuals at the age of 25 by school-type trajectory

School-type trajectory (primary - secondary)	Average hourly earning from main occupation at the age of 25		
	Mean	Std. Dev.	N
Public-Public	1978.47	1549.25	719
Private-Public	2520.43	1592.49	119
Public-Private	2395.92	1737.09	219
Private-Private	2552.80	1994.06	258
Total	2,209.72	1,698.37	1,315

5.6.1.2. OLS and Heckman selection models

In this section, I estimate the relationship between school-type trajectories followed by individuals and their hourly earnings at the age of 25 by using OLS regression models and also Heckman selection models (2SLS) to correct for selection bias on the earnings I observe in my dataset. As explained in the methodological section, I ran the models on the logarithmic transformation of this variable. As in the case of the educational attainment models, because of the problem of selection on observables (and perhaps also of selection on unobservable characteristics of individuals), I focus my analysis here on the significance and direction of the estimated coefficients rather than on their magnitudes.

The specifications for the OLS and 2SLS models presented in Table 5.17 and Table 5.18 respectively (upper panels) control for gender, social background, family context variables, location, time related variables, the overall mark at secondary school, and the number of years of education completed by the age of 25. Also, although I have not reported all the estimated coefficients, I added 12 dummy variables for the region where individuals were working at the age of 25[94]. It is important to keep in mind that the overall mark at secondary school, the number of years of education completed at the age of 25 and the region where

[93] As in Section 5.3 and 5.4, I present in Appendix H (Table H-1 and Table H-2) the same analysis but with the school-type trajectories collapsed into the dichotomous explanatory variables already introduced in Section 5.3 to 5.5. These analyses suggest that having studied in a private school at any level (primary, secondary or both) seems to make a larger difference to the hourly earnings of individuals by the age of 25 than having studied in one of them at the secondary level in particular.
[94] As explained in the variables section of this chapter, there were 13 regions in Chile until 2005.

individuals are working at the age of 25 can all be considered as possible outcomes of individuals' school-type trajectories. For example, in Section 5.4 I discussed how school-type trajectories arguably play a role in individuals' marks at secondary level, and the latter are subsequently important determinants of educational attainment later in life. Moreover, all the analyses of Section 5.4 account for the important effects of school-type trajectories on the educational attainment of individuals by the age of 25. Consequently, we could easily argue that the main mechanism mediating the influence of school-type trajectories on earnings at the age of 25 is the level of education reached by individuals by that age. In an extreme case, we could even expect that, after controlling for educational attainment, the impact of school type on earnings becomes negligible. In the case of the region where individuals work at the age of 25, we could similarly claim that different school-type trajectories may induce different migratory decisions on individuals (within the country), either before undertaking post-secondary education studies to access better educational opportunities or after completing post-secondary studies to access better job opportunities. Therefore, I include these three variables - overall mark at secondary school, the number of years of education completed by the age of 25 and the region where individuals were working at the age of 25 - in the OLS and 2SLS models with the only purpose of observing correlations and trying to understand the mechanisms linking school-type choice with individuals' earnings at the age of 25.

Table 5.17 presents the estimated coefficients for the association between hourly earnings at the age of 25, school-type trajectories, and all the control variables already described. As the results indicate, school-type trajectories significantly influence hourly earnings by the age of 25. Even though this association is largely reduced after controlling for the social background variables, it still remains positive and significant at 1% level of significance. Regarding the control variables, all those that appear to be significant at least at the 10% level of significance show the expected signs.

Table 5.17: OLS regressions for hourly earnings at the age of 25: Main effects of school-type trajectories and covariates

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
school type trajectory = 0, public-public (omitted)											
school type trajectory = 1, private-public	0.256***	0.255***	0.190***	0.176***	0.173***	0.172***	0.154***	0.154***	0.147***	0.148***	0.117**
	(0.0555)	(0.0549)	(0.0540)	(0.0541)	(0.0542)	(0.0544)	(0.0542)	(0.0538)	(0.0520)	(0.0525)	(0.0505)
school type trajectory = 2, public-private	0.185***	0.180***	0.150***	0.150***	0.147***	0.143***	0.110**	0.114**	0.0952**	0.0983**	0.0663
	(0.0450)	(0.0445)	(0.0440)	(0.0439)	(0.0440)	(0.0443)	(0.0447)	(0.0446)	(0.0440)	(0.0441)	(0.0411)
school type trajectory = 3, private-private	0.257***	0.270***	0.195***	0.188***	0.187***	0.185***	0.150***	0.147***	0.134***	0.134***	0.0790**
	(0.0400)	(0.0401)	(0.0395)	(0.0396)	(0.0395)	(0.0401)	(0.0414)	(0.0415)	(0.0409)	(0.0407)	(0.0396)
sex = 1, male		0.175***	0.159***	0.160***	0.160***	0.161***	0.158***	0.160***	0.192***	0.193***	0.198***
		(0.0308)	(0.0300)	(0.0300)	(0.0299)	(0.0299)	(0.0298)	(0.0296)	(0.0297)	(0.0298)	(0.0286)
parental education (years)			0.0373***	0.0302***	0.0292***	0.0307***	0.0314***	0.0311***	0.0305***	0.0289***	0.0180***
			(0.00410)	(0.00460)	(0.00461)	(0.00476)	(0.00471)	(0.00471)	(0.00464)	(0.00471)	(0.00469)
social status				0.0754***	0.0111	0.00788	0.0181	0.0197	0.0306	0.0215	-0.00454
				(0.0283)	(0.0375)	(0.0380)	(0.0378)	(0.0377)	(0.0370)	(0.0370)	(0.0343)
parental class=2, self-employed					-0.132**	-0.131**	-0.124**	-0.116*	-0.0984	-0.0937	-0.0589
					(0.0627)	(0.0628)	(0.0626)	(0.0628)	(0.0616)	(0.0617)	(0.0594)
parental class=3, skilled manual workers and farmers					-0.127**	-0.123**	-0.107*	-0.101*	-0.0818	-0.0956	-0.0599
					(0.0577)	(0.0585)	(0.0586)	(0.0592)	(0.0583)	(0.0582)	(0.0552)
parental class==4, semi & non-skilled manual workers and farm workers					-0.166***	-0.161**	-0.140**	-0.140**	-0.113*	-0.117*	-0.0603
					(0.0620)	(0.0627)	(0.0622)	(0.0625)	(0.0619)	(0.0620)	(0.0596)
number of siblings						-0.00447	-0.00469	-0.000472	3.46e-05	-0.000637	0.00754
						(0.00962)	(0.00959)	(0.00959)	(0.00970)	(0.00950)	(0.00895)
parent age when child started primary school						0.00316	0.00348*	0.00326*	0.00310	0.00370*	0.00191
						(0.00195)	(0.00193)	(0.00194)	(0.00191)	(0.00191)	(0.00182)
biparental family = 1, lived with both parents						0.0154	0.00685	0.0129	0.000965	0.00958	-0.00971
						(0.0514)	(0.0513)	(0.0511)	(0.0498)	(0.0492)	(0.0468)
school in the capital region = 1, always attended a school in the CR							0.130***	0.134***	0.142***	0.0260	0.0536
							(0.0323)	(0.0322)	(0.0318)	(0.0747)	(0.0682)
zones where attended primary & secondary school = 2, urban-rural							0.0205	0.0123	0.0195	0.0349	0.00702
							(0.173)	(0.171)	(0.175)	(0.169)	(0.153)
zones where attended primary & secondary school = 3, rural-urban							0.246	0.244	0.257*	0.259*	0.224
							(0.156)	(0.151)	(0.151)	(0.145)	(0.138)
zones where attended primary & secondary school = 4, urban-urban							0.0927	0.101	0.118	0.111	0.107
							(0.141)	(0.137)	(0.137)	(0.131)	(0.123)
age of the reform when child started primary school								0.0204***	0.0224***	0.0210***	0.0163***
								(0.00533)	(0.00523)	(0.00523)	(0.00507)
overall secondary school mark									0.188***	0.189***	0.114***
									(0.0327)	(0.0327)	(0.0326)
number of years of education at the age of 25											0.0931***
											(0.00945)
constant	7.412***	7.320***	6.984***	7.069***	7.187***	7.053***	6.892***	6.795***	5.712***	5.768***	5.080***
	(0.0210)	(0.0255)	(0.0435)	(0.0506)	(0.0678)	(0.112)	(0.176)	(0.175)	(0.259)	(0.297)	(0.297)
fixed effects for region where working at the age of 25	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES
observations	1,315	1,315	1,315	1,315	1,315	1,315	1,315	1,315	1,315	1,315	1,315
R-squared	0.041	0.064	0.116	0.121	0.126	0.128	0.142	0.152	0.173	0.193	0.261

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The coefficients estimated before and after controlling for social background follow the same pattern as the descriptive statistics reported earlier, with the trajectory private-private exhibiting the largest association with earnings, followed by private-public and then public-private. However, after additionally controlling for when and where individuals attended school (school region and zone and the age of the reform when individuals started primary school), the correlation between earnings at the age of 25 with the school trajectory private-public becomes stronger than the correlation between earnings and the trajectory private-private (specification 7). Another interesting point is that, even though the estimated coefficients for all school-type trajectories are smaller after adding an additional control for the overall secondary school mark, they all remain significantly different from zero. Also interestingly, the influence of the region of studies (measured as whether or not individuals always studied in the capital region) on hourly earnings at the age of 25 becomes completely insignificant after controlling for the region where individuals perform their main occupation at the age of 25 (specification 10). This reflects the fact that there is a large correlation between the region where individuals attended school and the region where they live and work at the age of 25. Finally, we observe that even after controlling for years of education completed by the age of 25, the

trajectories private-public and private-private still significantly explain earnings at the age of 25 at the 5% level of significance. This is, however, not the case of the trajectory public-private, whose association with earnings at the age of 25 becomes not significantly different from zero after controlling for all the covariates; this means that its association with earnings becomes not statistically different from the association of the trajectory public-public with earnings.

Table 5.18 reproduces the analyses presented in Table 5.17 but using a 2SLS estimation that corrects for the potential selection bias produced by only considering people with non-zero earnings at the age of 25 (Heckman, 1979). The upper panel (Panel A) reports the estimated coefficients for the OLS earning models (second-stage) and the lower panel (Panel B) shows the estimated coefficients for the first-stage probit models of labour market participation. To facilitate comparison, the second-stage models for earnings include all the regressors that I included in the OLS models; however, the first-stage (probit) models include the variables that appeared to be significant in the participation models in Section 5.5, which are: gender, a dummy for whether the individual always attended school in the capital region, the age of the reform when the individuals started primary school, the number of years of education by the age of 25, a dummy variable indicating whether the individual is married at the age of 25, and another dummy variable indicating whether the individual has children by the age of 25[95]. The last three regressors, which are not part of the set of control variables of the earning models, were included in all the specifications of the selection models (specifications 1 to 11). In contrast, the other regressors were added gradually to each specification of the selection model depending on whether they were added in the models for earnings.

[95] Although considering the results of Section 5 I tried the variable parental social class as a regressor in the first-stage probit model for labour market participation, none of the estimated coefficients for this variable were significant; the exception to this was the coefficient for the third social class group (skilled non manual workers and farmers) which only appeared to be significant in the most complete specification. Therefore, I believe that this correlation was rather spurious. I also tried to use the indicator variable for having had a working mother; however, as in Section 5.5, it appeared to be insignificant in all specifications.

Table 5.18: 2SLS regressions for hourly earnings at the age of 25

Panel A: main effects of school-type trajectories and covariates (second-stage model)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
school type trajectory = 0, public-public (omitted)											
school type trajectory = 1, private-public	0.253***	0.254***	0.189***	0.174***	0.171***	0.170***	0.152***	0.153***	0.147***	0.147***	0.117**
	(0.0558)	(0.0551)	(0.0541)	(0.0542)	(0.0541)	(0.0542)	(0.0541)	(0.0538)	(0.0531)	(0.0527)	(0.0505)
school type trajectory = 2, public-private	0.184***	0.180***	0.150***	0.150***	0.147***	0.144***	0.110***	0.114***	0.0959**	0.0989**	0.0660*
	(0.0435)	(0.0430)	(0.0419)	(0.0418)	(0.0417)	(0.0417)	(0.0421)	(0.0418)	(0.0414)	(0.0415)	(0.0398)
school type trajectory = 3, private-private	0.254***	0.268***	0.193***	0.186***	0.185***	0.183***	0.147***	0.146***	0.133***	0.133***	0.0790**
	(0.0410)	(0.0405)	(0.0403)	(0.0402)	(0.0401)	(0.0402)	(0.0413)	(0.0410)	(0.0405)	(0.0403)	(0.0389)
sex = 1, male		0.143***	0.133***	0.130***	0.128***	0.132***	0.128***	0.136***	0.166***	0.170***	0.204***
		(0.0462)	(0.0448)	(0.0448)	(0.0448)	(0.0448)	(0.0434)	(0.0429)	(0.0427)	(0.0422)	(0.0406)
parental education (years)			0.0372***	0.0301***	0.0290***	0.0305***	0.0311***	0.0309***	0.0303***	0.0288***	0.0180***
			(0.00425)	(0.00499)	(0.00499)	(0.00512)	(0.00510)	(0.00506)	(0.00500)	(0.00505)	(0.00493)
social status				0.0766***	0.0117	0.00863	0.0187	0.0202	0.0312	0.0219	-0.00466
				(0.0282)	(0.0379)	(0.0381)	(0.0385)	(0.0383)	(0.0378)	(0.0377)	(0.0362)
parental class=2, self-employed					-0.132**	-0.131**	-0.124**	-0.116*	-0.0985*	-0.0940	-0.0587
					(0.0598)	(0.0601)	(0.0601)	(0.0597)	(0.0591)	(0.0586)	(0.0562)
parental class=3, skilled manual workers and farmers					-0.127**	-0.124**	-0.107*	-0.101*	-0.0820	-0.0959*	-0.0597
					(0.0572)	(0.0578)	(0.0578)	(0.0575)	(0.0568)	(0.0565)	(0.0541)
parental class==4, semi & non-skilled manual workers and farm workers					-0.167***	-0.162**	-0.141**	-0.141**	-0.114*	-0.117*	-0.0600
					(0.0642)	(0.0645)	(0.0643)	(0.0639)	(0.0633)	(0.0628)	(0.0603)
number of siblings						-0.00432	-0.00457	-0.000629	-0.000131	-0.000777	0.00759
						(0.0102)	(0.0101)	(0.0101)	(0.0100)	(0.00991)	(0.00952)
parent age when child started primary school						0.00307	0.00338*	0.00320*	0.00304	0.00364*	0.00192
						(0.00193)	(0.00192)	(0.00191)	(0.00188)	(0.00187)	(0.00180)
biparental family = 1, lived with both parents						0.0146	0.00587	0.0114	-0.000547	0.00815	-0.00939
						(0.0467)	(0.0464)	(0.0462)	(0.0457)	(0.0453)	(0.0434)
school in the capital region = 1, always attended a school in the CR							0.122***	0.126***	0.134***	0.0192	0.0556
							(0.0332)	(0.0331)	(0.0328)	(0.0635)	(0.0609)
zones where attended primary & secondary school = 2, urban-rural							0.0245	0.0135	0.0207	0.0363	0.00642
							(0.248)	(0.247)	(0.244)	(0.244)	(0.233)
zones where attended primary & secondary school = 3, rural-urban							0.246	0.243	0.257*	0.258*	0.225
							(0.154)	(0.153)	(0.151)	(0.151)	(0.145)
zones where attended primary & secondary school = 4, urban-urban							0.0959	0.102	0.119	0.112	0.107
							(0.145)	(0.144)	(0.143)	(0.143)	(0.136)
age of the reform when child started primary school								0.0177***	0.0195***	0.0184***	0.0170***
								(0.00625)	(0.00618)	(0.00612)	(0.00576)
overall secondary school mark									0.188***	0.189***	0.113***
									(0.0324)	(0.0322)	(0.0315)
number of years of education at the age of 25											0.0938***
											(0.00903)
constant	7.441***	7.359***	7.016***	7.108***	7.229***	7.095***	6.936***	6.843***	5.762***	5.817***	5.059***
	(0.0316)	(0.0496)	(0.0620)	(0.0704)	(0.0841)	(0.125)	(0.186)	(0.190)	(0.265)	(0.291)	(0.295)
fixed effects for region where working at the age of 25	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES
lambda	-0.273	-0.230	-0.190	-0.219	-0.231	-0.210	-0.217	-0.186	-0.196	-0.175	0.0477
	(0.217)	(0.247)	(0.240)	(0.239)	(0.239)	(0.239)	(0.230)	(0.232)	(0.229)	(0.227)	(0.226)
observations	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387
selected observations	1,315	1,315	1,315	1,315	1,315	1,315	1,315	1,315	1,315	1,315	1,315

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Panel B: Probit selection model (first-stage model)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
sex = 1, male		0.896***	0.896***	0.896***	0.896***	0.896***	0.894***	0.913***	0.913***	0.913***	0.911***
		(0.159)	(0.159)	(0.159)	(0.159)	(0.159)	(0.160)	(0.162)	(0.162)	(0.162)	(0.160)
school in the capital region = 1, always attended a school in the CR							0.240*	0.277**	0.277**	0.277**	0.261*
							(0.132)	(0.135)	(0.135)	(0.135)	(0.136)
age of the reform when child started primary school								0.0890***	0.0890***	0.0890***	0.0853***
								(0.0250)	(0.0250)	(0.0250)	(0.0252)
number of years of education at the age of 25	-0.523***	-0.569***	-0.569***	-0.569***	-0.569***	-0.569***	-0.583***	-0.499***	-0.499***	-0.499***	-0.491***
	(0.131)	(0.136)	(0.136)	(0.136)	(0.136)	(0.136)	(0.137)	(0.142)	(0.142)	(0.142)	(0.142)
married = 1, married at the age of 25	-0.431***	-0.260*	-0.260*	-0.260*	-0.260*	-0.260*	-0.256*	-0.229	-0.229	-0.229	-0.156
	(0.133)	(0.139)	(0.139)	(0.139)	(0.139)	(0.139)	(0.140)	(0.143)	(0.143)	(0.143)	(0.148)
children25 = 1, has children at the age of 25											0.0809**
											(0.0404)
constant	2.037***	1.682***	1.682***	1.682***	1.682***	1.682***	1.601***	1.248***	1.248***	1.248***	0.157
	(0.0987)	(0.111)	(0.111)	(0.111)	(0.111)	(0.111)	(0.119)	(0.151)	(0.151)	(0.151)	(0.560)
Observations	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

As reported, the coefficients estimated for lambda, the error covariance, are insignificant in all the specifications. Ergo, I cannot reject the hypothesis of no selection bias affecting the OLS estimations presented in Table 5.17. Although without selection bias both OLS and 2SLS produce unbiased estimations of the true effects, we prefer the OLS estimator because 2SLS produces larger standard errors and is

consequently less efficient[96]. Also, although insignificant, the negative signs of the lambda coefficients in all specifications, except for the one that contains educational attainment by the age of 25 in addition to all covariates, suggest that the error term of the selection equation - first stage of the 2SLS model - and the error term of the earning equation are negatively correlated. This means that unobserved individual characteristics that induce more labour market participation tend to be associated with lower earnings[97]. The lack of evidence to confirm the problem of selection bias in my estimations is reflected in the fact that the estimated coefficients for the school-type trajectories estimated via 2SLS are quite similar to those estimated by simple OLS. Perhaps the only difference between them is that, even in the most complete specification that includes educational attainment at the age of 25, the estimated coefficient for the school-type trajectory public-private continues to be significant at the 10% significance level. However, since the 2SLS estimates did not prove to provide more consistent estimations of the parameters of interest for my research questions, I conduct the analysis of interaction effects in this section only using OLS specifications.

As seen, the results of the OLS regressions reported in Table 5.17 suggest that the influence of each school-type trajectory that includes at least one private school (at any level) on individuals' hourly earnings is statistically different from the influence of the trajectory public-public on these earnings. In order to better visualise the differences amongst all the school-type trajectories, I re-estimated specification 8 of the main effect models but with different school-type trajectories of reference. The results are displayed in Table I-1 in Appendix I. My findings clearly confirm that the estimated impacts on earnings of the school-type trajectories that include at least one private school are all different from the impact of the trajectory public-public, but there are no significantly differences amongst them.

With the purpose of understanding whether the influence of school-type trajectories on hourly earnings at the age of 25 varies according to observed characteristics of individuals, I fitted OLS models that included interaction terms of school-type trajectories with all the covariates presented in Table 5.17, except for those

[96] To confirm this result, I also estimated two-stage models using the MLE method and then ran Hausman tests to check that the differences between the parameters estimated by OLS and 2SLS were not statistically significant. In all cases, I obtained p-values for the Hausman test that were close to 0.9 and could not reject the null-hypothesis that the coefficients estimated by OLS and 2SLS were the same.

[97] This is consistent with the 'reservation wage' theory, that states that individuals have different willingness to wait for well-paid jobs and we may be observing in the labour market mainly those with little willingness to wait.

covariates that are contemporary to the outcome. From all of them, the only estimated interaction coefficients that were significant were the ones for the time when individuals attended school and the overall secondary school mark. These models are reported in Appendix I. It is important to highlight that I found no significant interaction between the school-type trajectories and any of the three parental social background variables.

Table I-2 and Table I-3 of Appendix I show the estimated effects of the interaction of school-type trajectories with having attended school at different times. Regardless of the variable chosen, either the age of the reform when individuals started primary school or the dummy variable indicating whether individuals started secondary school in 1993 or later, the finding is the same: the coefficients for all the interactions that include trajectories containing a private school are negative but only those obtained for the trajectory private-private are also significant at either 95% or 99% level of confidence. This means that the impact of having attended a subsidised-private school at both primary and secondary level decreased over the post-reform period with respect to the other three school-type trajectories.

Table I-4 displays the estimated coefficients for the interaction effects of school-type trajectories with the overall mark at secondary school. It is very interesting to observe that the positive influence of marks on hourly earnings at the age of 25 is significantly higher for those who followed the trajectories private-private and, particularly, for those who followed the private-public route at school. This finding, which resembles what I found for educational attainment at the age of 25, reinforces my belief that the trajectory private-public must have been largely followed by talented students who studied at good quality (and perhaps selective) public secondary schools.

The results from the OLS and 2SLS selection models already presented, allow me to conclude several points. First, the impact of school-type trajectory on the hourly earnings of individuals at the age of 25 is positive and significant over and above the effects of covariates that are non-contemporary to the outcome, including individuals' social background, family structure, location and time of attendance at school. Second, the trajectory of having attended a public school at both levels seems to have a significantly smaller

impact on earnings than all the school-type trajectories that include a private school; however, I did not find any significant differences amongst the impacts of the latter school trajectories on earnings. This means that the most relevant variable to analyse the effects of school type on hourly earnings at the age of 25 should simply be an indicator variable for having attended a subsidised-private school at any level. Third, contrary to intuition, having followed the same school-type trajectory did not seem to have produced different impacts on earnings for people from different social backgrounds. Fourth, also contrary to intuition, it does not seem to be the case that the increasing pressure for school competition that occurred during the post-reform period increased the impact of attending private schools relative to public schools on individuals' earnings at the age of 25 over time. In fact, relative to those who followed the public-public school route between 1981 and 1994, those who followed the private-private trajectory over the same period significantly reduced their monetary returns at the age of 25. Finally, I found evidence that the positive impact of the overall mark obtained by students when graduating from secondary school has a significantly higher return on earnings if they followed the private-private school route and even higher if they followed the private-public route. This provides more evidence in favour of my belief that the public-private route must have been largely chosen by particularly talented students from a range of different social backgrounds.

To conclude the multiple regression analyses, I present the main effects models for the indicator explanatory (or treatment) variables 'attended a secondary private school' and 'attended a private school at any level' estimated with OLS and 2SLS. This information is summarised in Table 5.19 and Table 5.20.

As anticipated, having attended a private school shows a positive and significant association with earnings in the two estimated models across all specifications after controlling for all covariates (including the socioeconomic and family variables, the overall secondary school mark, and all the covariates that are contemporary to earnings). We can also confirm that having attended a private school at any school level is associated with larger earning gains than having attended a private school at the secondary level.

Table 5.19: Main effects of having attended either a secondary subsidised-private school or a subsidised-private school at any level on hourly earnings at the age of 25: OLS coefficients

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1) Treatment: attended a subsidised private secondary school							
school type trajectory = 0, attended a public secondary school (omitted)							
school type secondary level = 1, attended a subsidised private secondary school	0.188***	0.141***	0.138***	0.105***	0.0898***	0.0905***	0.0515*
	(0.0326)	(0.0318)	(0.0321)	(0.0330)	(0.0325)	(0.0326)	(0.0308)
2) Treatment: attended a subsidised private school at any level							
school type trajectory = 0, never attended a subsidised private school (omitted)							
ever in a private school = 1, attended a subsidised private school	0.231***	0.169***	0.166***	0.135***	0.121***	0.123***	0.0819***
	(0.0313)	(0.0308)	(0.0312)	(0.0319)	(0.0314)	(0.0314)	(0.0304)
controls for social background	NO	YES	YES	YES	YES	YES	YES
controls for family demographics	NO	NO	YES	YES	YES	YES	YES
controls for time and geographical location	NO	NO	NO	YES	YES	YES	YES
controls for secondary school overall mark	NO	NO	NO	NO	YES	YES	YES
controls for region where working at the age of 25	NO	NO	NO	NO	NO	YES	YES
controls for educational attainment at the age of 25	NO	NO	NO	NO	NO	NO	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5.20: Main effects of having attended either a secondary subsidised-private school or a subsidised-private school at any level on hourly earnings at the age of 25: 2SLS coefficients

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1) Treatment: attended a subsidised private secondary school							
school type trajectory = 0, attended a public secondary school (omitted)							
school type secondary level = 1, attended a subsidised private secondary school	0.185***	0.141***	0.138***	0.104***	0.0897***	0.0905***	0.0514*
	(0.0326)	(0.0314)	(0.0315)	(0.0320)	(0.0317)	(0.0317)	(0.0305)
lambda	-0.326	-0.261	-0.239	-0.200	-0.212	-0.189	0.0447
	(0.219)	(0.240)	(0.240)	(0.233)	(0.230)	(0.228)	(0.227)
2) Treatment: attended a subsidised private school at any level							
school type trajectory = 0, never attended a subsidised private school (omitted)							
ever in a private school = 1, attended a subsidised private school	0.228***	0.168***	0.165***	0.135***	0.121***	0.123***	0.0818***
	(0.0313)	(0.0306)	(0.0307)	(0.0313)	(0.0310)	(0.0311)	(0.0299)
lambda	-0.285	-0.240	-0.219	-0.192	-0.204	-0.182	0.0427
	(0.217)	(0.239)	(0.239)	(0.232)	(0.229)	(0.227)	(0.226)
controls for social background	NO	YES	YES	YES	YES	YES	YES
controls for family demographics	NO	NO	YES	YES	YES	YES	YES
controls for time and geographical location	NO	NO	NO	YES	YES	YES	YES
controls for secondary school overall mark	NO	NO	NO	NO	YES	YES	YES
controls for region where working at the age of 25	NO	NO	NO	NO	NO	YES	YES
controls for educational attainment at the age of 25	NO	NO	NO	NO	NO	NO	YES

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5.6.1.3. Estimation of ATEs under the assumption of selection on observables

As we have found evidence of a strong association between hourly earnings at the age of 25 and whether individuals attended a private school, we are now interested in quantifying this effect. As already done with educational attainment by the age of 25, I first estimate average treatment effects (ATEs) under the assumption of selection on observables by using potential outcome models and the four different estimation methods already introduced in the methodological section: IPW, RA, AIPW and IPWRA. According to my descriptive analyses, what makes a positive and significant difference to individuals' earnings at the age of 25 is to have attended a private school at either primary, secondary or both levels, rather than having attended only a public school at both school levels. Having attended a private school,

particularly at the secondary level, also makes a significant positive difference, albeit smaller. For that reason, I am presenting in this section the results for the estimated ATEs of these two dichotomous treatment variables.

The ATEs reported in this section were performed with a logistic regression for the treatment models (attendance at a private school at secondary level and at any level) and a linear regression for the logarithmic transformation of earnings at the age of 25. Regarding the control variables for the treatment model, as explained in Section 5.3, I followed the recommendations of Cattaneo *et al.* (2013) and used the Bayesian information criterion to choose the variables for the treatment models. This criterion suggested the inclusion of the social background variables along with the number of siblings, the age of parents when the child started primary school and the indicator variable for 'always attended a school in the capital region'. This is the same specification that I used for the ATE models for educational attainment at the age of 25, and I kept it constant over the three estimation methods that use inverse probability weighting (IPW, AIPW and IPWRA). To select control variables for the outcome models, due to their theoretical importance, I opted for including the three variables accounting for parental social background plus the other regressors that proved to be robustly significant in most OLS models, except for the overall school marks at secondary level and the covariates that are contemporary to the point of measurement of earnings. In summary, the regressors included were gender, number of siblings, the age of parents when the child started primary school, and the age of the reform when the child started primary school. These specifications were maintained for the three different estimation methods that involved adjusting a regression for the outcome model, i.e., RA, AIPW and IPWRA.

Table 5.21 presents the estimated potential outcome means (POMs) and ATEs obtained by the four different estimation methods. They express the difference in hourly wages, measured in logarithmic scale, of attending a private school at the secondary level and not attending a private school at the secondary level (upper panel), as well as attending a private school at least at one level and never attending a private school (lower panel). My results confirm my previous beliefs and suggest that attending a private school has a positive and significant effect on earnings at the age of 25. They also confirm that the effect of attending a

private school at any level has a larger ATE than attending a private school specifically at the secondary level. In particular, I find that attending a private school at the secondary level produces an average increase of around 11 percentage points to individuals' earnings, while attending one of these schools at any level produces an average increase close to 14 percentage points. It is worth mentioning that, even though for simplicity I am presenting here the results for only one specification, the estimated ATEs proved to be very robust to different specifications based on the same sets of covariates that I used in the OLS and 2SLS models.

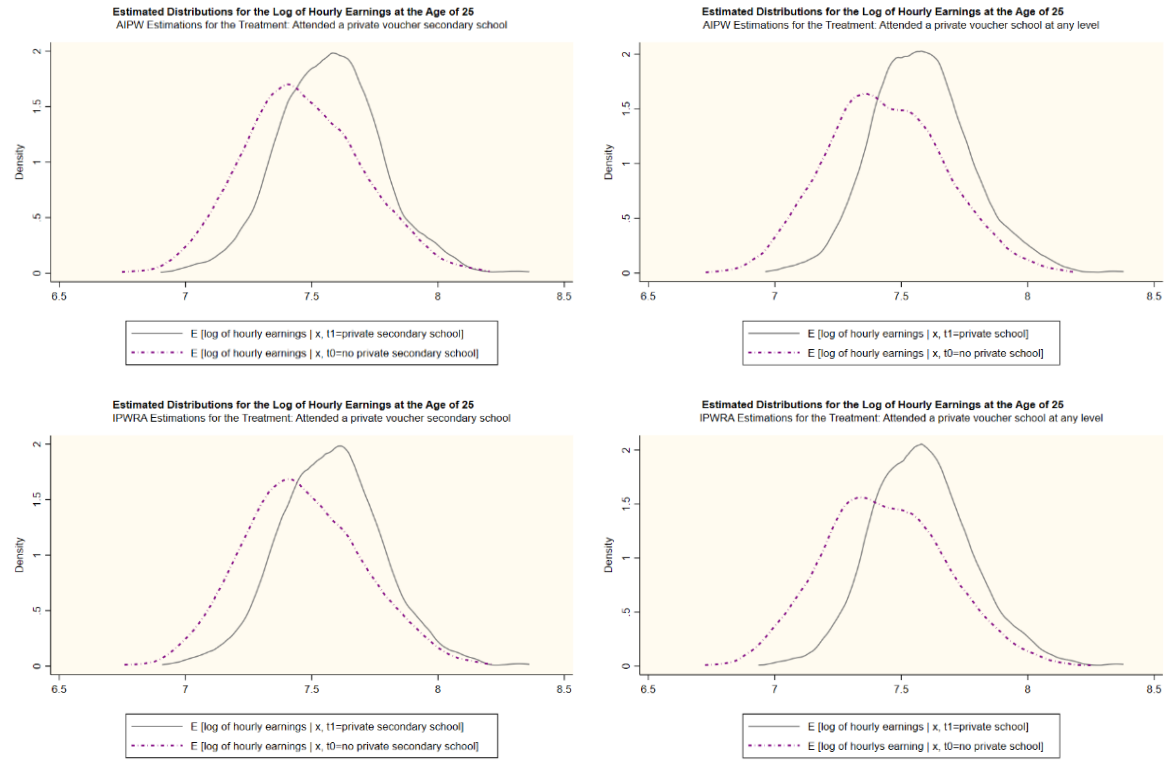
Table 5.21: Average Treatment Effects (ATE) of subsidised-private school attendance on hourly earnings (in log-scale) at the age of 25: Results for the IPW, RA, AIPW, and IPWRA models

School-type trajectory	Estimate	Log of hourly earnings			
		IPW	RA	AIPW	IPWRA
attended a secondary private school	POMs	7.482***	7.476***	7.476***	7.476***
		(0.0200)	(0.0196)	(0.0198)	(0.0197)
	ATEs	0.110***	0.105***	0.108***	0.109***
		(0.0329)	(0.0343)	(0.0342)	(0.0340)
attended a private school at any school level	POMs	7.459***	7.448***	7.448***	7.447***
		(0.0224)	(0.0214)	(0.0217)	(0.0216)
	ATEs	0.134***	0.140***	0.143***	0.142***
		(0.0320)	(0.0324)	(0.0325)	(0.0323)
observations		1,315	1,315	1,315	1,315

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In order to visualise not only the ATEs but also the estimated differences between all treated and untreated individuals, I present plots containing the estimated distributions of potential outcomes for attending and not attending a private school, either at the secondary level or at any level, under the assumption of selection on observable characteristics of individuals. These distributions were estimated with the double-robust models, AIPW and IPWRA, and are presented in Figure 5.6. The left-hand side panel of Figure 5.6 displays the distributions for the treatment 'attended a private school at the secondary level' and the right-hand side panel show the distributions for the treatment 'attended a private school at any level'. Moreover, while the upper panel presents the results obtained by the AIPW estimator, the lower panel presents the results obtained by the IPWRA estimator.

Figure 5.6: Estimated Distributions for the log of hourly earnings at the age of 25 - results for the double-robust AIPW and IPWRA models



The estimated distributions for the logarithm of hourly earnings at the age of 25 are fairly symmetric due to the log-transformation of the variable. However, regardless of the estimation method, we can see that the earning distributions for having attended a private school, either at secondary level or at any level, are all shifted to the right relative to the estimated distributions for not having attended one of these schools; additionally, they are also more compact and present a smaller variance. In all cases, the modes (peaks) of the distributions are very close to their mean values. We can also observe that the predicted top earnings for having attended a private school are larger than those predicted for having attended public schools; equivalently, the predicted bottom earnings for the latter group are much smaller than those predicted for having attended a private school at least at one school level.

All in all, the estimated distributions of earnings under the assumption of selection on observable characteristics of individuals allow us to observe that having attended a private school - either at any level or at secondary level - has significant effects not only on the average hourly earnings at the age of 25 but also on the different moments of these distributions.

5.6.1.4. Estimation of ATEs under the assumption of selection on unobservables

In this section I try to find a consistent estimate of the average effect of having attended a subsidised-private school at the secondary level on hourly earnings at the age of 25 under the assumption of selection on unobservable characteristics of individuals. As we have seen, if the selection of students into different school trajectories is strongly associated with individuals' unobservable characteristics that also have an impact on the earnings at the age of 25, the estimations of ATEs that only control for observables can be biased. All techniques that allow us to obtain consistent estimates of ATEs in the presence of endogeneity require us to include in the selection models at least one instrumental variable that is correlated with the treatment but uncorrelated with the unobservable individual heterogeneity in the outcome models.

As explained in the methodological section of this chapter, the lack of aggregated administrative records in Chile prior to 1990, meant that I was only able to construct an instrumental variable based on the school supply in a relevant geographical area by the time that students started secondary education. This means that, in practice, I can only instrumentalise the variable 'attended a secondary private school', which is the only treatment variable that I analyse in this section. It is also worth remembering that, as part of the assumptions that I needed to make to construct this instrument, I had to restrict my sample to only those individuals that lived in the same region from the time they were born until they finished secondary school. Thus, the sample I use in these estimations, which is 82% of the total sample that I used to estimate ATEs under the assumption of selection on observable individual characteristics, is only representative of the population of students that did not migrate to other regions while they were attending either primary or secondary school.

Moreover, as mentioned in the methodological section of this chapter, the endogenous regression adjustment (ERA) that must be used to obtain a consistent estimation of ATEs under the assumption of selection on unobservables only admits a probit regression in the selection model. In contrast, the ATEs for hourly earnings at the age of 25, that I estimated under the assumption of selection on observables in Section 5.6.1.3, used a logistic regression in the selection model. In this section, I present POMs and ATEs

estimated with the ERA estimator along with POMs and ATEs estimated with the double-robust AIPW and IPWRA estimators; however, to be able to make an adequate comparison of the results of these two different estimation strategies, this time I used a probit model for the selection equations of the double-robust estimators and also included the instrumental variable as an additional regressor.

Table 5.22 summarises my results for the ATEs of having attended a secondary private school on hourly earnings at the age of 25. For simplicity I only report the ATEs and the estimated potential outcome means for the untreated individuals (POMs) in the main body of this section and present all the rest of the estimated coefficients in Appendix J. As reported, this time the estimations performed with ERA, compared with those performed with AIPW and IPWRA, produced considerably larger standard errors. I believe that this could be explained by the fact that the instrumental variable may have an effect on earnings at the age of 25 over and above its indirect effect on it through the treatment.

Intuitively, since individuals in my sample did not migrate before the completion of secondary education, which typically occurs at the age of 17 or 18, I think it is possible that many of them did not migrate to a different region before the age of 25. Therefore, the supply of schools in the relevant geographical area may actually have had a relationship with regional attributes that determine whether people earn more or less at the age of 25. In other words, unfortunately, I believe that in this case the relationship between the instrument and the outcome could exist over and above the mediation of the treatment, which is a violation of the exclusion restriction that is crucial for obtaining a consistent estimation through instrumental variables. Therefore, although this cannot be statistically tested, it is likely that the instrument I constructed may not be a valid instrument to correctly identify ATEs, at least for the case of earnings at the age of 25. Having made this very important point about the possible non-validity of my instrument for estimating the effects of school type on earnings, I find that the ATE estimated with the ERA estimator is close to 23 percentage points. However, to determine whether the correction for selection helps to amend the endogeneity problem, I run an endogeneity test for the ERA estimator - a Wald test for the null hypothesis that the treatment and outcome unobservables are uncorrelated - obtaining a p-value of 0.923. This provides enough evidence against the hypothesis that the corrections for endogeneity based on the only

instrumental variable I was able to construct produce more consistent estimations than the techniques that only correct for selection on observable characteristics of individuals. Consequently, we can, unsurprisingly, argue that the estimations obtained from the double-robust estimators AIPW and IPWRA are preferred to those obtained by ERA.

Table 5.22: Average Treatment Effects (ATE) of attending a secondary subsidised-private school on hourly earnings (in log-scale) at the age of 25: results for the AIPW, IPWRA and ERA models.

School-type trajectory	Estimate	Log of hourly earnings		
		AIPW	IPWRA	ERA
attended a secondary private school	POMs	7.470*** (0.0210)	7.470*** (0.0211)	7.376*** (0.166)
	ATEs	0.120*** (0.0365)	0.119*** (0.0368)	0.226 (0.265)
observations		1,113	1,113	1,113

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

It is also important to mention that, unlike the results I obtained under the assumption of selection on observable characteristics of individuals, the results I obtained using the ERA estimator appeared to be quite unstable and not robust to different model specifications. This reinforces my doubts on the reliability of the estimation approach that I tried to develop in this section to correct for a potential selection on unobservable characteristics of individuals, due to the invalidity of the instrument.

5.6.2. Conclusions

The results of the analyses conducted in Section 5.6 under the assumption of selection on observable characteristics of individuals suggest that having attended a subsidised-private school either at the primary or the secondary level rather than a public school had a significant effect on individuals' hourly earnings at the age of 25. The estimated average effect on earnings at the age of 25 is between 10 and 11 percentage points in the case of attendance at a subsidised-private school at the secondary level and between 13 and 14 percentage points in the case of attendance at one of these schools at either or both levels; these effects are observed after constructing a counterfactual group based on double-robust methods that combined inverse probability weighting with regression adjustment.

I tried to propose a method that corrects for the potential role of the unobservable characteristics of students that influence both the selection of school type and the hourly earnings at the age of 25; however, endogeneity tests run on this model did not reject the null hypothesis that unobservable factors that determine earnings at the age of 25 mediate the decision to study in a subsidised-private school. However, more importantly, there are some reasons to suspect that the instrument I constructed may not be valid for the purpose of identifying the effects of school type on earnings.

Regarding the potential mediating factors affecting the impact of school type on hourly earnings at the age of 25, I only observed associations by looking at the coefficients of the interaction effect models and, therefore, no causality can be inferred from them; however, I did not find any evidence that subsidised-private schools have given better chances to the individuals from disadvantaged social groups that attended them to obtain higher future earnings relative to their better off classmates. In fact, the effect of the different school-type trajectories on hourly earnings appears to be quite homogenous across different categories of socioeconomic background. The only robustly significant evidence I found is that the labour market apparently rewards any additional secondary-school mark point more when students spent all their school years in a subsidised-private school compared with when they followed either the public-public or the public-private school route. However, the reward from the labour market for marks obtained by those who followed the trajectory private-public seems to be even larger than the reward for the marks obtained by those who always studied in a subsidised-private school. This point reinforces the hypothesis I mentioned in Section 5.4, which is that apparently the public secondary schools chosen by those who attended a subsidised-private primary school are good quality ones; consequently, having attended a public secondary school renders no fewer future benefits than having attended a secondary subsidised-private school when students studied in a primary subsidised-private school.

Finally, all models I estimated in this section suggest increasing gains in earnings over time for all individuals regardless of the school-type trajectory they followed. This is a logical result considering that the Chilean economy experienced slow but systematic growth over that period (with the only exception being the financial crisis in 2009). However, I found some interesting evidence suggesting that, in comparison with

those who attended a public school at least at one school level, those who attended only subsidised-private schools have reduced their earning returns over this period; this tendency is robust to both the definition of the variable that accounts for the stage of development of the 1981 reform when individuals started primary school and also to different model specifications. In summary, if we believe that the effect of school type on earnings at the age of 25 is a reasonably good measure of quality of school education, then I could conclude that possibly the quality of the subsidised-private sector decreased relative to the quality of the public sector. This is an unexpected finding, especially considering that many subsidised-private schools started charging fees to parents on top of the voucher in 1993; in fact, I had hypothesised that they had improved their relative advantage with respect to public schools to produce good quality education since that year. Although what I observe in my data is exactly the opposite, this result resembles my own results for access to post-secondary education in Section 5.4 and also echoes the results of Mizala and Torche (2012). Particularly, these authors conclude that tuition fees paid by parents at subsidised-private schools did not produce any significant improvement in the effectiveness of subsidised-private schools relative to public schools (measured by test scores) when they control for the socioeconomic composition of these schools.

To summarise, the findings of this section do not allow me to discard the hypothesis that having attended a subsidised-private school rather than a public school made a difference to individuals' earnings in Chile at the age of 25. However, the earning gap between those who attended a public school at least at one school level and those who only attended subsidised-private schools seems to have decreased rather than increased over the period of expansion of the subsidised-private sector in Chile. Finally, I did not identify any evidence that the ability of subsidised-private schools to increase their student's future earnings varied by students' social background.

5.7. Conclusions Chapter 5

Throughout this chapter, I used a series of estimation methods to study the association between individuals' school-type choices and their educational and labour market outcomes by the age of 25 based on a

representative sample of individuals who started primary school in Chile between 1981 and 1994. At the beginning of this period, Chile undertook a sweeping voucher school reform that set up the basis for public and private voucher schools to compete for students in a free educational market. In this context, students and their families could choose to attend any public or subsidised-private school of their preference and the state would pay a per-student subsidy - the voucher - directly to the chosen schools. The military dictatorship that established this system believed that competition would enhance efficiency and bad quality schools would disappear over time as they would not be chosen by students and their families.

Perhaps one of the most salient aspects of this reform was that the rules in place for subsidised-private schools were not the same as those for public voucher schools. While public schools could not establish any mechanism to screen students in their admission processes unless they were oversubscribed, subsidised-private schools were allowed to select students according to any criteria of their preference. Also, unlike public schools, subsidised-private schools were granted the right to be for-profit and, since 1993, to charge tuition fees to parents on top of the state voucher. These features of the Chilean school system were practically fully in place until 2015, when a new bill approved by the Chilean congress, the 'School Inclusion Act', mandated that subsidised-private schools should become non-profit, non-selective and free to attend by 2025. However, the combination of guarantees provided to subsidised-private schools between 1981 and 2015 has had two major consequences: first, as presented in Chapter 3, the number of subsidised-private schools increased dramatically over the three decades following 1981 and, by 2016, they were covering more than 55% of the total enrolment rates at primary and secondary education in Chile. Second, as I estimated in Chapter 4, there was an increase in socioeconomic stratification by school type in the educational system, with subsidised-private schools mostly receiving students from the middle classes and students from the most disadvantaged social backgrounds being highly concentrated in public schools.

A series of descriptive reports made with the information of the SIMCE test - the official cognitive ability test designed to monitor the quality of school education in Chile - have systematically found higher achievement for students from subsidised-private schools relative to students from public schools. Thus, the question that naturally emerges is whether the better performance exhibited by subsidised-private

schools is explained by better quality of education – through, for example, better teachers, smaller class sizes, improved curriculums, etc - or it is mostly associated with the more advantaged socioeconomic composition of their student bodies. In an extreme case, we could argue, subsidised-private schools could spend much of their resources setting up effective selection mechanisms instead of improving their educational services; this would allow them to choose the most talented students in order to improve their SIMCE test scores with very little effort and then advertise themselves as good quality schools. Additionally, the fact that subsidised-private schools were granted the right to make profit means that any surplus did not have to be necessarily reinvested at schools to improve their quality.

Perhaps for all those reasons, most of the empirical literature intending to evaluate the effects of the voucher school reform in Chile have focused on trying to understand whether subsidised-private schools have really provided a better quality of education than public schools, above and beyond student sorting. These evaluations have had two main characteristics. First, most of them relied completely on students' performance in standardised cognitive ability tests - mainly the SIMCE test - as a measure of school quality and, second, they have all faced the methodological challenge of dealing with the problem of non-random allocation of students at schools. Had school vouchers in Chile been allocated randomly (as was the case of the Colombian PACES program, the Indian voucher program at Andhra Pradesh or the Milwaukee school experiment in the US) it would have been much easier to obtain unbiased measures of the comparative performance of subsidised-private and public schools in Chile. Unfortunately, since the Chilean voucher school system was established at a national scale and offered school vouchers to attend either subsidised-private schools or public schools to all families, the allocation of students across school types has not been random; on the contrary, it has been the result of both selection procedures and co-payments established at subsidised schools, and self-selection from students and their families.

The methodological complexity of performing estimations that take into account the endogeneity caused by the selection of students into school types is probably the reason why the extant evaluations of the effect of subsidised-private schools on student's performance greatly differ in their results. As reported, there is a diversity of academic articles that have identified large positive effects, small positive effects, no effects

or even negative effects of having studied in a subsidised-private school instead of in a public school on students' test scores. Despite this, those studies that have jointly analysed the findings of a large number of individual studies on this matter (Sahlgren, 2013; Drago and Paredes, 2011) observe that the majority of those that use adequate estimation methods have reported positive albeit small differences in favour of subsidised-private schools.

To contribute to the literature on the relative performance of public and subsidised-private schools, I proposed to analyse their effects on three outcomes: educational attainment, employment situation and earnings. For theoretical as well as practical reasons, I decided to measure these variables early on in adulthood, specifically at the age of 25. In addition to this, I proposed to identify whether the effects of having attended a subsidised-private school rather than a public school on my outcomes of interest varied depending on individuals' socioeconomic background, school level and the period when individuals attended school relative to the implementation of the 1981 reform. Most likely because of the scarcity of long-term longitudinal studies in Chile, the effects of attending different types of schools on educational and labour market outcomes later in life has not been well studied. In fact, my literature review only allowed me to identify three studies intended to answer relatively similar research questions: Patrinos and Sakellariou (2011), Bravo *et al.* (2010) and Torche (2005a). However, the first two of these studies had a focus on the overall impact of school choice and competition on the average individuals' educational and labour market outcomes in Chile rather than on comparing the relative performance of subsidised-private and public schools; the third study tackled this difference in relative performance, but its main focus was the change in the role of socioeconomic background on educational attainment as a consequence of the 1981 reform.

My first research hypothesis was that, given their larger potential to access additional financial resources, and their freedom to implement more flexible managerial practices (Chubb and Moe, 1990 and 1988), we should observe on average better outcomes at the age of 25 amongst the group of individuals who attended subsidised-private schools rather than public schools. My estimations of the average treatment effects (ATEs) for educational attainment and earnings at the age of 25 suggest that this may be the case. In particular, I found that, when controlling for observable individual characteristics, attending a subsidised-

private school rather than a public school at the secondary level increases the likelihood of accessing and completing post-secondary studies by the age of 25 by around 14% and 7% respectively; additionally, it increases the likelihood of entering university and obtaining a university degree by the same age by around 10% and 8% respectively. I also estimated that attending a subsidised-private school at any level increases the probability of starting and completing post-secondary studies by the age of 25 by 13% and 8% respectively, while it increases the probability of starting university studies and getting a university diploma by the age of 25 by 10% and 9% respectively. Regarding earnings, I found that attending a subsidised-private secondary school increases earnings at the age of 25 by about 11%, while attending a subsidised-private school rather than a public school at any level gives a positive difference on earnings at the age of 25 of about 14%. All these results proved to be significant and robust to different estimation methods and specifications; however, as explained, they are all based on the assumption of selection on observable characteristics of individuals. In contrast, I could not find any evidence of an effect of school-type trajectory on the employment situation of individuals at the age of 25.

Although these results sound fairly reasonable, it is important to keep in mind that the hypothesis of selection on observable characteristics of individuals may not be very realistic in the context of this investigation. In fact, even though my models contain a large set of variables accounting for the socioeconomic background of individuals and the demographics of their families of origin, I lack a variable reflecting cognitive ability (the classic ability bias) as well as other presumably important variables such as effort, ambition and responsibility. This would produce no issues if these omitted variables were independent of both the covariates of the model and the outcomes for those who attended subsidised schools ('treated individuals') and those who attended public schools ('untreated individuals'). However, it is likely that these unobservable variables correlate, for instance, with both individuals' socioeconomic origin and the outcomes under these two possible treatment states, which would introduce bias in my estimations. For this reason, I also tried to estimate average treatment effects by using estimation methods with less restrictive assumptions, i.e. selection on unobservable characteristics of individuals.

The identification of school-type effects under the assumption of selection on unobservables relies on the estimation of an endogenous regression adjustment (ERA). This procedure estimates a model for the probability of having attended a subsidised-private school that requires the inclusion of at least one instrumental variable. Consequently, I constructed and evaluated two possible instruments: an indicator variable for individuals' participation in religious activities and the supply of subsidised-private schools in the relevant geographical area at the moment that individuals started secondary school. Similar instruments have been used in studies conducted in both Chile and a number of developed countries to analyse the effects of schools on students' performance in test scores. Since only the second of these instruments proved to be correlated enough with the allocation of students into school types, I included it in my estimations. However, after obtaining new estimates using ERA and testing for endogeneity, I could not reject the hypothesis of no correlation between the unobservables of treatment and outcome models, suggesting that endogeneity was not a problem in my estimations. Perhaps the only exception to this was the estimation of the effects of attending a secondary subsidised-private school on the likelihood of having graduated from a university at the age of 25, where the hypothesis of endogeneity could be rejected but only at the 10% significance level. Given that, when endogeneity is not detected, the estimates produced by the methods based on selection on observables are more reliable, I opted for discarding my correction for endogeneity.

My second hypothesis was that the advantages of having attended a subsidised-private school rather than a public school must have increased over time because only the former have received additional resources from tuition fees since 1993. Although the interaction effects regression models presented in Section 5.4, and 5.6 cannot be interpreted causally, they do allow me to observe certain regularities in the mediation of the maturity of the reform on the effect of school-type trajectories on individuals' outcomes at the age of 25. For example, I found evidence of a negative interaction between the school trajectory 'private-private' and the maturity of the reform on individuals' chances of having accessed university by the age of 25. At the same time, I found that the maturity of the reform also negatively affected the earning returns of individuals who followed the 'private-private' school path compared with those who followed other paths. In contrast, the interaction effect models identified that the trajectory 'private-public' increasingly improved

their students' likelihood of graduating from post-secondary education in general and universities in particular over time relative to other trajectories. These results may suggest that the competitive pressures of the voucher school reform had an effect on improving quality of education more at the remaining public schools that survived school competition than at subsidised-private schools, especially at the secondary level. In fact, as Bravo *et al.* (2010) hypothesises, it is likely that the new secondary subsidised-private schools that emerged in the latest stage of the reform were not as good quality as the pre-existing ones. All these results also echo Mizala and Torche's (2012) finding that tuition fees do not seem to have produced a significant improvement in students' test scores at subsidised-private schools when the socioeconomic composition of student bodies is taken into account.

In relation to the presumed generalised improvement of the Chilean school system triggered by the increasing competition following 1981, it is important to make a precautionary note. If the assumptions of the policy makers who designed this voucher school reform were correct and competition would improve the overall quality of the school system, we should expect to see an improvement over time in all individual outcomes at the age of 25 regardless of the school types that they attended. Even though all outcomes I measured in this thesis improved over the period of expansion of the subsidised-private education sector in Chile, a crucial factor to take into account is that the increasing role of the private sector as a provider of education in the post-1981 era also affected the post-secondary educational level. In fact, over the period I analyse, there was a large proliferation of private universities and community colleges which highly expanded the supply of academic as well as vocational degrees. As seen in Section 5.4, between 1990 and 2005 the rates of enrolment in higher education in Chile increased by as much as 150% (Gallegos, 2014). Also, many of these newly created universities and institutes of higher education were far less selective than the established ones. For these reasons, we cannot be certain whether the increased access to post-secondary education and graduation rates that I observe in this period had more to do with the many additional places available at new tertiary education institutions rather than with a significant overall improvement in the quality of the educational system. Ultimately, estimating the impact of competition on educational and labour market outcomes was not one of the purposes of this thesis and answering this question would have required a much more sophisticated analytic framework. As described in the literature

review of this chapter, the studies that try to link school choice and school competition with improvements in the average performance of students in Chile have also produced very contested results; for example, Sahlgren (2013), who conducted an exhaustive systematic review of the many articles written on this topic, concludes that "there is no robust evidence that the Chilean voucher reform has increased educational quality significantly" (Ibid:54).

Regarding my third hypothesis, I expected to find a significant mediation of individuals' social background on the effects of school type on educational and labour market outcomes. As we already know from Chapter 4, the social composition of public schools became increasingly homogenous over the years following the 1981 reform. However, exactly the opposite seems to have happened to subsidised-private schools, who started covering a systematically larger portion of the enrolment rate that included children from lower- and upper-middle privileged classes (and even some children from the most social privileged groups during the most recent years, as my results of Chapter 4.4 suggest). This diversity of subsidised-private schools in Chile, which includes free and paid schools, for-profit and non-profit schools as well as religious and non-religious schools is discussed by Carnoy and McEwan (2003) and more recently by Mizala and Torche (2012) and Sahlgren (2013). All these authors posit that, the combinations of these subsidised-private school attributes have determined that they serve different population segments. At the same time, even if subsidised-private schools were not diverse, the children of more culturally advantaged parents tend to make better use of the same school resources than their less culturally advantaged classmates simply because they have greater exposure to similar resources at home. Ergo, I expected to see that the average effects of attending a subsidised-private school on individual outcomes would be mediated by social background. Despite this, my results mainly invalidate my expectations, with the only exception being the effect of school-type trajectories on the probability of having accessed post-secondary and university studies by the age of 25, which seems to be mediated by individuals' social status. In particular, I find a positive and significant interaction between this variable and the trajectory private-public. This suggests that individuals from more cultured backgrounds are in a better position, compared to their counterparts from less advantaged cultural backgrounds who followed the same school trajectory, to access all sorts of post-secondary educational programs by the age of 25. This result is not entirely surprising. As I mentioned

extensively throughout this chapter, I think it is likely that an important subset of the students in that school path belonged to culturally advantaged families who decided to transit from a subsidised-private primary school to a selective public secondary school. In fact, there is a group of traditional and prestigious public schools in Chile that, although free-of-charge, are very good quality and normally heavily oversubscribed (e.g., the so-called 'emblematic lyceums'); these schools are well-known for attracting talented students from across all social backgrounds. Therefore, it is reasonable to assume that the children of high status parents will make a better use of this trajectory to transit to post-secondary education.

My analyses of the mediation of individuals' social background on the effects of school type on educational outcomes also find that parental social status mediates the effect of the school trajectory 'private-private' on the probability of accessing university studies by the age of 25. Overall, the influence of social status as the only variable mediating the effect of those school-type trajectories that have in common the attendance at a subsidised-private school at the primary level could be indicating that the sociocultural networks that students establish at private primary schools in Chile may play a relevant role in their future access to higher education.

Finally, students' performance at secondary education is one of the main criteria that universities and community colleges in Chile use to screen candidates in their admission processes (Larroucau *et al.*, 2015); thus, I hypothesised that attending a subsidised-private school at the secondary level should render more benefits in terms of educational attainment and labour market outcomes than having attended one of these schools at the primary level. However, the empirical evidence of this chapter casts doubts on this hypothesis, as the only outcome for which this may be the case is the access to post-secondary education by the age of 25. In this single case, having attended a subsidised-private school at the secondary level produced a positive and significant increase in the likelihood of having accessed post-secondary studies by the age of 25 relative to having followed both the public-public and public-private trajectories. In the case of all the other outcomes, I did not find any statistically significant differences amongst the estimated coefficients for the trajectories public-private, private-public and private-private; however, all of them were statistically different from the trajectory public-public. Therefore, what seems to make a difference in

students' access to university, graduation from any kind of post-secondary education institution, and earnings at the age of 25, is whether they attended a subsidised-private school at any point of their school careers. This is a very interesting finding that requires us to reflect on the underlying mechanisms behind this result. One of the plausible mechanisms is peer effects resulting from school sorting. For example, it is possible that the interaction with better peers for at least half of individuals' school careers promotes the development of long-term academic skills that better prepare individuals for their future educational and labour market challenges. Another mechanism could be the role of socio-cultural networks. Perhaps being exposed to these networks at either primary or secondary school provides individuals with a network of contacts that may facilitate their future access to both educational institutions and better job prospects. Unfortunately, the data from the CSP Survey does not allow me to empirically test any of these hypotheses. I will expand on these plausible explanations in the final chapter that presents the overall conclusions of this thesis and a policy discussion (Chapter 6).

To conclude this chapter, a very important point needs to be made regarding the limitations of my estimates. The assumption of selection on observable individuals' characteristics is in fact very restrictive considering the complex nature of the selection mechanisms involved in the allocation of students into different school types in Chile. This is a problem that all researchers who have tried to determine either the effects of subsidised-private schools relative to public schools or the effects of school competition and school choice in the Chilean voucher system on a diversity of individuals' outcomes have faced.

Even though I attempted to construct a strong instrument that would help me to control for the potential endogeneity in my estimations, following the idea of Mizala and Torche (2012), I believe that, at least in the case of the models explaining earnings at the age of 25, there are very good reasons to be suspicious about the validity of this instrument. Unfortunately, the scarcity of good educational administrative records from years prior to 1990 in Chile meant that I could only construct a proxy variable for the local supply of schools available for students at the moment they started secondary school. At the same time, the precise information on the location of schools that individuals attended at both primary and secondary level that was included in the CSP Survey's questionnaires was not included in the public databases. Therefore, to

infer the approximate relevant geographic area that families may have taken into account when choosing a secondary school for their children, I had to reduce my sample to a subgroup of individuals who lived in the same place from the time they were born until they finished secondary school. The latter normally occurs in Chile around the ages of 17 or 18 years old. As a result of this, I think it became very likely that the supply of local subsidised-private schools available for individuals when they started secondary school highly correlates with economic attributes of the area where most individuals were working at the age of 25; this means that the school supply I estimated may strongly determine whether individuals received higher or lower earnings at that age. In summary, this potential direct causal link between the instrument and the outcome variable may have made my instrument invalid at least for the purpose of estimating school-type effects for individuals' earnings at the age of 25. Although I believe that this link is less direct in the case of educational attainment by the age of 25, when I estimated ATEs for the access and completion of post-secondary studies using this instrument, I did not find evidence of endogeneity affecting these estimations at the 95% confidence level. Perhaps having had access to national administrative records of schools in Chile over the 1980s would have helped me to construct a more reliable instrument based on the available supply of subsidised-private schools when individuals started primary rather than secondary school. However, the fact that most individuals in my sample did not migrate to different areas of the country before they finished secondary school casts doubt on this.

Therefore, when assessing the role of school type on individuals' educational attainment as well as earnings at the age of 25, I had to accept that the best ATEs I could produce were the ones estimated under the assumption of selection on observable individual characteristics. This assumption does not require that the selection does not depend on any unobservable characteristics of individuals; as explained in the methodological section of this chapter, the selection could still depend on unobservables if they are independent of the covariates of the outcome models and the outcomes under every possible state of the treatment (in this case having attended a public or a subsidised-private school); however, this is still a very strong assumption.

Identifying a valid and strong instrument is a very challenging task even in theoretical terms. Sahlgren (2013), who systematically evaluates several studies conducted with instrumental variables that have assessed different aspects of the Chilean voucher school system concludes that "they fail to account for selection bias properly because of poor instruments (Ibid:48)". If, on top of the theoretical problem of identifying an adequate instrument to control for endogeneity, we add the practical difficulties of constructing this instrument because of the lack of long-term and high quality administrative records and longitudinal studies, the difficulties faced by empirical researchers are not easy to surmount. For these reasons, I think that being able to conduct further investigations into the consequences of the Chilean voucher school system and, more specifically, to obtain more precise estimates of the middle- and long-term effects of having studied at a subsidised-private rather than a public school, will crucially depend on the future availability of good quality data. In that sense, it is important that the institutions that develop, fund and conduct longitudinal studies understand the importance of not only maintaining these studies over time, but also of keeping a stable set of questions throughout all their waves to ensure comparability.

6. Conclusion and policy discussion

This thesis aimed to contribute additional empirical evidence to the debate on the effects of voucher school programs by analysing the case of Chile. The Chilean voucher school system, which was established by a military dictatorship in 1981, is an interesting case study, firstly because of its scale; unlike other voucher schemes in operation around the globe, it was established at a country-wide level and involved private as well as public (state) schools. Also, and perhaps more importantly, Chile provided private voucher schools – the so-called 'subsidised-private schools' – with a particular combination of guarantees that no other country in the world has chosen to jointly replicate: freedom to make profit, to select students based on their own criteria, and to charge tuition fees to parents on top of the state voucher. Whilst the first two of these guarantees were fully in place in Chile for more than 30 years (1981-2015), the latter has only been in operation since the introduction of the 'Shared Financing Scheme' in 1993 and is currently being removed through a gradual process that should be completed by 2025. For these reasons, I agree with Hsieh and Urquiola, (2006) in considering that the Chilean case offers a unique opportunity to analyse the consequences of a transition from a highly centralised national school system, which relied on the state as the major provider of education, to a decentralised market-oriented school system based on competition and choice and increasingly reliant on private provision.

As explained in Chapter 1, this thesis had two overall sets of questions. The first, whose respective empirical analyses I presented in Chapter 4, aimed at understanding the role of socioeconomic background in families' selection of a school type for their children in Chile – i.e., whether they chose a public school, a subsidised-private school or a fully-paid private school - with a focus on how much this relationship changed with the introduction of the voucher school reform and the subsequent 'Shared Financing Scheme'. As further discussed in that chapter, the extant evidence provided by studies on student sorting across school types in Chile has found evidence for an increasingly strong association between socioeconomic background and school-type choice during the period following the voucher school reform (Valenzuela, Bellei and de los Rios, 2014; Elacqua, 2012; Hsieh and Urquiola, 2006); however, I considered that it was important to verify whether this was a tendency that began in previous decades or whether there was evidence of an inflection point in the strength of this relationship around 1981 and 1993. Also, unlike previous studies, I used a

multidimensional approach to socioeconomic background and aimed to determine which of its particular components were the main ones driving this association.

Although conducting regression analyses with a cohort-approach does not constitute evidence of any causal link, my results did not allow me to discard the idea that social background became more important in explaining school-type choice in Chile over the course of the transition from a centralised public education system to a decentralised competitive voucher school system, and this seems to have been mainly driven by parental education. On the other hand, the extension of this analysis to the period pre- and post- 1993 made it possible for me to observe whether the change of legislation, which allowed subsidised-private schools to charge additional tuition fees on top of the voucher, resulted in the link between socioeconomic background and school type becoming stronger. My empirical analyses for this period were suggestive of a further concentration of students with similar socioeconomic background in the same school types. However, the surprising aspect of this analysis was that the main variables driving this change appear to have been parental education and status, rather than social class and/or income as I had hypothesised. Nevertheless, this result could be partially capturing the effect of the 'Preferential Subsidy Law' that has supplemented the state voucher for students from low-income families since 2008.

In Chapter 5, I tried to answer the second set of research questions of this thesis, referring to whether school type had an effect on several educational and labour market outcomes by the age of 25 for all those who attended school between 1981 and 2005 and whether these effects were mediated by socioeconomic background or the maturity of the reform. Prior literature on the effects of the Chilean voucher school system had largely overlooked medium-term students' outcomes most likely because of the scarcity of longitudinal data to conduct this kind of study. Despite the methodological limitations that I faced to obtain an unbiased estimation of the ATEs – about which I discussed in detail in the conclusion of Chapter 5 – I found some evidence that individuals who attended a subsidised-private school over the 25 years following the 1981-reform were more likely to start and complete post-secondary education in general, and university education in particular. Also, they were more likely to earn higher salaries than those who only attended public schools during their entire school careers. Specifically, when I assume selection on observable

individual characteristics and estimate using potential outcomes models, I obtain that attending a subsidised-private school at any school level, relative to only attending public schools, increased the probability of having accessed and graduated from post-secondary studies by the age of 25 by 13% and 8% respectively. Additionally, the same treatment increased the probability of having started and completed university studies by 10% and 9% respectively, and gave individuals a positive difference of about 14% in their earnings at the same age. Only when I studied the probability of having a paid occupation at the age of 25 - for those individuals that were not studying full-time at that age - did I not find any advantage for individuals that attended a subsidised-private school (at any level) with respect to those who only attended public schools.

A particularly interesting aspect of my findings in Chapter 5 was that, contrary to what I expected, having attended a subsidised-private school at the secondary level rather than at the primary level, did not significantly improve students' educational and labour market outcomes at the age of 25. The only exception to this was the access to post-secondary education (including both vocational and academic programs). According to my estimations, having attended a subsidised-private school exclusively at the secondary level gave individuals additional advantages in accessing post-secondary programs by the age of 25 compared to those who only attended one of these schools at the primary level; however, this effect was not observed when I looked only at the access to university.

On the other hand, in spite of being only descriptive, the results of interaction-effect multiple-regression models suggested that neither parental education nor parental social class have been important mediators of the impact of school type on my outcomes of interest. This means that children who studied at subsidised-private schools seem to have benefited in a similar way regardless of the educational level or social class of their parents. Nevertheless, my conclusion was different in the case of parental social status. In particular, the children of high status parents seem to have been more likely to access a university if they attended a subsidised-private school at both primary and secondary level. Perhaps more surprisingly, this mediation effect of parental social status seems to be even larger for individuals who attended a public

primary school and a subsidised-private secondary school and was also significant in the case of access to any post-secondary educational institution, including vocational training centres, apart from universities. Although also only descriptive, another interesting finding in Chapter 5 was that the relative advantage of having always studied in a subsidised-private school (primary and secondary level) compared to all the other possible school-type paths seems to have reduced over time at least in the case of access to university studies and earnings. This could be interpreted as evidence that competition may have triggered some quality improvements in the remaining public schools in the Chilean voucher school system, rather than inducing the emergence of better-quality private schools over time.

Following Levin's framework to evaluate voucher school systems that I presented in Chapter 2, this thesis contributes new empirical evidence to the discussion of both equity and efficiency aspects of the Chilean voucher school reform; therefore, I will expand on these two particular issues.

6.1. Equity considerations

Regarding equity, I believe that my results reinforce the previous findings of Valenzuela, Bellei and de los Rios (2014), Elacqua (2012), and Hsieh and Urquiola (2003 and 2006) who report increasing levels of socioeconomic stratification of students by school type following the implementation of the 1981 voucher school reform. My results complement theirs in suggesting that, when comparing a cohort of individuals who finished their school careers before 1981 with a cohort that studied their entire school career during the period in which the voucher system was already in place, there has been an increase in the association between the socioeconomic background of students and school type since 1981. Therefore, although the link between socioeconomic background and school type certainly existed in Chile before the establishment of the voucher school system, my estimations suggest that the reform may have made this association stronger. My findings also coincide with the theoretical model developed by McLoad and Urquiola (2009) who predict that, if school reputation and selection are introduced within a competitive school market, the result is socioeconomic stratification of students across schools.

With respect to the great importance of parental education in accounting for the link between socioeconomic background and school choice, as I discussed in Section 4.3, the increasing role of this variable in the likelihood of choosing a subsidised-private school after 1981 fits Coleman, Schiller and Schneider's (1993) hypothesis. This hypothesis poses that parents with higher levels of education will be the major beneficiaries of school choice since they are more skilled at being able to collect, compile and analyse relevant information on schools to make the best possible decision. Also, this result coincides with both quantitative (Elacqua, Schneider and Buckley, 2006; Chumacero, Gomez and Paredes, 2011) and qualitative (Hernandez and Raczynski, 2015; Gubbins, 2013; Córdoba, 2014) studies pointing out that parents from disadvantaged socioeconomic backgrounds in Chile seem to have motivations different from school quality in deciding on a school for their children. Therefore, I believe that my empirical results do not find support for the alternative hypothesis (Friedman, 1962; Coleman, Schiller and Schneider's, 1993; Neal, 2018) that choice, when accompanied by selection, would benefit the most disadvantaged families in society, whose children are typically locked into their neighbourhood's public school. Indeed, all my empirical analyses report that the middle-privileged strata were the ones who migrated from public to subsidised-private schools after the establishment of the voucher school system.

In terms of the significant increase in the importance of parental social status in explaining school-type choice after the establishment of the 'Shared Financing Scheme' in Chile, as I reflected in the conclusion of Section 4.4, this result seems to suggest that subsidised-private schools transformed into a symbol of status for Chilean families once they began charging tuition fees. As a matter of fact, qualitative literature on school choice in Chile (Román and Corvalán, 2016; Kosunen and Carrasco, 2016; Hernandez and Raczynski, 2015; Córdoba, 2014) has reported that higher status families have found in these schools a way to differentiate themselves from the most socially disadvantaged families. Perhaps the most interesting aspect I found in my review of the qualitative literature is that families who chose a subsidised-private school tended to mention much more frequently the quality of peers as a good attribute of their chosen schools rather than the quality of teaching itself. Moreover, the fact that, unlike public schools, subsidised-private schools could select students based on both academic and socioeconomic criteria was seen in a very positive light by these parents. This view is shared by Rinne *et al.* (2015), who compares family attitudes

towards market-driven school mechanisms in Chile and Finland, finding that the Chilean middle-classes strongly support their right to choose a school of their preference, the selection of students at schools, and co-payments that privilege families who can afford fees (Ibid:113)[98]. For Kosunen and Carrasco (2016), this reflects a confirmation of Bourdieu and Passeron's theory of exclusion, where cultural capital represents both an indicator of status and a power resource for social stratification (Bourdieu and Passeron's 1977). The choice of a school that resembles the cultural standing of students' own families, which is also confirmed by other studies conducted by economists (Elacqua, Schneider and Buckley, 2006; Gallego and Hernando, 2009) could be understood in Bourdieu's language as "direct exclusion", because families seem to base their decision about schools, and particularly about schools' student bodies, on "elective affinities". However, even if we are more inclined to accept economic theories of educational inequality and therefore believe that families make educational decisions based on the costs and benefits of different alternatives, the same phenomenon can be explained if we simply accept Breen and Goldthorpe's (1997) thesis of "aversion to downward mobility". In this case, more higher status parents, fearing that their children will end up experiencing downward mobility, would rationally select a school where they will have fewer chances to interact with less refined, cultivated or educated students who could jeopardise their children's educational experience. Of course, parents from the lowest status backgrounds of the society, unafraid of experiencing downward mobility, will rationally tend to give much less importance to schools' students bodies when choosing a school for their children.

Regardless of the underlying nature of parents' motivations driving school-type decisions, all my analyses suggest that children from the most disadvantaged cultural background were systematically left behind in public schools while their more culturally advantaged counterparts gradually migrated to subsidised-private schools between 1981 and 2015. Considering that gross enrolment rates in secondary education in Chile increased from around 65% in 1981 (Gauri, 1998) to almost 100% in 2015 (MDS, 2015), it is possible to argue that, over the period of the large expansion of secondary education in Chile, educational inequalities at this level of education changed from quantitative to qualitative inequalities, as the hypothesis of

[98] It is interesting to observe that this study finds very strong support for school choice and all market-based school mechanisms in Chile among all social groups except for the most socially disadvantaged families.

Effectively Maintained Inequality (EMI) (Lucas 2001, 2009) would predict. In other words, rather than being important whether or not individuals in Chile completed secondary education, it started becoming increasingly important where they completed this level. This hypothesis is also consistent with some empirical evidence provided by studies on university graduates' earnings and access to top ranked jobs, where the location and prestige of the school that individuals attended appear to be important determinants of their future success in the labour market, above and beyond their educational attainment and achievement (Núñez and Gutiérrez, 2004; Zimmerman, 2019).

From an educational policy perspective, the concentration of students with similar socioeconomic backgrounds in the same schools can be detrimental for the most socially disadvantaged children if peer effects are present, even in the case that they have access to exactly the same quality of teaching, educational technologies and school facilities than their more socially advantaged counterparts. As seen in Chapter 2 and the conclusion of Chapters 4 and 5, investigations into the effect of peers on educational achievement conducted with Chilean data (Gutiérrez-Cofré, 2019; Canales and Webb, 2018; McEwan, 2003) suggest that socially disadvantaged children tend to benefit in terms of their academic performance from the interaction with socioeconomically better-off classmates. However, if, on top of peer effects, there are substantial differences in the quality of services offered by schools that serve individuals from different socioeconomic backgrounds these differences can be further amplified.

My analyses in Chapter 5 indicate that having attended a subsidised-private school at any level in Chile does make a significant difference on individuals' outcomes at the age of 25 relative to having always attended a public school after controlling for selection on students' observable characteristics that include socioeconomic background; however, the lack of information on both peer effects and school characteristics in the datasets I used in this thesis means that I am unable to identify underlying mechanisms. If we assume that this effectiveness gap between subsidised-private and public schools is partly explained by peer effects and partly by some school attributes, then we can argue that Chilean voucher schools have been contributing to maintaining educational and economic inequalities across generations in a two-fold manner: firstly by stratifying children into school types by social background and secondly by offering a

better quality of education to the more privileged children who attend subsidised-private schools. Therefore, the process of selecting a school type in Chile seems to both reflect and trigger a series of socioeconomic inequalities that persist at least until individuals turn 25 and presumably later in life.

For all these reasons, policy makers interested in the promotion of equality of educational opportunity, may want to avoid education policy designs that intendedly or unintendedly produce a situation of separating equilibrium, where children from the most disadvantaged social origins end up concentrated in completely different schools than children from more privileged socioeconomic backgrounds.

6.2. Efficiency considerations

Having analysed the equity considerations, following the framework provided by Levin (2002), it remains to discuss how my empirical results contribute new evidence to the assessment of the efficiency aspects of the Chilean voucher school system. This is not a trivial endeavour because efficiency not only refers to producing the best possible outcomes, but also producing them at the lowest level of expenditure. Therefore, in order to arrive at any conclusions, we should study both; whether subsidised-private schools, which became the predominant providers of education in Chile between 1981 and 2015, were more effective than public schools at producing better outcomes for their students and whether they managed to do so at a lower cost.

Regarding effectiveness, my results in Chapter 5 lead me to believe that subsidised-private schools, between 1981 and 2005 (the year in which the youngest people in my sample graduated from secondary school), have been significantly more effective at producing good outcomes for their students than public schools. The simplest explanation for this gap is the fact that, since 1993, a considerable number of subsidised private schools started charging fees to parents on top of the state voucher, and these differential resources may have been invested by these schools in features that enhanced their students' learning, such as the following: better teachers, smaller class sizes, better facilities, etc. However, my results do not really suggest that after 1993 the effectiveness gap between subsidised-private and public schools increased, but perhaps

the opposite; ergo, we need to look at other reasonable explanations. The organisational theories of public vs. private schools provide plausible frameworks to explain this result. For example, for Chubb and Moe (1990, 1988) private schools are intrinsically more likely to produce effectiveness because, unlike public schools, which are subordinated to a hierarchic system of democratic politics, they are largely autonomous. Consequently, they are less constrained in their ability to make decisions intended to improve school quality. Other theories put the emphasis on the influence of families on the institutional aspects of schools. In particular, some authors observe that poor socioeconomic characteristics of parents are associated with low involvement in schools, lower quality of teachers, slower pacing and less rigorous curricula (Armor *et al.*, 2018; Lauen and Gaddis, 2013; Lee, Bryk, and Smith 1993). The lack of parental involvement can be therefore seen as a lack of accountability of schools to parents that provides no incentives for schools serving the poor to improve over time. If this is the case, it is unlikely that the competitive pressures promoted by school choice will exert a positive effect on public schools. As the most disadvantaged children in the Chilean society have remained in public schools, this could also be a good explanation for why individuals who accessed subsidised-private schools seem to have advantages in acquiring both further education and higher earnings later in life. However, before taking this for granted, a handful of precautionary notes need to be made.

First, although I estimated positive and significant ATEs for attending a subsidised-private rather than a public school on both educational attainment and earnings at the age of 25 under the assumption of selection under observables, it is important to consider that these effects could be overestimated. This can be the case if important individual omitted variables, such as parental income, genetic ability, ambition or motivation, which are typically positively correlated with educational attainment and earnings, are also positively correlated with the likelihood of attending a subsidised-private school. Although I tried to correct my estimations for the influence of such factors by using an instrumental variable approach, the rejection of the hypothesis of endogeneity may have had more to do with the validity of my instrument than with the fact that endogeneity was not a problem in my estimations.

Second, as already mentioned in the discussion about equity, recent literature conducted with Chilean data on student's performance in standardised tests suggests that peer effects are important, especially for children from disadvantaged social backgrounds (Gutierrez-Cofre, 2019; Canales and Webb, 2018; McEwan, 2003). Even if, as some authors remark, peer effects do not make the 'school-type effects' completely disappear (Sapelli and Vial, 2005; Sapelli, 2003), they do reduce the magnitude of these effects. Therefore, it is likely that, had I controlled for peer effects, the magnitude of the effects I estimated for subsidised-private schools relative to public schools would have been smaller; unfortunately, this is an hypothesis that this thesis cannot empirically address[99].

Third, regardless of my empirical concerns on omitted variables and endogeneity, my results do suggest that having attended a subsidised-private school at only one level (regardless of the level) is what made a difference to individuals' educational attainment and earnings by the age of 25. Although institutional constraints and lack of accountability from schools to parents provide reasonable explanations for observing lower academic and labour market performance among individuals who studied at public schools, they do not completely solve this puzzle[100]. In fact, it is difficult to make a case for these factors to have a medium-term impact on students' outcomes if they were only present at a single educational level, especially considering how crucial the four years of secondary education are to accessing a university program in Chile[101]. If having always attended a public school is what really draws the dividing line between secondary school graduates, and its impact remains until they are 25 years old and presumably later, it is important to reflect on potential mechanisms that explain this particular result. As we know from Chapter 4, individuals who always attended a public school are the most socially disadvantaged in the Chilean society, and the evidence (Flores *et al.*, 2015; Gallego and Hernando, 2009; Elacqua, Schneider and Buckley, 2006) suggests

[99] Controlling for peer effects would require having information about the socioeconomic background of the classmates of each individual in my sample and, more ideally, also about their school grades; naturally it is practically impossible to find this information in a longitudinal study that asks adults about the information of their schools retrospectively, as in the CSP Survey. The studies on peer effects that have been conducted in Chile are based on the socioeconomic information of students that take the SIMCE test every year, this information is collected through a questionnaire that is sent to parents over the period in which their children are taking the test. That is why there are a handful of papers written on the impact of peer effects on educational achievement of students while still at school.

[100] In fact, the only exception to this is the access to post-secondary education (including both academic and vocational education) by the age of 25, where the secondary level seems to have an effect.

[101] The overall mark of students at secondary school (that is one of the covariates that I introduced in the logistic regression analyses) is one of the most important variables considered by universities in their admission processes in Chile. Typically, every bachelor's program sets up ex-ante the weight that this overall mark will have on the student score that will determine his/her eligibility for that program, and it can weigh as much as 30% of this score (Larroucau et al., 2015)

that they keep choosing their neighbourhood's public schools; therefore, I believe it is crucial to look at the literature on contextual and neighbourhood effects on schools to search for plausible explanations.

The 'contagion' theories of contextual effects on students' performance can perhaps offer a better explanation for my findings. Unlike the institutional theories, these theories put the emphasis on the dynamics that occur within the classrooms rather than at the school level, suggesting that students from disadvantaged socioeconomic backgrounds that possess lower levels of aspiration, lack study habits and present more disruptive behaviour in class, tend to level down the performance of their fellow students (Armor *et al.*, 2018; Lauen and Gaddis, 2013, South *et al.*, 2003). If being exposed to a better peer environment helps students to improve their aspirations and to develop soft-skills such as ambition, goal-orientation and responsibility that tend to stay once acquired, it is possible that attending a subsidised-private school at only one school level is enough to observe better educational outcomes in the future. An alternative explanation, which does not preclude the potential role of the 'contagion mechanisms', is the role of social capital (Coleman, 1988). In this case, the interaction with peers from more advantaged cultural and educational statuses, even for only a few years, may provide students with the access to social networks that can play an important role in their future access to post-secondary education institutions and prospective jobs. The already mentioned literature on the role of school type and school location in determining the job quality of Chilean adults can constitute some evidence of this (Núñez and Gutiérrez, 2004; Zimmerman, 2019[102]). Moreover, recent empirical literature based on data from developed countries has found that teacher expectations can play an important role in both educational achievement (Gentrup *et al.*, 2020; Sorhagen, 2013) and educational attainment (Papageorge *et al.*, 2016). These studies show that teacher's perceptions of their students' abilities, as well as their expectations for their students' careers, can operate as self-fulfilling prophecies with detrimental consequences for the poor and racial minorities because teachers' levels of optimism and pessimism exhibit important sociodemographic gaps. Therefore, it could also be the case that individuals who only studied at public schools over their entire school careers had significantly higher exposure to low teacher expectations than their counterparts who attended a

[102] Although Zimmerman's work focuses on attendance at elite fully-paid private schools and how it influences the access to top income positions, I think that his findings reflect an important idiosyncratic element of the Chilean labour market that it is to reward the attendance at certain school types as a mark of membership in a particular status group.

subsidised-private school at least at one level, which may have also negatively affected their motivation and future educational choices.

A third precautionary note about my results is the fact that my data does not support the hypothesis that the gap in effectiveness between subsidised-private schools and public schools increased over time. Indeed, as mentioned earlier in this chapter, the interaction effects with the age of the reform suggest that at least in terms of access to university and earnings by the age of 25, the trajectory 'private-private' (i.e., having attended a subsidised-private school at both primary and secondary level) became less effective with respect to all trajectories that contain a public school at one or both levels. At the same time, I observed that the trajectory 'private-public' became significantly more successful than all the other trajectories in terms of graduating rates from post-secondary studies in general and university in particular. These results provide some evidence that at least the gaps between secondary subsidised-private and public secondary schools actually reduced over the period 1981-2015, which coincides with the hypothesis of Bravo *et al.* (2010). These authors posit that the quality of the new subsidised-private secondary schools in the system that emerged after the 1981 reform may have been lower than the original subsidised-private schools. Perhaps the decreasing number of public schools in the Chilean educational system meant that only the better-quality public schools remained while the guarantees given to subsidised-private schools did not necessarily provide them with the incentives required to always keep their quality up to high standards.

In fact, if as suggested by the extant empirical literature for Chile, being exposed to the influence of good peers has a positive effect on educational achievement, then subsidised-private schools could produce and perpetuate their good results over time by simply applying rigorous selection processes that ensure that their student bodies keep being composed of talented students from relatively advantaged socioeconomic backgrounds. As I explain in previous chapters, the scores obtained by students in the SIMCE test - the national standardised test taken by 4th, 8th and 10th graders in Chile - are reportedly the best-known indicators of school quality in Chile; thus, schools systematically use their results at SIMCE to advertise themselves to keep attracting good prospective candidates. So, in sum, the dynamics created by school choice, selection practices and peer effects can produce a 'virtuous circle' for subsidised-private schools in

which they could potentially show persistent good results over time while putting very little effort into improving teaching practices[103]. In an extreme case, we could argue, subsidised-private schools interested in maximizing their profits could decide to invest all their resources in selecting the most talented students while devoting no resources to improving their quality of teaching and still survive the school competition under the market-based rules that operated for more than thirty years in Chile. This could occur especially in contexts where selection practices are relatively cheap to implement, while improving teaching quality (by, for example, hiring better teachers or reducing the size of the classes) tend to be quite expensive. Even if this is a very extreme case and there is no evidence that such a situation could have been occurring *de facto* in Chile, we cannot ignore that the rules established by the 1981 voucher school reform set up the incentives for some subsidised-private schools to want to operate this way. Therefore, beyond and above equity considerations, there are also efficiency-based reasons to believe that the guarantees given to subsidised-private schools, allowing them to select students, make a profit and charge tuition fees on top of the voucher, may have induced stagnation in the quality of teaching practices in the subsidised-private sector.

Despite the apparent reduction in the size of the gap between public and subsidised-private schools – at least at the secondary level - over time, and regardless of the underlying mechanisms, the overall combination of attributes offered by subsidised-private schools reportedly produced better average educational outcomes and earnings to Chileans by the age of 25 when controlling for selection on socioeconomic and demographic individual characteristics. However, the question that remains unanswered is whether these better outcomes were produced efficiently, which requires us to look at their per-student cost in comparison with those of public schools.

As we know, between 1981 and 2007, both public and subsidised-private schools received a flat-rate school voucher from the central government. If the voucher had been their only source of funding, comparing efficiency between both school types would be a simple task; however, subsidised-private schools were given the right to charge fees on top of the voucher in 1993 and a supplementary voucher was given to any

[103] This can be inferred from Davis and Ostrom's theory of coproduction (1991) that is also explained by Parry (1996).

voucher school receiving poor children from 2008. Moreover, while some voucher schools were operated by for-profit conglomerates, that in some cases owned a number of schools, others were managed by non-profit organisations that raised extra funding from donors (Aedo, 1998) Additionally, the fact that the 1981 reform gave the management of public schools to municipalities meant that many of them spent part of their resources funding public schools and the amount spent was left to each municipality's discretion. In fact, Gallego (2013) points out that this funding mechanism was an impediment to the disappearance of some public schools, despite their low enrolment during the 1990s, which threatened the advantages of school competition.

Given the very complex funding mechanisms in place at both public and subsidised-private schools, few studies on school effectiveness have analysed cost differences across different school types in Chile. As far as I am aware, the best attempt to do so is the work of Carnoy and McEwan (2003) and McEwan and Carnoy (2000). These authors find significant differences between catholic and non-catholic subsidised-private schools that allow them to arrive at distinctive conclusions for the comparative analyses of effectiveness and efficiency between public and subsidised-private schools. As their estimations suggest, catholic subsidised-private schools are more effective than public schools at producing achievement for their students, but their per-student costs are around 5% higher, which means that in sum they are not more efficient than public schools. Conversely, they find that non-catholic subsidised-private schools are slightly less effective than public schools in terms of educational achievement, but they are substantially better at reducing costs, these being around 11% lower than those at public schools[104]. If these relative differences in per-student costs across school types adequately reflected those for the period I analysed in this thesis[105], and if it were possible to assume that the effectiveness I estimated for all subsidised-private schools is relatively similar for catholic and non-catholic schools (and the assumption of selection on observable individual characteristics holds), we could claim that at least non-catholic subsidised-private

[104] Results obtained by these authors when controlling for SES, school location, municipal dummies and school characteristics (Carnoy and McEwan, 2003; McEwan and Carnoy, 2000).
[105] Carnoy and McEwan based their estimations of costs on information records from 1996 and the youngest people in my dataset, which is based on information of the CSP Survey, graduated from secondary school in 2004. It is relevant to mention that these authors used the results of SIMCE tests taken only by fourth graders; ergo, the school information they analysed is only for primary schools. According to my own estimations for 2002, based on information from the Chilean Catholic Church and the Ministry of Education, by that year, around 32% of the total school enrolment was attending a non-catholic subsidised-private school while 12% was attending a catholic subsidised-private school in Chile.

school are not only more effective but also more efficient than public schools. Unfortunately, the lack of more disaggregated information about the religious orientation of the schools that individuals attended at primary and secondary level in my dataset means that I cannot arrive at any reliable conclusion about efficiency.

6.3. Research limitations and areas for future investigation

As mentioned in the conclusion of Chapter 5, one of the main limitations that I faced when trying to find appropriate estimation methods to answer this thesis' research questions was the lack of good quality long-term data. The limited possibilities of accessing school registers from the 1980s affected my ability to construct a better instrumental variable that could have helped me to obtain more reliable and robust estimations under the assumption of selection on unobservable characteristics of individuals. More specifically, having this information would have allowed me to construct an instrument for the school type that individuals attended at primary school, which perhaps would have had fewer validity concerns than the instrument that I was able to construct with the data available. In addition to this, I found other data-related problems associated with the fact that not all the information that was part of the questionnaires in the main longitudinal study that I used in this thesis, the Chilean Social Protection Survey (CSP Survey), was included in the public databases. I was able to surmount some of these difficulties by getting access to individual questionnaires and retrieving all surveyees' answers on my own. In fact, this is the way that I managed to recover individuals' parental occupations that were the basis for the construction of two of the main explanatory variables that I used in this thesis: parental social class and parental social status. However, there was more information that I could not retrieve because of both time and financial constraints; this is the case for the more precise data on the location of schools where individuals attended both primary and secondary education. Having had access to that particular information would have helped me to construct a more reliable instrumental variable on the relevant supply of schools available for students when they started secondary education based on less heroic assumptions about the relevant school supply area for each individual.

Aside from the constraints I found to control for potential endogeneity in my estimations, another important limitation of my research is that I was unable to distinguish amongst the different kinds of subsidised-private schools that emerged in Chile between 1981 and 2015. As mentioned earlier in this chapter, many of these schools are catholic, and the evidence provided by some studies (Carnoy and McEwan, 2003; McEwan and Carnoy, 2000) suggests that the these schools have been more effective in improving students' educational performance than non-catholic subsidised-private schools; however, the opposite has happened with regards to containing costs. On the other hand, subsidised-private schools may or may not have charged tuition fees to parents and may or may not have been for-profit depending on their own managerial decisions. Research on school body composition has shown that all these different varieties of schools serve different populations. For example, Elacqua (2009 and 2012) finds that free for-profit voucher schools have received more individuals from disadvantaged social backgrounds and indigenous ancestry than non-profit voucher schools. Until the moment that the 'School Inclusion Act' was approved by the Chilean congress, subsidised-private schools were covering 54.5% of the national enrolment rate and had a wide diversity of different educational projects. Therefore, having been able to capture that diversity in this thesis in order to understand whether a particular kind of subsidised-private school has been mainly responsible for their better outcomes with respect to public schools would have undoubtedly enriched this research project.

Finally, I think that the conclusions of my research would have also benefited from having information on parental income. As seen in Chapter 4, parental income captures a more immediate measure of families' availability of financial resources compared with parental social class, which I believe represents a longer-term proxy for the economic situation of parents. The only case when I could include this variable in my empirical models was in the estimations of the role of socioeconomic background on school-type choice for recent birth-cohorts of students, which I performed using three waves of a cross-sectional national study (CASEN). Given the fact that there are no long-term longitudinal studies in Chile, the information on parental socioeconomic background that I could construct comes from recall information reported in the CSP Survey by adult individuals. Since parental income cannot be collected through biographic questions, there is no way that researchers can access this information. Apart from the lack of a variable

reflecting more exactly the financial situation of families, using recall information instead of contemporary information reported by respondents at the point of measurement, may introduce a series of biases that I extensively discussed in Chapter 4.

Regarding prospective research areas, if the CSP Survey is extended and new waves of data are collected in the near future, it would be interesting to observe whether the gaps in educational attainment and earnings between individuals who studied in different school types that I identified by the age of 25 diminish or increase later in life. On the other hand, if new better sources of information emerge, and they make it possible to reproduce my analyses distinguishing between different kinds of subsidised-private schools, that would enable an important contribution to this literature. Lastly, the data currently contained in the CSP databases could be used to investigate the role of school type on other labour market outcomes, such as job quality and job stability, that I did not include in this research.

Given that the attributes of the Chilean voucher school system that were the focus of this thesis are now in the process of being modified, I believe that the most important future research in this area should tackle the consequences of the 'School Inclusion Act'; particularly, whether the elimination of profit-orientation, selection of students, and co-payments reduces the socioeconomic stratification of students within the Chilean school system, as the legislators expected. In this regard, a critical aspect to explore will be the impact of the new subsidised-private schools on the educational outcomes of the most socially disadvantaged members of the society, who traditionally have benefited the least from the vouchers in the past. Moreover, it will be important to observe whether the emergent scheme of incentives produced by the new regulatory framework will translate into improvements in the effectiveness and efficiency of subsidised-private schools, compared with the previous model.

Of course, the capacity to undertake this future research will strongly depend on the availability of good quality longitudinal data that will make it possible to follow individuals over a considerable number of years. As mentioned in Chapter 4, many of the longitudinal surveys that emerged in Chile in the 1990s and 2000s have been discontinued, and even the study I used to conduct most of the analyses for this thesis (The CSP

Survey) has not produced any new waves since 2015. Therefore, as I mentioned in the conclusion of Chapter 5, I think it is important that the organisms and institutions in charge of producing and funding these studies understand the importance of maintaining them over time. Considering that SIMCE has produced very good quality data on socioeconomic characteristics of students and their families, and also about the schools themselves while individuals are still at school, I believe that a very positive initiative would be starting a longitudinal study that follows a subsample of these individuals over time.

6.4. Policy implications

All in all, this thesis agrees with the reflections of Patrinos and Sakellariou (2011) in terms of that the 1981 reform seems to have improved the effectiveness of the education system probably at the expense of equity. It also agrees with Torche (2005a) in considering that the large advantages I detected for individuals who attended a subsidised-private school at least at one school level, compared with those who only attended public schools, suggest that the stratification by socioeconomic background that followed the 1981 reform may have acted as a vehicle for the reproduction of educational inequality. Although the evidence I produced seems to indicate that the outcome gaps between those who always attended a public school and the rest did not increase over the years following the reform, but rather the opposite (at least in the case of secondary schools), the gap is still very considerable. Therefore, I consider it quite debatable that a country should maintain unaltered an educational system whose main benefits are not in reach of its most socially disadvantaged members.

If, as some studies have suggested (Gallego, 2013; Gallego, 2002), the main constraint that the Chilean voucher school system has faced to produce better educational results has been the difficulty in setting up a truly competitive system[106], I think there is no good reason to believe that eliminating selection processes, tuition fees and the for-profit motive, while keeping private provision and school competition, will produce

[106] These studies posit that the fact that some municipalities provided funding for public schools meant that many low-quality public schools that have very low enrolment did not disappear, which meant that the principles of free competition could not really operate in Chile. The author estimates that this problem was more serious in municipalities whose mayors belonged to the same coalition as the government in power.

worse educational outcomes. In fact, as I discussed earlier in this chapter, the scheme that fully operated in Chile between 1981 and 2015 provided certain economic incentives for rent-seeking subsidised-private schools to compete by attracting the best students rather than by enhancing the effectiveness of their teaching practices, which may presumably have induced some inefficiencies. Moreover, if since 1993 subsidised-private schools were able to increase their rents by seeking further fees from higher income families, as pointed out by Sahlgren (2013), this is a flaw in the system design itself rather than a problem explained by the greediness of these schools. Therefore, it is possible that the elements of the new school system design will enable it to fully benefit from the advantages of competition and choice. Moreover, the process of de-municipalisation of schools, which started in Chile in 2017, should also help to enhance the competitive aspect of the Chilean voucher school system, because it will prevent local governments from giving contributions to schools at their own discretion, which aside from being a regressive practice, has kept some public schools in operation despite their lower levels of enrolment.

For all these reasons, I think that the modifications to the Chilean voucher school system introduced by the 'School Inclusion Act', which has already removed profit-orientation and discretionary selection practices at subsidised-private schools, and will soon completely remove tuition fees, may have the potential to enhance more equal educational opportunity in Chile without sacrificing quality. As Neal (2018) notices, while Chile allowed selective admission procedures and tuition fees to parents on top of the voucher, the Swedish voucher school system did not allow either and obtained much lower levels of social segregation amongst schools along with better educational outcomes.

The 2008 'Preferential Subsidy Law', which increased the value of the per-student voucher for children from the most disadvantaged backgrounds, was an important previous policy attempt to remove some of the constraints faced by socially disadvantaged students in accessing better-quality schools in the Chilean voucher school market. As explained in Chapter 3, schools participating in this funding scheme were forbidden from using selection tests or running interviews with parents to screen their prospective

students[107]. Although this policy was aligned with the purpose of equalizing educational opportunity and avoiding the intergenerational reproduction of such inequality, it may have still been insufficient to guarantee that the most disadvantaged members of the society could also enjoy the benefits of school choice. For example, Elacqua and Santos (2013) identify that, while most of public schools participated in the new scheme, around 40 percent of subsidised-private schools decided not the accept differentiated vouchers because their benefits did not outweigh the costs of complying with the non-selection requirement. Moreover, although a handful of evaluations have identified significant and positive effects of this policy on educational achievement (Mizala and Torche, 2017; Carrasco *et al.* 2015; Correa *et al.*, 2014; Neilson, 2013; Villarroel, 2012), recent empirical work has contested its actual potential to reduce educational inequality (Feigenberg *et al.*, 2019; Aguirre, 2017; Feigenberg *et al.*, 2017). In particular, these studies find that the reduction of the socioeconomic gap in educational achievement that followed the 'Preferential Subsidy Law' was related to a reduction in the socioeconomic gap within schools that occurred by the time this policy was assessed, rather than by enhanced competition, school switching, and decreased market power of public schools serving poor neighbourhoods, as was expected. Therefore, what we can learn from this policy experience is that, firstly, many subsidised-private schools may have not been economically incentivised to quit selection in order to accept the differentiated vouchers, and secondly, some socially disadvantaged parents may not have been encouraged to reconsider their school preferences as a result of the more generous vouchers.

In summary, the forty years of experience with voucher schools in Chile up to the present day allow me to suggest that at least three aspects will be crucial to promote better quality of educational opportunity in the future. First, in order to produce the correct incentives that will encourage all voucher schools to serve the most socially unprivileged children, it is necessary to maintain a scheme of differentiated vouchers that adequately compensate schools for the differences in the socioeconomic composition of their student bodies. In fact, international literature that has analysed the main lessons from the Chilean voucher school system for developed countries has emphasised the importance of differentiated vouchers schemes to

[107] It is relevant to notice that I did not have any possibility of evaluating the effects of this policy in this thesis because the youngest individuals in the sample I analysed graduated from secondary school in 2004 and the 'Preferential Subsidy Law' was enacted in 2008.

equalise educational performance and enhance students' achievement at the schools serving the poor (Sahlgren, 2013; Neal, 2018). The end of selection established by the 'School Inclusion Act' in Chile should ameliorate the problem that many high-achieving subsidised-private schools avoided the 'Preferential Subsidy Scheme' to keep screening students, which should make differentiated vouchers more effective.

Second, as Levin (2002) highlights, setting up regulations for the overall functioning of a voucher school system, including its finance, curriculum definition, admission processes, and profit orientation among other important aspects, is only one of the necessary conditions for the optimal functioning of the system. The other necessary condition is that schools effectively operate under these rules. For example, if the new regulatory scheme prevents subsidised-private schools from charging fees to parents or accepting payments from them as donations, its effect on equality of educational opportunity will depend on whether this can be implemented in an equitable manner and no school, either private or public, tries to deviate from it. Exactly the same applies to keeping standard admission procedures and to making sure that all schools teach the minimum mandatory curriculum. As best described by Levin's own words (2002) "a policy is only as good as the ability to enforce it" (Ibid:164) Of course, enforcing these policies will require constant monitoring as well as sanctioning in case of failing to fulfil schools' obligations. Despite the foreseeable obstacles in the implementation of these provisions, incoming governments may see the advantages of allocating resources to them.

The last key aspect to promote more equality of educational opportunity in Chile and in any other competitive school system is to ensure that parents make decisions on their children's schools mainly based on their quality. In fact, it is likely that the success of the modifications to the Chilean voucher school system introduced by the 'School Inclusion Act' will strongly depend on whether families, regardless of their socioeconomic background, will prioritise school quality over and above other school attributes. Although this is a challenging goal, there is evidence that a policy change that facilitated the access of Chilean families to better quality information about schools – including admission and graduation rates, school inputs, teacher evaluations and class sizes - had significant effects on their school search behaviour (Elacqua and Martínez, 2011). Therefore, future governments could try to ensure that the information

about school attributes is not only fully accessible, understandable and available to everyone, including the most socially disadvantaged families, but also that these families, as much as their more socially advantaged counterparts, will actively use this information when deciding on a school for their children. Perhaps, establishing local agencies to give orientation to parents would be a good initiative in this regard. Additionally, other policies intended to reduce the costs for low-income families to effectively make use of their choice - such as subsidised public transportation for students to commute from home to school[108] - could also help these families to benefit from school competition once the transition period is over and the new Chilean voucher school system is fully in place.

[108] Public transportation is currently free only for primary school students in Chile.

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Appendix A. Parental social class scale

Table A-1: Parental social class scale (Torche, 2007).

Occupational group	Typical occupations	Percentage	Status Score
Professionals in science, engineering, and health	Medical doctor, dentist, architect, engineer, chemist, statistician	3.5	1.915
Professionals in business, law, and others	Lawyer, accountant, economist, writer, composer, psychologist, librarian	3.2	1.531
Professionals in education	College professor, secondary, primary, and especial education teacher	4.7	1.183
Associate professionals in business, law, and others	Business assoc. prof., govt. social benefits official, police inspector, decorator	5	1.078
Managers in production, operations, and finance	Manager in manufacture, construction, finance, personnel, transportation, hotels	2.3	0.957
Associate professionals in others	Engineer technician, Telecom. technician, computer assistant, aircraft pilot, medical equipment operator, agronomy technician, optician, nurses	3.8	0.666
Secretaries and numerical clerks	Secretary, data entry operator, stenographer, library clerk, mail carrier, coding clerk	5.1	0.612
Other clerical workers	Clerical worker NEC	2.5	0.421
Cashiers, tellers, and receptionists	Cashier, teller, receptionist, travel agency clerk	2.1	0.41
Shop sales workers	Shop sales person, demonstrators, models	5.6	0.21
Managers in wholesale or retail trade	General manager in wholesale and retail trade	4.5	0.205
Drivers	Taxi driver, bus driver, crane operator, lifting truck operator	5.9	0.114
Personal services workers	Childcare provider, nursing home attendant, hairdresser, beautician, valet	3.1	0.062
Welders, blacksmiths, toolmakers, and mechanics	Welder, blacksmith, tool maker, mechanic, potter, printer, motor vehicle mechanic	4.5	0
Service workers	Travel attendant, housekeeper, waiter, bartender, travel guide	3.7	-0.202
Plant and machine operatives	Mining, papermaking, power-producing plant operator, cement, pharm., plastic, food, weaving, electrical machine operator, automated assembly line worker	2.6	-0.28
Construction workers, plumbers, and electricians	Bricklayers, carpenter, plumber, electrician, painter, roofer, miner	5.3	-0.328
Other skilled manual workers	Butcher, baker, wood treater, cabinet maker, weaver, tailor, sewer, shoe maker	4.2	-0.472
Porters, messengers, and doormen	Window and vehicle cleaner, messenger, doorman, garbage collector	2.5	-0.482
Cleaners	Shoe cleaner, office and hotel cleaner, hand launderer	2.6	-0.526
Stall and market salespersons	Stall and market salesperson	1.5	-0.571
Street and door-to-door vendors	Street salesperson, door-to-door vendor, telephone salesperson	1.6	-0.636
Animal producer, forestry, and fishery workers	Dairy producer, poultry producer, forestry worker, fishery worker, charcoal burner	2.2	-0.679
Laborer in mining, construction, and manufacturing	Unskilled laborer in mining, construction, maintenance, transportation and assembling, freight handler	2	-0.727
Subsistence farmers	Subsistence agricultural and fishery worker	1.1	-0.927
Domestic servants	Maid, domestic cleaner	8.5	-0.991
Field croppers, vegetable growers, and gardeners	Field crop grower, vegetable grower, tree grower, gardener, mixed-crop grower	2.4	-1.125
Farm laborers	Farm-hands, forestry laborer, fishery laborer	4.8	-1.418

Appendix B. Instrumental variables

Table B-1: Logistic regressions for the probability of having attended a subsidised-private secondary school including potential instrumental variables as covariates

VARIABLES	(1)	(2)
sex = 1, male	-0.104	-0.129
	(0.122)	(0.128)
parental education	0.0849***	0.0931***
	(0.0206)	(0.0217)
social class = 2, IVa+b: Self-Employed	-0.203	-0.101
	(0.239)	(0.252)
social class = 3, V+VI: Skilled Manual and Farmers	0.0716	0.174
	(0.232)	(0.242)
social class = 4, VIIa+IVc: Semi and Unskilled Manual,Farm workers	0.0239	0.129
	(0.259)	(0.271)
social status score (Torche,2010)	-0.142	-0.0443
	(0.156)	(0.162)
number of siblings	-0.0584	-0.0639
	(0.0401)	(0.0421)
parent age when child started primary school	0.0152*	0.0202**
	(0.00782)	(0.00823)
attended school in the RM = 1, always attended school in the MR	0.736***	1.000***
	(0.205)	(0.128)
school supply in relevant geographical area (instrumental variable)	0.00136*	
	(0.000746)	
individual participates in church activities=1, yes (instrumental variable)		-0.0500
		(0.221)
constant	-2.277***	-2.536***
	(0.443)	(0.469)
observations	1,283	1,169

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table B-2: Estimated correlations between instruments and treatment variables

Correlation between Instruments and Treatments	IV (1)	(V(2)
correlation with treatment: attended a secondary private school	0.2338 (N=1,283)	0.0038 (N=1,441)
correlation with treatment: attended a private school at any school level	-	-0.0201 (N=1,441)

IV(1) is the supply of subsidised-private schools in each individual's relevant geographical area.

IV(2) is and indicator variable for whether the individual participates in church activities.

Appendix C. Descriptive statistics of collapsed school-type trajectories and educational attainment by the age of 25

Table C-1: Number and proportion of students that accessed post-secondary education and university studies by the age of 25 by attendance to a private school at any level

School type attended at primary and secondary level	Access to post-secondary education by the age of 25						Access to university by the age of 25					
	Did not access		Accesed		Total		Did not access		Accesed		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Never attended a private school	520	61.47%	326	38.53%	846	100%	702	82.98%	144	17.02%	846	100%
Attended a private school	300	40.87%	434	59.13%	734	100%	500	68.12%	234	31.88%	734	100%
Total	820	51.90%	760	48.10%	1,580	100%	1,202	76.08%	378	23.92%	1,580	100%

Table C-2: Number and proportion of students that accessed post-secondary education and university studies by the age of 25 by school-type attended at secondary level

School type attended at secondary level	Access to post-secondary education by the age of 25						Access to university by the age of 25					
	Did not access		Accesed		Total		Did not access		Accesed		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Public	589	58.96%	410	41.04%	999	100%	806	80.68%	193	19.32%	999	100%
Private	231	39.76%	350	60.24%	581	100%	396	68.16%	185	31.84%	581	100%
Total	820	51.90%	760	48.10%	1,580	100%	1,202	76.08%	378	23.92%	1,580	100%

Table C-3: Number and proportion of students who graduated from post-secondary education and university by the age of 25 by attendance to a private school at any level

School type attended at primary and secondary level	Post-secondary graduation by the age of 25						University graduation by the age of 25					
	Did not graduate		Graduated		Total		Did not graduate		Graduated		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Never attended a private school	652	81.09%	152	18.91%	804	100%	752	93.53%	52	6.47%	804	100%
Attended a private school	470	68.51%	216	31.49%	686	100%	560	81.63%	126	18.37%	686	100%
Total	1,122	75.30%	368	24.70%	1,490	100%	1,312	88.05%	178	11.95%	1,490	100%

Table C-4: Number and proportion of students who graduated from post-secondary education and university by the age of 25 by school-type attended at secondary level

School type attended at secondary level	Post-secondary graduation by the age of 25						University graduation by the age of 25					
	Did not graduate		Graduated		Total		Did not graduate		Graduated		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Public	750	78.78%	202	21.22%	952	100%	872	91.60%	80	8.40%	952	100%
Private	372	69.14%	166	30.86%	538	100%	440	81.78%	98	18.22%	538	100%
Total	1,122	75.30%	368	24.70%	1,490	100%	1,312	88.05%	178	11.95%	1,490	100%

Appendix D. Logistic regression tables for the main and interaction effects of school-type trajectories on access to post-secondary education and university

Table D-1: Estimated coefficients for the role of school-type trajectory on the probability of having accessed post-secondary education by the age of 25: main effects models controlling for non-contemporary covariates

VARIABLES	(1)	(2)	(3)	(4)
school type trajectory = 0, public-public		-0.287	-0.656***	-0.687***
		(0.193)	(0.154)	(0.152)
school type trajectory = 1, private-public	0.287		-0.369*	-0.400*
	(0.193)		(0.222)	(0.216)
school type trajectory = 2, public-private	0.656***	0.369*		-0.0308
	(0.154)	(0.222)		(0.183)
school type trajectory = 3, private-private	0.687***	0.400*	0.0308	
	(0.152)	(0.216)	(0.183)	
controls for social and family background, school location and time of the reform	YES	YES	YES	YES
observations	1,580	1,580	1,580	1,580

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table D-2: Estimated coefficients for the role of school-type trajectory on the probability of having accessed university studies by the age of 25: main effects models controlling for non-contemporary covariates

VARIABLES	(1)	(2)	(3)	(4)
school type trajectory = 0, public-public		-0.518**	-0.651***	-0.701***
		(0.214)	(0.179)	(0.168)
school type trajectory = 1, private-public	0.518**		-0.133	-0.183
	(0.214)		(0.241)	(0.228)
school type trajectory = 2, public-private	0.651***	0.133		-0.0500
	(0.179)	(0.241)		(0.198)
school type trajectory = 3, private-private	0.701***	0.183	0.0500	
	(0.168)	(0.228)	(0.198)	
controls for social and family background, school location and time of the reform	YES	YES	YES	YES
observations	1,580	1,580	1,580	1,580

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table D-3: Estimated coefficients for the role of school-type trajectory on the probability of having accessed post-secondary education by the age of 25: interaction effects models with parental social status

VARIABLES	(1)	(2)	(3)
school type trajectory = 0, public-public (omitted)			
school type trajectory = 1, private-public	0.444**	0.338	0.335
	(0.199)	(0.207)	(0.209)
school type trajectory = 2, public-private	0.766***	0.711***	0.626***
	(0.161)	(0.169)	(0.171)
school type trajectory = 3, private-private	0.896***	0.733***	0.702***
	(0.146)	(0.156)	(0.158)
social status score	0.813***	0.212	0.265
	(0.124)	(0.169)	(0.171)
school type trajectory = 1 # social status score	1.230***	1.227***	1.292***
	(0.436)	(0.444)	(0.448)
school type trajectory = 2 # social status score	0.193	0.234	0.172
	(0.258)	(0.266)	(0.267)
school type trajectory = 3 # social status score	0.215	0.276	0.270
	(0.256)	(0.267)	(0.273)
controls for social and family background, school location and time of the reform	NO	YES	YES
controls for secondary school overall mark	NO	NO	YES
observations	1,580	1,580	1,580

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table D-4: Estimated coefficients for the role of school-type trajectory on the probability of having accessed university studies by the age of 25: interaction effects models with parental social status

VARIABLES	(1)	(2)	(3)
school type trajectory = 0, public-public (omitted)			
school type trajectory = 1, private-public	0.517**	0.434*	0.440*
	(0.218)	(0.230)	(0.234)
school type trajectory = 2, public-private	0.655***	0.675***	0.548***
	(0.171)	(0.181)	(0.185)
school type trajectory = 3, private-private	0.778***	0.690***	0.647***
	(0.158)	(0.171)	(0.174)
social status score	0.686***	0.0318	0.0729
	(0.144)	(0.199)	(0.201)
school type trajectory = 1 # social status score	0.767**	0.892**	0.980**
	(0.373)	(0.385)	(0.388)
school type trajectory = 2 # social status score	0.370	0.386	0.356
	(0.276)	(0.283)	(0.284)
school type trajectory = 3 # social status score	0.511*	0.611**	0.619**
	(0.263)	(0.272)	(0.279)
controls for social and family background, school location and time of the reform	NO	YES	YES
controls for secondary school overall mark	NO	NO	YES
observations	1,580	1,580	1,580

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table D-5: Estimated coefficients for the role of school-type trajectory on the probability of having accessed university studies by the age of 25: interaction effects models with the age of the reform when individuals started primary school

VARIABLES	(1)	(2)	(3)
school type trajectory = 0, public-public (omitted)			
school type trajectory = 1, private-public	0.938***	0.619	0.769**
	(0.356)	(0.379)	(0.385)
school type trajectory = 2, public-private	0.906***	0.951***	0.859***
	(0.292)	(0.314)	(0.322)
school type trajectory = 3, private-private	1.200***	0.953***	0.843***
	(0.267)	(0.289)	(0.297)
age of the reform when started primary school	0.123***	0.134***	0.149***
	(0.0312)	(0.0336)	(0.0345)
school type trajectory = 1 # age of the reform when started primary school	-0.0228	-0.0221	-0.0578
	(0.0681)	(0.0734)	(0.0756)
school type trajectory = 2 # age of the reform when started primary school	-0.0567	-0.0704	-0.0782
	(0.0571)	(0.0615)	(0.0627)
school type trajectory = 3 # age of the reform when started primary school	-0.0528	-0.0581	-0.0441
	(0.0507)	(0.0543)	(0.0557)
controls for social and family background, school location and time of the reform	NO	YES	YES
controls for secondary school overall mark	NO	NO	YES
observations	1,580	1,580	1,580

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table D-6: Estimated coefficients for the role of school-type trajectory on the probability of having accessed university studies by the age of 25: interaction effects models with an indicator variable for started secondary school in 1993 or later

VARIABLES	(1)	(2)	(3)
school type trajectory = 0, public-public (omitted)			
school type trajectory = 1, private-public	0.990***	0.616**	0.727**
	(0.273)	(0.292)	(0.295)
school type trajectory = 2, public-private	0.654***	0.604**	0.503*
	(0.238)	(0.254)	(0.262)
school type trajectory = 3, private-private	1.214***	0.961***	0.891***
	(0.207)	(0.225)	(0.231)
started secondary school in 1993 or later = 1	0.605***	0.638***	0.753***
	(0.185)	(0.196)	(0.200)
school type trajectory = 1 # started secondary school in 1993 or later	-0.280	-0.125	-0.373
	(0.394)	(0.422)	(0.431)
school type trajectory = 2 # started secondary school in 1993 or later	0.00908	0.112	0.0464
	(0.331)	(0.354)	(0.361)
school type trajectory = 3 # started secondary school in 1993 or later	-0.503*	-0.547*	-0.504
	(0.301)	(0.322)	(0.329)
controls for social and family background, school location and time of the reform	NO	YES	YES
controls for secondary school overall mark	NO	NO	YES
observations	1,580	1,580	1,580

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table D-7: Estimated coefficients for the role of school-type trajectory on the probability of having accessed post-secondary education by the age of 25: interaction effects models with an indicator variable for always attended school in the capital region.

VARIABLES	(1)	(2)	(3)
school type trajectory = 0, public-public (omitted)			
school type trajectory = 1, private-public	0.582**	0.163	0.178
	(0.238)	(0.258)	(0.260)
school type trajectory = 2, public-private	0.963***	0.896***	0.847***
	(0.195)	(0.210)	(0.214)
school type trajectory = 3, private-private	1.251***	0.854***	0.817***
	(0.205)	(0.220)	(0.223)
attended school at the capital region = 1, always attended school at the capital region	0.314**	0.168	0.193
	(0.155)	(0.169)	(0.170)
school type trajectory = 1 # attended school at the capital region	0.0554	0.204	0.144
	(0.362)	(0.391)	(0.394)
school type trajectory = 2 # attended school at the capital region	-0.628**	-0.538*	-0.580*
	(0.292)	(0.313)	(0.317)
school type trajectory = 3 # attended school at the capital region	-0.533*	-0.361	-0.355
	(0.286)	(0.305)	(0.308)
controls for social and family background, school location and time of the reform	NO	YES	YES
controls for secondary school overall mark	NO	NO	YES
observations	1,580	1,580	1,580

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table D-8: Estimated coefficients for the role of school-type trajectory on the probability of having accessed university studies by the age of 25: interaction effects models with an indicator variable for always attended school in the capital region.

VARIABLES	(1)	(2)	(3)
school type trajectory = 0, public-public (omitted)			
school type trajectory = 1, private-public	0.651**	0.192	0.216
	(0.269)	(0.292)	(0.300)
school type trajectory = 2, public-private	1.014***	0.979***	0.876***
	(0.209)	(0.229)	(0.235)
school type trajectory = 3, private-private	1.248***	0.782***	0.715***
	(0.208)	(0.230)	(0.235)
attended school at the capital region = 1, always attended school at the capital region	-0.0282	-0.228	-0.201
	(0.204)	(0.220)	(0.223)
school type trajectory = 1 # attended school at the capital region	0.383	0.623	0.561
	(0.403)	(0.436)	(0.445)
school type trajectory = 2 # attended school at the capital region	-0.815**	-0.786**	-0.829**
	(0.349)	(0.376)	(0.382)
school type trajectory = 3 # attended school at the capital region	-0.478	-0.218	-0.198
	(0.315)	(0.339)	(0.346)
controls for social and family background, school location and time of the reform	NO	YES	YES
controls for secondary school overall mark	NO	NO	YES
observations	1,580	1,580	1,580

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table D-9: Estimated coefficients for the role of school-type trajectory on the probability of having accessed university studies by the age of 25: interaction effects models with overall secondary school marks

VARIABLES	(1)	(2)
school type trajectory = 0, public-public (omitted)		
school type trajectory = 1, private-public	-4.249	-5.336*
	(2.909)	(3.221)
school type trajectory = 2, public-private	2.277	3.758*
	(2.076)	(2.237)
school type trajectory = 3, private-private	-2.716	-2.664
	(2.010)	(2.192)
average global score at secondary school	0.756***	0.900***
	(0.202)	(0.220)
school type trajectory = 1 # average global score at secondary school	0.897*	1.037*
	(0.511)	(0.568)
school type trajectory = 2 # average global score at secondary school	-0.298	-0.562
	(0.363)	(0.392)
school type trajectory = 3 # average global score at secondary school	0.640*	0.584
	(0.352)	(0.385)
controls for social and family background, school location and time of the reform	NO	YES
observations	1,600	1,600

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix E. Logistic regression tables for the main and interaction effects of school-type trajectories on graduation from post-secondary education and university

Table E-1: Estimated coefficients for the role of school-type trajectory on the probability of having obtained a post-secondary education diploma by the age of 25: main effects models controlling for non-contemporary covariates

VARIABLES	(1)	(2)	(3)	(4)
school type trajectory = 0, public-public		-0.522**	-0.424**	-0.463***
		(0.208)	(0.176)	(0.168)
school type trajectory = 1, private-public	0.522**		0.0982	0.0596
	(0.208)		(0.236)	(0.224)
school type trajectory = 2, public-private	0.424**	-0.0982		-0.0386
	(0.176)	(0.236)		(0.199)
school type trajectory = 3, private-private	0.463***	-0.0596	0.0386	
	(0.168)	(0.224)	(0.199)	
controls for social and family background, school location and time of the reform	YES	YES	YES	YES
observations	1,490	1,490	1,490	1,490

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table E-2: Estimated coefficients for the role of school-type trajectory on the probability of having obtained a university degree by the age of 25: main effects models controlling for non-contemporary covariates

VARIABLES	(1)	(2)	(3)	(4)
school type trajectory = 0, public-public		-0.908***	-0.911***	-1.030***
		(0.273)	(0.240)	(0.222)
school type trajectory = 1, private-public	0.908***		-0.00326	-0.122
	(0.273)		(0.294)	(0.272)
school type trajectory = 2, public-private	0.911***	0.00326		-0.119
	(0.240)	(0.294)		(0.244)
school type trajectory = 3, private-private	1.030***	0.122	0.119	
	(0.222)	(0.272)	(0.244)	
controls for social and family background, school location and time of the reform	YES	YES	YES	YES
observations	1,490	1,490	1,490	1,490

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table E-3: Estimated coefficients for the role of school-type trajectory on the probability of having obtained a post-secondary diploma by the age of 25: interaction effects models with the age of the reform when individuals started primary school

VARIABLES	(1)	(2)	(3)
school type trajectory = 0, public-public (omitted)			
school type trajectory = 1, private-public	0.281	-0.102	-0.0174
	(0.336)	(0.355)	(0.358)
school type trajectory = 2, public-private	0.366	0.239	0.160
	(0.270)	(0.282)	(0.286)
school type trajectory = 3, private-private	0.494**	0.120	0.00890
	(0.251)	(0.269)	(0.274)
age of the reform when started primary school	-0.0600*	-0.0785**	-0.0726**
	(0.0317)	(0.0336)	(0.0339)
school type trajectory = 1 # age of the reform when started primary school	0.130*	0.162**	0.138*
	(0.0685)	(0.0724)	(0.0737)
school type trajectory = 2 # age of the reform when started primary school	0.0442	0.0496	0.0421
	(0.0589)	(0.0610)	(0.0615)
school type trajectory = 3 # age of the reform when started primary school	0.0686	0.0896	0.101*
	(0.0523)	(0.0547)	(0.0556)
controls for social and family background, school location and time of the reform	NO	YES	YES
controls for secondary school overall mark	NO	NO	YES
observations	1,490	1,490	1,490

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table E-4: Estimated coefficients for the role of school-type trajectory on the probability of having obtained a university degree by the age of 25: interaction effects models with the age of the reform when individuals started primary school

VARIABLES	(1)	(2)	(3)
school type trajectory = 0, public-public (omitted)			
school type trajectory = 1, private-public	0.426	-0.0218	0.212
	(0.486)	(0.508)	(0.515)
school type trajectory = 2, public-private	0.798**	0.711*	0.554
	(0.388)	(0.407)	(0.415)
school type trajectory = 3, private-private	1.105***	0.739**	0.551
	(0.349)	(0.370)	(0.381)
age of the reform when started primary school	0.0260	0.0135	0.0279
	(0.0483)	(0.0507)	(0.0517)
school type trajectory = 1 # age of the reform when started primary school	0.176**	0.213**	0.164*
	(0.0884)	(0.0946)	(0.0976)
school type trajectory = 2 # age of the reform when started primary school	0.0437	0.0464	0.0377
	(0.0775)	(0.0811)	(0.0820)
school type trajectory = 3 # age of the reform when started primary school	0.0517	0.0678	0.0904
	(0.0677)	(0.0710)	(0.0731)
controls for social and family background, school location and time of the reform	NO	YES	YES
controls for secondary school overall mark	NO	NO	YES
observations	1,490	1,490	1,490

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix F. Treatment and potential outcome models for the effects of school-type on access to and graduation from post-secondary education and university by the age of 25.

Table F-1: IPW, RA, AIPW & IPWRA outcome (OM) and treatment models (TM) for having accessed post-secondary studies by the age of 25. Treatment: attended a subsidised-private secondary school

VARIABLES	IPW	RA		AIPW			IPWRA		
	TME1	OME0	OME1	OME0	OME1	TME1	OME0	OME1	TME1
sex = 1, male	-0.161	-0.0226	0.0854	-0.0226	0.0854	-0.161	-0.00697	0.0241	-0.161
	(0.109)	(0.139)	(0.182)	(0.139)	(0.182)	(0.109)	(0.143)	(0.191)	(0.109)
parental education	0.0863***	0.137***	0.112***	0.137***	0.112***	0.0863***	0.136***	0.118***	0.0863***
	(0.0186)	(0.0244)	(0.0320)	(0.0244)	(0.0320)	(0.0186)	(0.0249)	(0.0342)	(0.0186)
social class = 2, IVa+b: Self-Employed	-0.0690	-0.169	-0.442	-0.169	-0.442	-0.0690	-0.0363	-0.473	-0.0690
	(0.215)	(0.277)	(0.358)	(0.277)	(0.358)	(0.215)	(0.283)	(0.377)	(0.215)
social class = 3, V+VI: Skilled Manual and Farmers	0.102	-0.739***	-0.178	-0.739***	-0.178	0.102	-0.580**	-0.206	0.102
	(0.207)	(0.270)	(0.352)	(0.270)	(0.352)	(0.207)	(0.278)	(0.372)	(0.207)
social class = 4, VIIa+IVc: Semi and Unskilled Manual,Farm workers	0.0476	-0.693**	-0.447	-0.693**	-0.447	0.0476	-0.516*	-0.562	0.0476
	(0.231)	(0.296)	(0.392)	(0.296)	(0.392)	(0.231)	(0.303)	(0.413)	(0.231)
social status score (Torche,2010)	-0.0222	0.285	0.586**	0.285	0.586**	-0.0222	0.369**	0.527**	-0.0222
	(0.139)	(0.179)	(0.238)	(0.179)	(0.238)	(0.139)	(0.183)	(0.255)	(0.139)
number of siblings	-0.0632*	-0.0857*	-0.135**	-0.0857*	-0.135**	-0.0632*	-0.0835*	-0.158**	-0.0632*
	(0.0372)	(0.0478)	(0.0664)	(0.0478)	(0.0664)	(0.0372)	(0.0477)	(0.0694)	(0.0372)
parent age when child started primary school	0.0155**	0.0205**	0.0308**	0.0205**	0.0308**	0.0155**	0.0149	0.0369***	0.0155**
	(0.00713)	(0.00914)	(0.0125)	(0.00914)	(0.0125)	(0.00713)	(0.00986)	(0.0130)	(0.00713)
attended school in the RM = 1, always attended school in the MR	0.971***					0.971***			0.971***
	(0.111)					(0.111)			(0.111)
age of the reform when started primary school		0.0375	0.0238	0.0375	0.0238		0.0294	0.0309	
		(0.0244)	(0.0325)	(0.0244)	(0.0325)		(0.0252)	(0.0347)	
constant	-2.217***	-1.821***	-1.359**	-1.821***	-1.359**	-2.217***	-1.692***	-1.512**	-2.217***
	(0.403)	(0.519)	(0.684)	(0.519)	(0.684)	(0.403)	(0.537)	(0.736)	(0.403)
Observations	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table F-2: IPW, RA, AIPW & IPWRA outcome (OM) and treatment models (TM) for having accessed university studies by the age of 25. Treatment: attended a subsidised-private secondary school

VARIABLES	IPW	RA		AIPW			IPWRA		
	TME1	OME0	OME1	OME0	OME1	TME1	OME0	OME1	TME1
sex = 1, male	-0.161	-0.0154	-0.145	-0.0154	-0.145	-0.161	-0.0494	-0.133	-0.161
	(0.109)	(0.171)	(0.196)	(0.171)	(0.196)	(0.109)	(0.177)	(0.206)	(0.109)
parental education	0.0863***	0.174***	0.137***	0.174***	0.137***	0.0863***	0.174***	0.133***	0.0863***
	(0.0186)	(0.0334)	(0.0369)	(0.0334)	(0.0369)	(0.0186)	(0.0343)	(0.0389)	(0.0186)
social class = 2, IVa+b: Self-Employed	-0.0690	0.153	-0.158	0.153	-0.158	-0.0690	0.174	-0.230	-0.0690
	(0.215)	(0.333)	(0.343)	(0.333)	(0.343)	(0.215)	(0.345)	(0.360)	(0.215)
social class = 3, V+VI: Skilled Manual and Farmers	0.102	0.0578	-0.324	0.0578	-0.324	0.102	0.125	-0.461	0.102
	(0.207)	(0.315)	(0.343)	(0.315)	(0.343)	(0.207)	(0.327)	(0.365)	(0.207)
social class = 4, VIIa+IVc: Semi and Unskilled Manual,Farm workers	0.0476	-0.375	-0.587	-0.375	-0.587	0.0476	-0.350	-0.763*	0.0476
	(0.231)	(0.352)	(0.390)	(0.352)	(0.390)	(0.231)	(0.365)	(0.417)	(0.231)
social status score (Torche,2010)	-0.0222	0.241	0.527**	0.241	0.527**	-0.0222	0.254	0.457	-0.0222
	(0.139)	(0.226)	(0.269)	(0.226)	(0.269)	(0.139)	(0.233)	(0.285)	(0.139)
number of siblings	-0.0632*	-0.161**	-0.0743	-0.161**	-0.0743	-0.0632*	-0.138*	-0.106	-0.0632*
	(0.0372)	(0.0709)	(0.0761)	(0.0709)	(0.0761)	(0.0372)	(0.0707)	(0.0821)	(0.0372)
parent age when child started primary school	0.0155**	0.0110	0.0277**	0.0110	0.0277**	0.0155**	0.00294	0.0285**	0.0155**
	(0.00713)	(0.0108)	(0.0134)	(0.0108)	(0.0134)	(0.00713)	(0.0114)	(0.0134)	(0.00713)
attended school in the RM = 1, always attended school in the MR	0.971***					0.971***			0.971***
	(0.111)					(0.111)			(0.111)
age of the reform when started primary school		0.128***	0.0752**	0.128***	0.0752**		0.118***	0.0679*	
		(0.0294)	(0.0330)	(0.0294)	(0.0330)		(0.0303)	(0.0353)	
constant	-2.217***	-3.724***	-3.062***	-3.724***	-3.062***	-2.217***	-3.455***	-2.776***	-2.217***
	(0.403)	(0.644)	(0.751)	(0.644)	(0.751)	(0.403)	(0.676)	(0.773)	(0.403)
Observations	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table F-3: IPW, RA, AIPW & IPWRA outcome (OM) and treatment models (TM) for having graduated from post-secondary studies by the age of 25. Treatment: attended a subsidised-private secondary school

VARIABLES	IPW	RA		AIPW			IPWRA		
	TME1	OME0	OME1	OME0	OME1	TME1	OME0	OME1	TME1
sex = 1, male	-0.164	-0.488***	-0.283	-0.488***	-0.283	-0.164	-0.424**	-0.250	-0.164
	(0.113)	(0.170)	(0.196)	(0.170)	(0.196)	(0.113)	(0.175)	(0.207)	(0.113)
parental education	0.0878***	0.0751***	0.108***	0.0751***	0.108***	0.0878***	0.0694**	0.0903**	0.0878***
	(0.0194)	(0.0289)	(0.0376)	(0.0289)	(0.0376)	(0.0194)	(0.0297)	(0.0399)	(0.0194)
social class = 2, IVa+b: Self-Employed	-0.0478	-0.238	-0.917**	-0.238	-0.917**	-0.0478	-0.187	-0.869**	-0.0478
	(0.222)	(0.316)	(0.362)	(0.316)	(0.362)	(0.222)	(0.323)	(0.375)	(0.222)
social class = 3, V+VI: Skilled Manual and Farmers	0.0193	-0.747**	-0.631*	-0.747**	-0.631*	0.0193	-0.743**	-0.513	0.0193
	(0.214)	(0.319)	(0.338)	(0.319)	(0.338)	(0.214)	(0.323)	(0.354)	(0.214)
social class = 4, VIIa+IVc: Semi and Unskilled Manual,Farm workers	0.00298	-0.652*	-0.873**	-0.652*	-0.873**	0.00298	-0.612*	-0.896**	0.00298
	(0.240)	(0.347)	(0.383)	(0.347)	(0.383)	(0.240)	(0.361)	(0.397)	(0.240)
social status score (Torche,2010)	-0.0404	0.275	-0.0984	0.275	-0.0984	-0.0404	0.272	-0.0888	-0.0404
	(0.144)	(0.213)	(0.248)	(0.213)	(0.248)	(0.144)	(0.218)	(0.258)	(0.144)
number of siblings	-0.0472	-0.0568	-0.0607	-0.0568	-0.0607	-0.0472	-0.0663	-0.0787	-0.0472
	(0.0377)	(0.0563)	(0.0692)	(0.0563)	(0.0692)	(0.0377)	(0.0561)	(0.0739)	(0.0377)
parent age when child started primary school	0.0144*	0.00896	0.0274**	0.00896	0.0274**	0.0144*	0.00328	0.0305**	0.0144*
	(0.00737)	(0.0102)	(0.0136)	(0.0102)	(0.0136)	(0.00737)	(0.0105)	(0.0140)	(0.00737)
attended school in the RM = 1, always attended school in the MR	0.952***					0.952***			0.952***
	(0.114)					(0.114)			(0.114)
age of the reform when started primary school		-0.0413	-0.00788	-0.0413	-0.00788		-0.0364	-0.00898	
		(0.0306)	(0.0333)	(0.0306)	(0.0333)		(0.0314)	(0.0362)	
constant	-2.209***	-1.376**	-2.115***	-1.376**	-2.115***	-2.209***	-1.142*	-2.023**	-2.209***
	(0.416)	(0.607)	(0.753)	(0.607)	(0.753)	(0.416)	(0.622)	(0.792)	(0.416)
Observations	1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table F-4: IPW, RA, AIPW & IPWRA outcome (OM) and treatment models (TM) for having graduated from university studies by the age of 25. Treatment: attended a subsidised-private secondary school

VARIABLES	IPW	RA		AIPW			IPWRA		
	TME1	OME0	OME1	OME0	OME1	TME1	OME0	OME1	TME1
sex = 1, male	-0.164	-0.278	-0.358	-0.278	-0.358	-0.164	-0.248	-0.322	-0.164
	(0.113)	(0.249)	(0.239)	(0.249)	(0.239)	(0.113)	(0.259)	(0.248)	(0.113)
parental education	0.0878***	0.161***	0.161***	0.161***	0.161***	0.0878***	0.154***	0.143***	0.0878***
	(0.0194)	(0.0490)	(0.0480)	(0.0490)	(0.0480)	(0.0194)	(0.0484)	(0.0507)	(0.0194)
social class = 2, IVa+b: Self-Employed	-0.0478	0.575	-1.026**	0.575	-1.026**	-0.0478	0.500	-0.877*	-0.0478
	(0.222)	(0.454)	(0.430)	(0.454)	(0.430)	(0.222)	(0.468)	(0.448)	(0.222)
social class = 3, V+VI: Skilled Manual and Farmers	0.0193	0.0448	-0.767*	0.0448	-0.767*	0.0193	-0.0658	-0.652	0.0193
	(0.214)	(0.472)	(0.400)	(0.472)	(0.400)	(0.214)	(0.479)	(0.422)	(0.214)
social class = 4, VIIa+IVc: Semi and Unskilled Manual,Farm workers	0.00298	-0.590	-1.122**	-0.590	-1.122**	0.00298	-0.579	-1.167**	0.00298
	(0.240)	(0.562)	(0.455)	(0.562)	(0.455)	(0.240)	(0.598)	(0.465)	(0.240)
social status score (Torche,2010)	-0.0404	0.417	-0.175	0.417	-0.175	-0.0404	0.428	-0.154	-0.0404
	(0.144)	(0.307)	(0.300)	(0.307)	(0.300)	(0.144)	(0.312)	(0.312)	(0.144)
number of siblings	-0.0472	-0.174	-0.0876	-0.174	-0.0876	-0.0472	-0.181	-0.0952	-0.0472
	(0.0377)	(0.119)	(0.0862)	(0.119)	(0.0862)	(0.0377)	(0.113)	(0.0913)	(0.0377)
parent age when child started primary school	0.0144*	0.00273	0.0272*	0.00273	0.0272*	0.0144*	-0.00569	0.0222	0.0144*
	(0.00737)	(0.0148)	(0.0161)	(0.0148)	(0.0161)	(0.00737)	(0.0149)	(0.0156)	(0.00737)
attended school in the RM = 1, always attended school in the MR	0.952***					0.952***			0.952***
	(0.114)					(0.114)			(0.114)
age of the reform when started primary school		0.0852**	0.0759*	0.0852**	0.0759*		0.0857**	0.0695	
		(0.0422)	(0.0397)	(0.0422)	(0.0397)		(0.0435)	(0.0431)	
constant	-2.209***	-4.045***	-3.624***	-4.045***	-3.624***	-2.209***	-3.606***	-3.195***	-2.209***
	(0.416)	(0.943)	(0.921)	(0.943)	(0.921)	(0.416)	(0.975)	(0.934)	(0.416)
Observations	1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table F-5: IPW, RA, AIPW & IPWRA outcome (OM) and treatment models (TM) for having accessed post-secondary studies by the age of 25. Treatment: attended a subsidised-private school at any level

VARIABLES	IPW	RA		AIPW			IPWRA		
	TME1	OME0	OME1	OME0	OME1	TME1	OME0	OME1	TME1
sex = 1, male	-0.151	-0.0365	0.0806	-0.0365	0.0806	-0.151	-0.00389	0.00413	-0.151
	(0.107)	(0.151)	(0.163)	(0.151)	(0.163)	(0.107)	(0.161)	(0.171)	(0.107)
parental education	0.0902***	0.153***	0.0997***	0.153***	0.0997***	0.0902***	0.152***	0.111***	0.0902***
	(0.0181)	(0.0274)	(0.0277)	(0.0274)	(0.0277)	(0.0181)	(0.0289)	(0.0293)	(0.0181)
social class = 2, IVa+b: Self-Employed	-0.0418	-0.268	-0.243	-0.268	-0.243	-0.0418	-0.154	-0.324	-0.0418
	(0.209)	(0.320)	(0.304)	(0.320)	(0.304)	(0.209)	(0.332)	(0.315)	(0.209)
social class = 3, V+VI: Skilled Manual and Farmers	-0.126	-0.958***	0.0217	-0.958***	0.0217	-0.126	-0.810**	-0.0590	-0.126
	(0.204)	(0.303)	(0.306)	(0.303)	(0.306)	(0.204)	(0.316)	(0.321)	(0.204)
social class = 4, VIIa+IVc: Semi and Unskilled Manual,Farm workers	-0.183	-0.953***	-0.177	-0.953***	-0.177	-0.183	-0.791**	-0.329	-0.183
	(0.225)	(0.333)	(0.337)	(0.333)	(0.337)	(0.225)	(0.347)	(0.354)	(0.225)
social status score (Torche,2010)	0.0653	-0.0271	0.868***	-0.0271	0.868***	0.0653	0.0423	0.769***	0.0653
	(0.135)	(0.191)	(0.214)	(0.191)	(0.214)	(0.135)	(0.200)	(0.230)	(0.135)
number of siblings	-0.102***	-0.0758	-0.131**	-0.0758	-0.131**	-0.102***	-0.0849	-0.158**	-0.102***
	(0.0369)	(0.0508)	(0.0602)	(0.0508)	(0.0602)	(0.0369)	(0.0522)	(0.0626)	(0.0369)
parent age when child started primary school	0.0132*	0.0163*	0.0354***	0.0163*	0.0354***	0.0132*	0.00951	0.0454***	0.0132*
	(0.00716)	(0.00957)	(0.0116)	(0.00957)	(0.0116)	(0.00716)	(0.0110)	(0.0118)	(0.00716)
attended school in the RM = 1, always attended school in the MR	1.017***					1.017***			1.017***
	(0.109)					(0.109)			(0.109)
age of the reform when started primary school		0.0362	0.0280	0.0362	0.0280		0.0247	0.0318	
		(0.0268)	(0.0288)	(0.0268)	(0.0288)		(0.0289)	(0.0309)	
constant	-1.522***	-1.759***	-1.647***	-1.759***	-1.647***	-1.522***	-1.558**	-1.955***	-1.522***
	(0.400)	(0.563)	(0.616)	(0.563)	(0.616)	(0.400)	(0.605)	(0.649)	(0.400)
Observations	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table F-6: IPW, RA, AIPW & IPWRA outcome (OM) and treatment models (TM) for having accessed university studies by the age of 25. Treatment: attended a subsidised-private school at any level

VARIABLES	IPW	RA		AIPW			IPWRA		
	TME1	OME0	OME1	OME0	OME1	TME1	OME0	OME1	TME1
sex = 1, male	-0.151	-0.0441	-0.0935	-0.0441	-0.0935	-0.151	-0.134	-0.119	-0.151
	(0.107)	(0.192)	(0.175)	(0.192)	(0.175)	(0.107)	(0.209)	(0.185)	(0.107)
parental education	0.0902***	0.174***	0.143***	0.174***	0.143***	0.0902***	0.172***	0.147***	0.0902***
	(0.0181)	(0.0385)	(0.0328)	(0.0385)	(0.0328)	(0.0181)	(0.0397)	(0.0349)	(0.0181)
social class = 2, IVa+b: Self-Employed	-0.0418	-0.0509	0.0707	-0.0509	0.0707	-0.0418	-0.167	0.0137	-0.0418
	(0.209)	(0.409)	(0.299)	(0.409)	(0.299)	(0.209)	(0.441)	(0.310)	(0.209)
social class = 3, V+VI: Skilled Manual and Farmers	-0.126	-0.0283	-0.105	-0.0283	-0.105	-0.126	-0.0411	-0.202	-0.126
	(0.204)	(0.363)	(0.309)	(0.363)	(0.309)	(0.204)	(0.391)	(0.325)	(0.204)
social class = 4, VIIa+IVc: Semi and Unskilled Manual,Farm workers	-0.183	-0.520	-0.373	-0.520	-0.373	-0.183	-0.620	-0.487	-0.183
	(0.225)	(0.413)	(0.343)	(0.413)	(0.343)	(0.225)	(0.448)	(0.365)	(0.225)
social status score (Torche,2010)	0.0653	-0.0179	0.676***	-0.0179	0.676***	0.0653	-0.0710	0.592**	0.0653
	(0.135)	(0.259)	(0.245)	(0.259)	(0.245)	(0.135)	(0.279)	(0.257)	(0.135)
number of siblings	-0.102***	-0.158**	-0.0699	-0.158**	-0.0699	-0.102***	-0.134	-0.0984	-0.102***
	(0.0369)	(0.0793)	(0.0696)	(0.0793)	(0.0696)	(0.0369)	(0.0836)	(0.0768)	(0.0369)
parent age when child started primary school	0.0132*	0.0154	0.0202*	0.0154	0.0202*	0.0132*	0.00186	0.0241**	0.0132*
	(0.00716)	(0.0117)	(0.0122)	(0.0117)	(0.0122)	(0.00716)	(0.0129)	(0.0119)	(0.00716)
attended school in the RM = 1, always attended school in the MR	1.017***					1.017***			1.017***
	(0.109)					(0.109)			(0.109)
age of the reform when started primary school		0.129***	0.0854***	0.129***	0.0854***		0.120***	0.0791**	
		(0.0335)	(0.0293)	(0.0335)	(0.0293)		(0.0363)	(0.0313)	
constant	-1.522***	-3.891***	-3.140***	-3.891***	-3.140***	-1.522***	-3.319***	-3.120***	-1.522***
	(0.400)	(0.710)	(0.682)	(0.710)	(0.682)	(0.400)	(0.785)	(0.705)	(0.400)
Observations	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table F-7: IPW, RA, AIPW & IPWRA outcome (OM) and treatment models (TM) for having graduated from post-secondary studies by the age of 25. Treatment: attended a subsidised-private school at any level

VARIABLES	IPW	RA		AIPW			IPWRA		
	TME1	OME0	OME1	OME0	OME1	TME1	OME0	OME1	TME1
sex = 1, male	-0.132	-0.661***	-0.232	-0.661***	-0.232	-0.132	-0.532**	-0.211	-0.132
	(0.111)	(0.194)	(0.172)	(0.194)	(0.172)	(0.111)	(0.209)	(0.183)	(0.111)
parental education	0.0966***	0.0860**	0.0819***	0.0860**	0.0819***	0.0966***	0.0800**	0.0726**	0.0966***
	(0.0189)	(0.0338)	(0.0318)	(0.0338)	(0.0318)	(0.0189)	(0.0359)	(0.0337)	(0.0189)
social class = 2, IVa+b: Self-Employed	-0.0292	-0.441	-0.614**	-0.441	-0.614**	-0.0292	-0.305	-0.547*	-0.0292
	(0.217)	(0.380)	(0.304)	(0.380)	(0.304)	(0.217)	(0.401)	(0.317)	(0.217)
social class = 3, V+VI: Skilled Manual and Farmers	-0.197	-1.065***	-0.378	-1.065***	-0.378	-0.197	-1.036***	-0.286	-0.197
	(0.211)	(0.372)	(0.298)	(0.372)	(0.298)	(0.211)	(0.389)	(0.316)	(0.211)
social class = 4, VIIa+IVc: Semi and Unskilled Manual,Farm workers	-0.222	-1.116***	-0.438	-1.116***	-0.438	-0.222	-1.085**	-0.497	-0.222
	(0.233)	(0.404)	(0.338)	(0.404)	(0.338)	(0.233)	(0.443)	(0.357)	(0.233)
social status score (Torche,2010)	0.0365	-0.0413	0.228	-0.0413	0.228	0.0365	-0.0740	0.214	0.0365
	(0.139)	(0.238)	(0.224)	(0.238)	(0.224)	(0.139)	(0.253)	(0.236)	(0.139)
number of siblings	-0.0859**	-0.0510	-0.0563	-0.0510	-0.0563	-0.0859**	-0.0755	-0.0801	-0.0859**
	(0.0376)	(0.0620)	(0.0619)	(0.0620)	(0.0619)	(0.0376)	(0.0651)	(0.0649)	(0.0376)
parent age when child started primary school	0.0116	0.00915	0.0229*	0.00915	0.0229*	0.0116	1.57e-05	0.0291**	0.0116
	(0.00740)	(0.0114)	(0.0119)	(0.0114)	(0.0119)	(0.00740)	(0.0122)	(0.0121)	(0.00740)
attended school in the RM = 1, always attended school in the MR	1.016***					1.016***			1.016***
	(0.113)					(0.113)			(0.113)
age of the reform when started primary school		-0.0773**	0.0111	-0.0773**	0.0111		-0.0801**	0.00665	
		(0.0361)	(0.0290)	(0.0361)	(0.0290)		(0.0385)	(0.0315)	
constant	-1.553***	-1.153*	-1.995***	-1.153*	-1.995***	-1.553***	-0.776	-2.073***	-1.553***
	(0.413)	(0.701)	(0.653)	(0.701)	(0.653)	(0.413)	(0.748)	(0.687)	(0.413)
Observations	1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table F-8: IPW, RA, AIPW & IPWRA outcome (OM) and treatment models (TM) for having graduated from university by the age of 25. Treatment: attended a subsidised-private school at any level

VARIABLES	IPW	RA		AIPW			IPWRA		
	TME1	OME0	OME1	OME0	OME1	TME1	OME0	OME1	TME1
sex = 1, male	-0.132	-0.508*	-0.294	-0.508*	-0.294	-0.132	-0.437	-0.264	-0.132
	(0.111)	(0.306)	(0.212)	(0.306)	(0.212)	(0.111)	(0.335)	(0.223)	(0.111)
parental education	0.0966***	0.175***	0.149***	0.175***	0.149***	0.0966***	0.176***	0.142***	0.0966***
	(0.0189)	(0.0628)	(0.0414)	(0.0628)	(0.0414)	(0.0189)	(0.0624)	(0.0443)	(0.0189)
social class = 2, IVa+b: Self-Employed	-0.0292	0.324	-0.583	0.324	-0.583	-0.0292	0.298	-0.415	-0.0292
	(0.217)	(0.601)	(0.364)	(0.601)	(0.364)	(0.217)	(0.668)	(0.374)	(0.217)
social class = 3, V+VI: Skilled Manual and Farmers	-0.197	-0.173	-0.477	-0.173	-0.477	-0.197	-0.334	-0.343	-0.197
	(0.211)	(0.605)	(0.359)	(0.605)	(0.359)	(0.211)	(0.668)	(0.381)	(0.211)
social class = 4, VIIa+IVc: Semi and Unskilled Manual,Farm workers	-0.222	-1.378*	-0.586	-1.378*	-0.586	-0.222	-1.489*	-0.603	-0.222
	(0.233)	(0.736)	(0.396)	(0.736)	(0.396)	(0.233)	(0.886)	(0.407)	(0.233)
social status score (Torche,2010)	0.0365	-0.119	0.170	-0.119	0.170	0.0365	-0.224	0.155	0.0365
	(0.139)	(0.386)	(0.271)	(0.386)	(0.271)	(0.139)	(0.444)	(0.286)	(0.139)
number of siblings	-0.0859**	-0.143	-0.0970	-0.143	-0.0970	-0.0859**	-0.173	-0.120	-0.0859**
	(0.0376)	(0.141)	(0.0790)	(0.141)	(0.0790)	(0.0376)	(0.144)	(0.0829)	(0.0376)
parent age when child started primary school	0.0116	0.0113	0.0167	0.0113	0.0167	0.0116	-0.000820	0.0180	0.0116
	(0.00740)	(0.0177)	(0.0142)	(0.0177)	(0.0142)	(0.00740)	(0.0177)	(0.0134)	(0.00740)
attended school in the RM = 1, always attended school in the MR	1.016***					1.016***			1.016***
	(0.113)					(0.113)			(0.113)
age of the reform when started primary school		0.0288	0.104***	0.0288	0.104***		0.0348	0.0984***	
		(0.0534)	(0.0347)	(0.0534)	(0.0347)		(0.0591)	(0.0377)	
constant	-1.553***	-4.129***	-3.549***	-4.129***	-3.549***	-1.553***	-3.628***	-3.489***	-1.553***
	(0.413)	(1.210)	(0.803)	(1.210)	(0.803)	(0.413)	(1.348)	(0.830)	(0.413)
Observations	1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490	1,490

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table F-9: AIPW, IPWRA and ERA outcome (OM) and treatment models (TM) for having accessed post-secondary studies by the age of 25. Treatment: attended a subsidised-private secondary school

VARIABLES	AIPW			IPWRA			ERA		
	OME0	OME1	TME1	OME0	OME1	TME1	TME1	OME0	OME1
sex = 1, male	0.0223	0.0175	-0.0614	0.0446	-0.0357	-0.0614	0.0257	0.0116	-0.0614
	(0.0937)	(0.121)	(0.0743)	(0.0968)	(0.128)	(0.0743)	(0.0950)	(0.124)	(0.0743)
social status score (Torche,2010)	0.137	0.323**	-0.0847	0.180	0.348**	-0.0847	0.141	0.305*	-0.0847
	(0.120)	(0.160)	(0.0949)	(0.122)	(0.170)	(0.0949)	(0.121)	(0.163)	(0.0949)
parental education	0.0785***	0.0661***	0.0520***	0.0788***	0.0632***	0.0520***	0.0671***	0.0822***	0.0520***
	(0.0159)	(0.0215)	(0.0124)	(0.0164)	(0.0227)	(0.0124)	(0.0184)	(0.0241)	(0.0124)
social class = 2, IVa+b: Self-Employed	-0.171	-0.283	-0.128	-0.0861	-0.235	-0.128	-0.151	-0.302	-0.128
	(0.185)	(0.240)	(0.146)	(0.190)	(0.252)	(0.146)	(0.189)	(0.244)	(0.146)
social class = 3, V+VI: Skilled Manual and Farmers	-0.474**	-0.109	0.0421	-0.374*	-0.0562	0.0421	-0.474**	-0.0898	0.0421
	(0.185)	(0.230)	(0.142)	(0.191)	(0.242)	(0.142)	(0.187)	(0.232)	(0.142)
social class = 4, VIIa+IVc: Semi and Unskilled Manual,Farm workers	-0.488**	-0.301	0.0184	-0.388*	-0.316	0.0184	-0.485**	-0.305	0.0184
	(0.204)	(0.256)	(0.159)	(0.211)	(0.270)	(0.159)	(0.207)	(0.259)	(0.159)
number of siblings	-0.0731**	-0.0767*	-0.0346	-0.0706**	-0.0918**	-0.0346	-0.0679**	-0.0929**	-0.0346
	(0.0317)	(0.0420)	(0.0242)	(0.0313)	(0.0443)	(0.0242)	(0.0322)	(0.0436)	(0.0242)
parent age when child started primary school	0.0134**	0.0146*	0.00947**	0.0104	0.0171**	0.00947**	0.0115*	0.0167*	0.00947**
	(0.00607)	(0.00836)	(0.00479)	(0.00653)	(0.00860)	(0.00479)	(0.00624)	(0.00860)	(0.00479)
age of the reform when started primary school	0.0237	0.00513		0.0221	0.00743		0.0242	0.00457	
	(0.0162)	(0.0210)		(0.0166)	(0.0224)		(0.0162)	(0.0210)	
attended school in the RM = 1, always attended school in the MR			0.450***			0.450***			0.450***
			(0.128)			(0.128)			(0.128)
school supply in relevant geographical area (instrumental variable)			0.000847*			0.000847*			0.000847*
			(0.000469)			(0.000469)			(0.000469)
constant	-1.057***	-0.619	-1.407***	-1.021***	-0.617	-1.407***	-1.103***	-1.310**	-1.407***
	(0.344)	(0.455)	(0.268)	(0.356)	(0.479)	(0.268)	(0.350)	(0.621)	(0.268)
Observations	1,283	1,283	1,283	1,283	1,283	1,283	1,283	1,283	1,283

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table F-10: AIPW, IPWRA and ERA outcome (OM) and treatment models (TM) for having accessed university studies by the age of 25. Treatment: attended a subsidised-private secondary school

VARIABLES	AIPW			IPWRA			ERA		
	OME0	OME1	TME1	OME0	OME1	TME1	OME0	OME1	TME1
sex = 1, male	-0.0293	-0.170	-0.0614	-0.0309	-0.151	-0.0614	-0.101	-0.0970	-0.0614
	(0.108)	(0.128)	(0.0743)	(0.112)	(0.137)	(0.0743)	(0.122)	(0.118)	(0.0743)
social status score (Torche,2010)	0.121	0.296*	-0.0847	0.133	0.297	-0.0847	0.00152	0.387**	-0.0847
	(0.139)	(0.176)	(0.0949)	(0.145)	(0.187)	(0.0949)	(0.155)	(0.163)	(0.0949)
parental education	0.0889***	0.0819***	0.0520***	0.0935***	0.0717***	0.0520***	0.0765***	0.101***	0.0520***
	(0.0197)	(0.0240)	(0.0124)	(0.0202)	(0.0259)	(0.0124)	(0.0249)	(0.0240)	(0.0124)
social class = 2, IVa+b: Self-Employed	0.0327	-0.117	-0.128	0.0472	-0.141	-0.128	-0.0759	0.0106	-0.128
	(0.207)	(0.237)	(0.146)	(0.216)	(0.254)	(0.146)	(0.251)	(0.207)	(0.146)
social class = 3, V+VI: Skilled Manual and Farmers	0.0446	-0.310	0.0421	0.0593	-0.356	0.0421	0.0843	-0.227	0.0421
	(0.205)	(0.231)	(0.142)	(0.214)	(0.247)	(0.142)	(0.236)	(0.212)	(0.142)
social class = 4, VIIa+IVc: Semi and Unskilled Manual,Farm workers	-0.211	-0.403	0.0184	-0.216	-0.467*	0.0184	-0.231	-0.305	0.0184
	(0.226)	(0.258)	(0.159)	(0.238)	(0.281)	(0.159)	(0.261)	(0.233)	(0.159)
number of siblings	-0.100**	-0.0314	-0.0346	-0.0873**	-0.0509	-0.0346	-0.0811	-0.0626	-0.0346
	(0.0465)	(0.0465)	(0.0242)	(0.0439)	(0.0500)	(0.0242)	(0.0515)	(0.0459)	(0.0242)
parent age when child started primary school	0.0129*	0.0110	0.00947**	0.00949	0.0105	0.00947**	0.0143*	0.0105	0.00947**
	(0.00669)	(0.00867)	(0.00479)	(0.00707)	(0.00891)	(0.00479)	(0.00745)	(0.00787)	(0.00479)
age of the reform when started primary school	0.0728***	0.0375*		0.0701***	0.0322		0.0757***	0.0414**	
	(0.0187)	(0.0218)		(0.0195)	(0.0235)		(0.0210)	(0.0195)	
attended school in the RM = 1, always attended school in the MR			0.450***			0.450***			0.450***
			(0.128)			(0.128)			(0.128)
school supply in relevant geographical area (instrumental variable)			0.000847*			0.000847*			0.000847*
			(0.000469)			(0.000469)			(0.000469)
constant	-2.295***	-1.541***	-1.407***	-2.216***	-1.258**	-1.407***	-2.576***	-2.290***	-1.407***
	(0.393)	(0.500)	(0.268)	(0.414)	(0.525)	(0.268)	(0.453)	(0.547)	(0.268)
Observations	1,283	1,283	1,283	1,283	1,283	1,283	1,283	1,283	1,283

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table F-11: AIPW, IPWRA and ERA outcome (OM) and treatment models (TM) for having graduated from post-secondary studies by the age of 25. Treatment: attended a subsidised-private secondary school

VARIABLES	AIPW			IPWRA			ERA		
	OME0	OME1	TME1	OME0	OME1	TME1	OME0	OME1	TME1
sex = 1, male	-0.213**	-0.119	-0.0602	-0.157	-0.110	-0.0602	-0.209*	-0.124	-0.0602
	(0.108)	(0.131)	(0.0769)	(0.112)	(0.141)	(0.0769)	(0.110)	(0.132)	(0.0769)
social status score (Torche,2010)	0.0618	-0.0228	-0.107	0.0608	0.0216	-0.107	0.0763	-0.0415	-0.107
	(0.137)	(0.172)	(0.0975)	(0.141)	(0.176)	(0.0975)	(0.140)	(0.172)	(0.0975)
parental education	0.0473***	0.0591**	0.0500***	0.0447**	0.0427	0.0500***	0.0346*	0.0680***	0.0500***
	(0.0176)	(0.0246)	(0.0130)	(0.0181)	(0.0267)	(0.0130)	(0.0204)	(0.0263)	(0.0130)
social class = 2, IVa+b: Self-Employed	-0.322	-0.641***	-0.154	-0.291	-0.530**	-0.154	-0.293	-0.659***	-0.154
	(0.205)	(0.246)	(0.151)	(0.210)	(0.260)	(0.151)	(0.209)	(0.248)	(0.151)
social class = 3, V+VI: Skilled Manual and Farmers	-0.616***	-0.482**	-0.0477	-0.611***	-0.359	-0.0477	-0.591***	-0.492**	-0.0477
	(0.209)	(0.230)	(0.147)	(0.212)	(0.241)	(0.147)	(0.213)	(0.229)	(0.147)
social class = 4, VIIa+IVc: Semi and Unskilled Manual,Farm workers	-0.580**	-0.584**	-0.0506	-0.577**	-0.592**	-0.0506	-0.554**	-0.599**	-0.0506
	(0.232)	(0.260)	(0.165)	(0.242)	(0.270)	(0.165)	(0.235)	(0.262)	(0.165)
number of siblings	-0.0625*	-0.0562	-0.0231	-0.0709**	-0.0665	-0.0231	-0.0590	-0.0624	-0.0231
	(0.0362)	(0.0444)	(0.0246)	(0.0357)	(0.0476)	(0.0246)	(0.0367)	(0.0449)	(0.0246)
parent age when child started primary school	0.00799	0.0203**	0.00793	0.00624	0.0191**	0.00793	0.00613	0.0211**	0.00793
	(0.00647)	(0.00901)	(0.00495)	(0.00673)	(0.00943)	(0.00495)	(0.00660)	(0.00900)	(0.00495)
age of the reform when started primary school	-0.0213	-0.00913		-0.0164	-0.0121		-0.0211	-0.00961	
	(0.0188)	(0.0222)		(0.0196)	(0.0241)		(0.0189)	(0.0222)	
attended school in the RM = 1, always attended school in the MR			0.418***			0.418***			0.418***
			(0.132)			(0.132)			(0.132)
school supply in relevant geographical area (instrumental variable)			0.000905*			0.000905*			0.000905*
			(0.000482)			(0.000482)			(0.000482)
constant	-0.813**	-1.259**	-1.314***	-0.745*	-1.032*	-1.314***	-0.871**	-1.635**	-1.314***
	(0.379)	(0.502)	(0.276)	(0.387)	(0.539)	(0.276)	(0.388)	(0.650)	(0.276)
Observations	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table F-12: AIPW, IPWRA and ERA outcome (OM) and treatment models (TM) for having graduated from university studies by the age of 25. Treatment: attended a subsidised-private secondary school

VARIABLES	AIPW			IPWRA			ERA		
	OME0	OME1	TME1	OME0	OME1	TME1	OME0	OME1	TME1
sex = 1, male	0.00654	-0.139	-0.0602	0.0503	-0.115	-0.0602	0.00725	-0.149	-0.0602
	(0.142)	(0.146)	(0.0769)	(0.146)	(0.154)	(0.0769)	(0.148)	(0.148)	(0.0769)
social status score (Torche,2010)	0.221	0.0553	-0.107	0.240	0.0777	-0.107	0.253	0.0123	-0.107
	(0.175)	(0.201)	(0.0975)	(0.185)	(0.207)	(0.0975)	(0.183)	(0.206)	(0.0975)
parental education	0.0594**	0.0864***	0.0500***	0.0573**	0.0714**	0.0500***	0.0349	0.105***	0.0500***
	(0.0261)	(0.0293)	(0.0130)	(0.0255)	(0.0313)	(0.0130)	(0.0302)	(0.0317)	(0.0130)
social class = 2, IVa+b: Self-Employed	0.104	-0.444*	-0.154	0.0761	-0.331	-0.154	0.164	-0.486*	-0.154
	(0.256)	(0.267)	(0.151)	(0.268)	(0.287)	(0.151)	(0.268)	(0.272)	(0.151)
social class = 3, V+VI: Skilled Manual and Farmers	-0.178	-0.474*	-0.0477	-0.269	-0.401	-0.0477	-0.112	-0.505*	-0.0477
	(0.270)	(0.255)	(0.147)	(0.276)	(0.266)	(0.147)	(0.279)	(0.258)	(0.147)
social class = 4, VIIa+IVc: Semi and Unskilled Manual,Farm workers	-0.340	-0.441	-0.0506	-0.382	-0.452	-0.0506	-0.282	-0.477	-0.0506
	(0.296)	(0.284)	(0.165)	(0.323)	(0.292)	(0.165)	(0.303)	(0.292)	(0.165)
number of siblings	-0.114	-0.0546	-0.0231	-0.122*	-0.0636	-0.0231	-0.107	-0.0673	-0.0231
	(0.0789)	(0.0503)	(0.0246)	(0.0721)	(0.0551)	(0.0246)	(0.0824)	(0.0513)	(0.0246)
parent age when child started primary school	0.00750	0.0184*	0.00793	0.00358	0.0142	0.00793	0.00386	0.0203**	0.00793
	(0.00853)	(0.00988)	(0.00495)	(0.00863)	(0.00996)	(0.00495)	(0.00901)	(0.00987)	(0.00495)
age of the reform when started primary school	0.0469*	0.0368		0.0480*	0.0354		0.0498**	0.0358	
	(0.0241)	(0.0247)		(0.0254)	(0.0269)		(0.0245)	(0.0247)	
attended school in the RM = 1, always attended school in the MR			0.418***			0.418***			0.418***
			(0.132)			(0.132)			(0.132)
school supply in relevant geographical area (instrumental variable)			0.000905*			0.000905*			0.000905*
			(0.000482)			(0.000482)			(0.000482)
constant	-2.134***	-2.147***	-1.314***	-1.914***	-1.810***	-1.314***	-2.267***	-2.930***	-1.314***
	(0.507)	(0.583)	(0.276)	(0.522)	(0.614)	(0.276)	(0.521)	(0.738)	(0.276)
Observations	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix G. Descriptive statistics of collapsed school-type trajectories and employment situation at the age of 25

Table G-1: Number and proportion of individuals by whether they are working and/or studying at the age of 25

Studies at the age of 25	Employment situation at the age of 25					
	Not working		Working		Total	
	N	%	N	%	N	%
Not Studying	72	5.98%	1,133	94.02%	1,205	100%
Studying	17	8.54%	182	91.46%	199	100%
Total	89	6.34%	1,315	93.66%	1,404	100%

Table G-2: Number and proportion of students that were working at the age of 25 by attendance to a private school at any level

School type attended at primary and secondary level	Employment situation at the age of 25					
	Not working		Working		Total	
	N	%	N	%	N	%
Never attended a private school	39	5.15%	719	94.85%	758	100%
Attended a private school	33	5.25%	596	94.75%	629	100%
Total	72	5.19%	1,315	94.81%	1,387	100%

Table G-3: Number and proportion of students that that were working at the age of 25 by school type attended at secondary level

School type attended at secondary level	Employment situation at the age of 25					
	Not working		Working		Total	
	N	%	N	%	N	%
Public	45	5.10%	838	94.90%	883	100%
Private	27	5.36%	477	94.64%	504	100%
Total	72	5.19%	1,315	94.81%	1,387	100%

Appendix H. Descriptive statistics of collapsed school-type trajectories and hourly earnings at the age of 25

Table H-1: Average hourly earnings of individuals at the age of 25 by attendance to a subsidised-private school

School type attended at primary and secondary level	Average hourly earning from main occupation at the age of 25		
	Mean	Std. Dev.	N
Never attended a private school	1978.47	1549.25	719
Attended a private school	2488.69	1825.14	596
Total	2,209.72	1,698.37	1,315

Table H-2: Average hourly earnings of individuals at the age of 25 by school type attended at the secondary level

School type attended at secondary level	Average hourly earning from main occupation at the age of 25		
	Mean	Std. Dev.	N
Public	2055.43	1565.98	838
Private	2480.77	1880.14	477
Total	2,209.72	1,698.37	1,315

Appendix I. OLS tables for the main and interaction effects of school-type trajectories on hourly earnings at the age of 25

Table I-1: Estimated OLS coefficients for hourly earnings at the age of 25: main effects models for log of hourly earnings controlling for non-contemporary covariates

VARIABLES	(1)	(2)	(3)	(4)
school type trajectory = 0, public-public		-0.151***	-0.120***	-0.144***
		(0.0535)	(0.0441)	(0.0409)
school type trajectory = 1, private-public	0.151***		0.0314	0.00738
	(0.0535)		(0.0628)	(0.0590)
school type trajectory = 2, public-private	0.120***	-0.0314		-0.0241
	(0.0441)	(0.0628)		(0.0516)
school type trajectory = 3, private-private	0.144***	-0.00738	0.0241	
	(0.0409)	(0.0590)	(0.0516)	
controls for social and family background, school location and time of the reform	YES	YES	YES	YES
observations	1,315	1,315	1,315	1,315

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table I-2: Estimated OLS coefficients for the role of school-type trajectory on hourly earnings at the age of 25: interaction effects models with the age of the reform when individuals started primary school for log of hourly earnings

VARIABLES	(1)	(2)	(3)	(4)
school type trajectory = 0, public-public (omitted)				
school type trajectory = 1, private-public	0.299***	0.190*	0.206**	0.155*
	(0.102)	(0.0979)	(0.0950)	(0.0929)
school type trajectory = 2, public-private	0.220***	0.163**	0.152**	0.113*
	(0.0756)	(0.0740)	(0.0730)	(0.0675)
school type trajectory = 3, private-private	0.389***	0.293***	0.269***	0.232***
	(0.0734)	(0.0725)	(0.0709)	(0.0687)
age of the reform when started primary school	0.0279***	0.0304***	0.0326***	0.0284***
	(0.00737)	(0.00696)	(0.00690)	(0.00671)
private - public # age of the reform when started primary school	-0.0106	-0.00892	-0.0145	-0.00993
	(0.0217)	(0.0208)	(0.0201)	(0.0204)
public - private # age of the reform when started primary school	-0.00770	-0.0124	-0.0144	-0.0131
	(0.0152)	(0.0152)	(0.0149)	(0.0139)
private - private # age of the reform when started primary school	-0.0328**	-0.0356**	-0.0330**	-0.0376***
	(0.0143)	(0.0139)	(0.0136)	(0.0130)
controls for social and family background, school location and time of the reform	NO	YES	YES	YES
controls for secondary school overall mark	NO	NO	YES	YES
controls for years of education by the age of 25	NO	NO	NO	YES
observations	1,315	1,315	1,315	1,315

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table I-3: Estimated OLS coefficients for the role of school-type trajectory on hourly earnings at the age of 25: interaction effects models with an indicator variable for started secondary school in 1993 or later for log of hourly earnings

VARIABLES	(1)	(2)	(3)	(4)
school type trajectory = 0, public-public (omitted)				
school type trajectory = 1, private-public	0.306***	0.182**	0.194***	0.156**
	(0.0718)	(0.0714)	(0.0690)	(0.0647)
school type trajectory = 2, public-private	0.178***	0.103*	0.0934*	0.0631
	(0.0587)	(0.0560)	(0.0553)	(0.0517)
school type trajectory = 3, private-private	0.366***	0.257***	0.241***	0.183***
	(0.0561)	(0.0568)	(0.0557)	(0.0545)
started secondary school in 1993 or later = 1	0.158***	0.151***	0.168***	0.151***
	(0.0416)	(0.0398)	(0.0398)	(0.0384)
private - public # started secondary school in 1993 or later	-0.0983	-0.0591	-0.0986	-0.0877
	(0.110)	(0.106)	(0.103)	(0.0984)
public - private # started secondary school in 1993 or later	0.0150	0.0253	0.00537	-0.00334
	(0.0887)	(0.0882)	(0.0874)	(0.0826)
private - private # started secondary school in 1993 or later	-0.225***	-0.239***	-0.229***	-0.226***
	(0.0807)	(0.0763)	(0.0755)	(0.0727)
controls for social and family background, school location and time of the reform	NO	YES	YES	YES
controls for secondary school overall mark	NO	NO	YES	YES
controls for years of education by the age of 25	NO	NO	NO	YES
observations	1,315	1,315	1,315	1,315

Table I-4: Estimated OLS coefficients for the role of school-type trajectory on hourly earnings at the age of 25: Interaction effects models with overall secondary school marks for log of hourly earnings

VARIABLES	(1)	(2)	(3)
school type trajectory = 0, public-public (omitted)			
school type trajectory = 1, private-public	-1.479**	-1.269**	-0.962
	(0.656)	(0.628)	(0.631)
school type trajectory = 2, public-private	-0.514	-0.339	-0.297
	(0.574)	(0.548)	(0.521)
school type trajectory = 3, private-private	-0.777	-0.661	-0.548
	(0.499)	(0.470)	(0.446)
average global score at secondary school	0.0619	0.124***	0.0637
	(0.0466)	(0.0424)	(0.0416)
school type trajectory = 1 # average global score at secondary school	0.310***	0.254**	0.193*
	(0.118)	(0.113)	(0.113)
school type trajectory = 2 # average global score at secondary school	0.123	0.0781	0.0643
	(0.102)	(0.0976)	(0.0926)
school type trajectory = 3 # average global score at secondary school	0.183**	0.142*	0.112
	(0.0897)	(0.0844)	(0.0796)
controls for social and family background, school location and time of the reform	NO	YES	YES
controls for years of education by the age of 25	NO	NO	YES
observations	1,315	1,315	1,315

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix J. Treatment and potential outcome models for the effects of school-type on earnings at the age of 25.

Table J-1: IPW, RA, AIPW & IPWRA outcome (OM) and treatment models (TM) for earnings at the age of 25. Treatment: attended a subsidised-private secondary school

VARIABLES	IPW	RA		AIPW			IPWRA		
	TME1	OME0	OME1	OME0	OME1	TME1	OME0	OME1	TME1
sex = 1, male	-0.158	0.211***	0.0746	0.211***	0.0746	-0.158	0.216***	0.113**	-0.158
	(0.121)	(0.0369)	(0.0512)	(0.0369)	(0.0512)	(0.121)	(0.0386)	(0.0548)	(0.121)
social status score (Torche,2010)	-0.0408	-0.0155	0.0467	-0.0155	0.0467	-0.0408	-0.0128	0.0529	-0.0408
	(0.155)	(0.0436)	(0.0681)	(0.0436)	(0.0681)	(0.155)	(0.0457)	(0.0685)	(0.155)
parental education	0.0927***	0.0304***	0.0345***	0.0304***	0.0345***	0.0927***	0.0305***	0.0313***	0.0927***
	(0.0209)	(0.00546)	(0.00929)	(0.00546)	(0.00929)	(0.0209)	(0.00594)	(0.00910)	(0.0209)
social class = 2, IVa+b: Self-Employed	-0.167	-0.170**	-0.0604	-0.170**	-0.0604	-0.167	-0.163**	-0.0447	-0.167
	(0.240)	(0.0780)	(0.107)	(0.0780)	(0.107)	(0.240)	(0.0796)	(0.115)	(0.240)
social class = 3, V+VI: Skilled Manual and Farmers	-0.0104	-0.179**	-0.0220	-0.179**	-0.0220	-0.0104	-0.190**	-0.0449	-0.0104
	(0.231)	(0.0725)	(0.0961)	(0.0725)	(0.0961)	(0.231)	(0.0740)	(0.0956)	(0.231)
social class = 4, VIIa+IVc: Semi and Unskilled Manual,Farm workers	0.00532	-0.216***	-0.0326	-0.216***	-0.0326	0.00532	-0.224***	-0.0403	0.00532
	(0.258)	(0.0772)	(0.102)	(0.0772)	(0.102)	(0.258)	(0.0785)	(0.103)	(0.258)
parent age when child started primary school	0.0152*	0.00295	0.00560	0.00295	0.00560	0.0152*	0.00367	0.00583	0.0152*
	(0.00806)	(0.00225)	(0.00350)	(0.00225)	(0.00350)	(0.00806)	(0.00245)	(0.00380)	(0.00806)
age of the reform when started primary school		0.0291***	0.00456	0.0291***	0.00456		0.0274***	0.00629	
		(0.00668)	(0.00892)	(0.00668)	(0.00892)		(0.00678)	(0.00958)	
number of siblings	-0.0594					-0.0594			-0.0594
	(0.0408)					(0.0408)			(0.0408)
attended school in the RM = 1, always attended school in the MR	1.055***					1.055***			1.055***
	(0.122)					(0.122)			(0.122)
constant	-2.286***	7.085***	7.107***	7.085***	7.107***	-2.286***	7.081***	7.172***	-2.286***
	(0.457)	(0.149)	(0.313)	(0.149)	(0.313)	(0.457)	(0.162)	(0.328)	(0.457)
Observations	1,315	1,315	1,315	1,315	1,315	1,315	1,315	1,315	1,315

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table J-2: IPW, RA, AIPW & IPWRA outcome (OM) and treatment models (TM) for earnings at the age of 25. Treatment: attended a subsidised-private school at any level

VARIABLES	IPW	RA		AIPW			IPWRA		
	TME1	OME0	OME1	OME0	OME1	TME1	OME0	OME1	TME1
sex = 1, male	-0.121	0.222***	0.0824*	0.222***	0.0824*	-0.121	0.247***	0.112**	-0.121
	(0.118)	(0.0395)	(0.0463)	(0.0395)	(0.0463)	(0.118)	(0.0426)	(0.0506)	(0.118)
social status score (Torche,2010)	0.117	-0.0390	0.0514	-0.0390	0.0514	0.117	-0.0334	0.0530	0.117
	(0.152)	(0.0466)	(0.0594)	(0.0466)	(0.0594)	(0.152)	(0.0523)	(0.0604)	(0.152)
parental education	0.0959***	0.0288***	0.0333***	0.0288***	0.0333***	0.0959***	0.0297***	0.0315***	0.0959***
	(0.0205)	(0.00586)	(0.00784)	(0.00586)	(0.00784)	(0.0205)	(0.00671)	(0.00784)	(0.0205)
social class = 2, IVa+b: Self-Employed	-0.0793	-0.185**	-0.0781	-0.185**	-0.0781	-0.0793	-0.174*	-0.0659	-0.0793
	(0.235)	(0.0883)	(0.0896)	(0.0883)	(0.0896)	(0.235)	(0.0910)	(0.0932)	(0.235)
social class = 3, V+VI: Skilled Manual and Farmers	-0.150	-0.173**	-0.0625	-0.173**	-0.0625	-0.150	-0.177**	-0.0695	-0.150
	(0.228)	(0.0801)	(0.0850)	(0.0801)	(0.0850)	(0.228)	(0.0829)	(0.0862)	(0.228)
social class = 4, VIIa+IVc: Semi and Unskilled Manual,Farm workers	-0.119	-0.225***	-0.0565	-0.225***	-0.0565	-0.119	-0.224**	-0.0536	-0.119
	(0.252)	(0.0860)	(0.0891)	(0.0860)	(0.0891)	(0.252)	(0.0906)	(0.0933)	(0.252)
age of the reform when started primary school	0.0133	0.00255	0.00574*	0.00255	0.00574*	0.0133	0.00378	0.00601	0.0133
	(0.00810)	(0.00238)	(0.00311)	(0.00238)	(0.00311)	(0.00810)	(0.00282)	(0.00365)	(0.00810)
parent age when child started primary school	0.0133	0.00255	0.00574*	0.00255	0.00574*	0.0133	0.00378	0.00601	0.0133
	(0.00810)	(0.00238)	(0.00311)	(0.00238)	(0.00311)	(0.00810)	(0.00282)	(0.00365)	(0.00810)
number of siblings	-0.108***					-0.108***			-0.108***
	(0.0408)					(0.0408)			(0.0408)
attended school in the RM = 1, always attended school in the MR	1.091***					1.091***			1.091***
	(0.120)					(0.120)			(0.120)
constant	-1.669***	7.172***	6.926***	7.172***	6.926***	-1.669***	7.120***	6.978***	-1.669***
	(0.458)	(0.159)	(0.246)	(0.159)	(0.246)	(0.458)	(0.187)	(0.273)	(0.458)
Observations	1,315	1,315	1,315	1,315	1,315	1,315	1,315	1,315	1,315

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table J-3: AIPW, IPWRA and ERA outcome (OM) and treatment models (TM) for earnings at the age of 25. Treatment: attended a subsidised-private secondary school

VARIABLES	AIPW			IPWRA			ERA		
	OME0	OME1	TME1	OME0	OME1	TME1	OME0	OME1	TME1
sex = 1, male	0.205***	0.0825	-0.0637	0.200***	0.0645	-0.0637	0.202***	0.0763	-0.0637
	(0.0414)	(0.0614)	(0.0797)	(0.0399)	(0.0573)	(0.0797)	(0.0410)	(0.0483)	(0.0797)
social status score (Torche,2010)	-0.0226	-0.0388	-0.0719	-0.0215	-0.0327	-0.0719	-0.0697	0.0307	-0.0719
	(0.0488)	(0.0724)	(0.103)	(0.0471)	(0.0745)	(0.103)	(0.0492)	(0.0623)	(0.103)
parental education	0.0267***	0.0435***	0.0541***	0.0255***	0.0442***	0.0541***	0.0257**	0.0338***	0.0541***
	(0.00644)	(0.00956)	(0.0135)	(0.00604)	(0.00974)	(0.0135)	(0.0107)	(0.0127)	(0.0135)
social class = 2, IVa+b: Self-Employed	-0.156*	-0.0972	-0.165	-0.164**	-0.130	-0.165	-0.180*	-0.134	-0.165
	(0.0819)	(0.124)	(0.157)	(0.0797)	(0.115)	(0.157)	(0.0926)	(0.0930)	(0.157)
social class = 3, V+VI: Skilled Manual and Farmers	-0.171**	-0.117	-0.0463	-0.160**	-0.0941	-0.0463	-0.183**	-0.0966	-0.0463
	(0.0766)	(0.101)	(0.152)	(0.0744)	(0.107)	(0.152)	(0.0836)	(0.0909)	(0.152)
social class = 4, VIIa+IVc: Semi and Unskilled Manual,Farm workers	-0.232***	-0.0255	-0.0234	-0.220***	-0.0273	-0.0234	-0.264***	-0.0669	-0.0234
	(0.0807)	(0.112)	(0.171)	(0.0799)	(0.115)	(0.171)	(0.0882)	(0.0955)	(0.171)
parent age when child started primary school	0.00269	0.00515	0.00902*	0.00198	0.00559	0.00902*	0.00185	0.00641*	0.00902*
	(0.00261)	(0.00441)	(0.00524)	(0.00246)	(0.00416)	(0.00524)	(0.00256)	(0.00356)	(0.00524)
age of the reform when started primary school	0.0336***	0.0162		0.0359***	0.0145		0.0328***	0.0135	
	(0.00726)	(0.0102)		(0.00718)	(0.00959)		(0.00748)	(0.00851)	
number of siblings			-0.0393			-0.0393			-0.0393
			(0.0263)			(0.0263)			(0.0263)
attended school in the RM = 1, always attended school in the MR			0.440***			0.440***			0.440***
			(0.136)			(0.136)			(0.136)
school supply in relevant geographical area (instrumental variable)			0.000976**			0.000976**			0.000976**
			(0.000495)			(0.000495)			(0.000495)
constant	7.078***	7.271***	-1.360***	7.090***	7.197***	-1.360***	7.142***	6.974***	-1.360***
	(0.169)	(0.367)	(0.292)	(0.156)	(0.353)	(0.292)	(0.168)	(0.457)	(0.292)
Observations	1,113	1,113	1,113	1,113	1,113	1,113	1,113	1,113	1,113

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1