From access to attainment: patterns of social inequality and equity policies in higher education

Estelle Herbaut

Thesis submitted for assessment with a view to
obtaining the degree of Doctor of Political and Social Sciences
of the European University Institute

Florence, 14 December 2018

European University Institute
Department of Political and Social Sciences

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Abstract

To what extent, and how, does social background influence students' attainment in higher education? Building on the life course perspective on educational inequalities, this PhD thesis focuses on patterns of inequality formation in French higher education and on an evaluation of educational policies to reduce them. It assesses the effect of social origin on pivotal outcomes of higher education careers in both the vertical dimension of stratification (access to higher education, dropout) and horizontal dimension (access and transfer to prestigious institutions). In order to provide a comprehensive assessment of patterns of inequalities, from initial access to final attainment, this thesis further combines the study of single key transitions with an analysis of whole students' trajectories during their educational careers. Focusing on policy solutions, it estimates the effect of alternative pathways on the composition of the student body in prestigious institutions and provides a systematic review of the (quasi-) experimental literature evaluating the impacts of both outreach interventions and financial aid on the outcomes of disadvantaged students in higher education.

Results first confirm the crucial role of previous education in shaping social inequalities in higher education outcomes. However, these results also provide evidence of a "lingering" effect of social origin in the French higher education system for some crucial outcomes, especially in the horizontal dimension of social stratification. They further confirm the relevance of the compensatory advantage hypothesis in the formation of social inequalities in higher education outcomes, as, in France, socially advantaged students with lower performance are better able to gain eligibility to higher education and to overcome failure in their first year of tertiary studies. Finally, the systematic literature review allows the conclusion that some late interventions, when well-designed, are efficient in increasing opportunities for disadvantaged students and reducing inequalities in higher education outcomes. Most notably, outreach interventions which complement information with personalized support are usually efficient in increasing access rates, and need-based grants appear to raise, often substantially, the graduation rates of disadvantaged students.

Finally, the implications of these results for our understanding of social stratification in higher education and some promising avenues for future research are discussed.

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Chapter 1
Theoretical perspectives on social inequalities in higher education

Introduction

Around the world, 215 million students are now enrolled in higher education (UIS, 2018). Over the past few decades, accessing higher education, which used to be the exception, has become increasingly common and, in some countries, the norm. Driven by public demand as much as by political agendas, higher education systems have expanded and diversified in order to take in, train, and award degrees to an always increasing number of students. What questions does this major societal evolution raise for our understanding of social stratification?

Research on social mobility has long identified education as a major channel of social stratification in industrialized societies, as formalized by the seminal work of Blau & Duncan (1967). For many years, the sociological literature had focused on primary and secondary schools to identify patterns of inequalities, unfold its driving mechanisms, or discuss its consequences. However, there has been a growing interest regarding the question of inequalities in higher education, which has become highly relevant for two reasons. Firstly, and as mentioned earlier, education systems, and higher education in particular, have experienced a dramatic expansion in half a century. In developed countries, upper secondary attainment is becoming almost universal: in 2016, 84% of 25-34 year-olds from OECD countries had at least graduated from high school, compared to roughly 50% in 1970, and the proportion of this age group with higher education qualifications has steadily increased, from about 15% in 1970 to 26% in 2000 and 43% in 2016 (OECD, 2017). Worldwide, the number of higher education students has soared from 32 million in 1970 to 215 million in 2016 (UIS, 2018). The development of this "mass higher education" undoubtedly calls for closer attention to its role in social stratification. Secondly, higher education degrees remain associated with large public and private benefits, which makes inequalities in access and graduation a pressing concern. In industrialized countries, the employment rate of tertiary graduates is, on average, about 10 percentage points higher than high school graduates and their earnings are 56% higher (OECD, 2017). Even when considering what an individual invests to study at the tertiary level (in tuition fees and foregone earnings), it is estimated that a man will gain around

$250,000 in net benefits over his career compared to someone who just graduates from high school (OECD average). Similarly, the cost for governments to fund higher education institutions is largely compensated, as higher education actually brings about large public net benefits through additional tax revenues and lower social transfers (OECD, 2017). There is little doubt that these substantial benefits for higher education graduates will continue to steer demand towards more university education and increase the pressure on governments to guarantee accessible and equitable higher education systems. Given the importance of educational attainment in social stratification, promoting an equitable educational system is indeed a central ideal of democratic societies.

It goes beyond the scope of this thesis to summarize the different theoretical approaches to define equity or equality of opportunities (see for example, Fishkin, 2014; Rawls, 1999; Sen, 2009; Walzer, 1983). Instead, I build on the most common definition used in the field of education, where it refers to the principle that educational achievement should not be determined by circumstances that are beyond a person's control (Roemer, 1998, p. 6) *i.e.* that educational attainment should not be determined by family socio-economic background, gender, or ethnicity. Despite recent studies pointing to a decline in inequalities of educational opportunity (IEO) over the 20th century (Barone & Ruggera, 2017; Breen, Luijkx, Müller, & Pollak, 2009; Vallet, 2008), the association between socio-economic background and educational attainment has by no means disappeared, and higher education attainment makes no exception. In all European countries, for example, children with at least one-tertiary educated parent are still much more likely to graduate from higher education (Bernardi & Ballarino, 2014). In France, 42% of 25-29 year-olds had graduated from higher education in 2015, but this proportion ranged from 30% for children of workers and employees, to 65% for children of the higher and lower salariat (Ministère de l'Enseignement supérieur, de la Recherche et de l'Innovation, 2017).

How does this large difference in higher education outcomes across social groups come about? The gross association between social origin and higher education attainment says little about the stratifying power of higher education systems. As highlighted by Duru-Bellat (2009), it is crucial to distinguish inequalities *in* higher education from inequalities produced *by* higher education. Being the last stage of the educational system, inequalities in higher education outcomes also reflect unequal opportunities occurring earlier in the educational pipeline.

Early inequalities in educational performance can be expected to translate into different secondary education outcomes, which are crucial in framing opportunities in higher education. Are these inequalities simply maintained or amplified during higher education? Which are the crucial points during the higher education career for the emergence of inequalities? And can social inequalities be reduced by political reforms or interventions at this level of education? Building on the life course perspective on inequalities, this dissertation aims to address these questions by identifying the processes of inequality formation along the higher education career and investigate the effects of various policies on the educational opportunities for disadvantaged students at this level of education. It focuses on the case of French higher education and aims to contribute to the current literature in different ways. First, I address the question of the stratifying role of higher education by carefully disentangling inequalities accumulated during previous stages of the educational career, from inequalities emerging in higher education. Contrary to the majority of sociological studies on higher education, which have focused on access patterns (for example, Shavit, Arum, & Gamoran, 2007), this work also attempts to provide a comprehensive assessment of patterns of inequalities from initial access to final attainment, and combines the study of single key transitions with the analysis of whole students' trajectories. In addition, I estimate inequalities in access to, or graduation from, higher education in general, but I pay particular attention to qualitative differences across types of institution which are especially relevant in higher education. Finally, I question the impacts of equity policies at this stage of the educational system by offering a broad overview of the latest findings on the causal effects of various types of policies.

This chapter introduces some of the major debates and findings in the literature on educational inequalities. I start by summarizing the major hypotheses regarding the role of higher education in the social stratification process, as well as the models which have been most influential in describing mechanisms of educational inequalities. I then introduce the life course perspective on education inequalities which serves as a general framework for this dissertation. Although I do not attempt to provide an extensive account of the literature on inequalities in higher education (as more detailed information is provided in each chapter), I still present some of the key implications of the existing research which frame the approach

chosen in this dissertation. Finally, I describe the major features of the French higher education system and provide the overall outline of the dissertation.

The role of higher education in social stratification

What is the role of higher education in the social stratification process? Being the last stage of the educational system, there is little doubt that equity in higher education is shaped by equity in the previous stages of the educational career. It may be that educational inequalities produced earlier in the educational pipeline are simply carried over to this level of education. Conversely, higher education systems may further promote or hinder equity and social mobility. This section describes the concurrent hypotheses formulated on these questions. While some of them were directly formulated to understand the role of higher education, many were developed regarding the consequences of the expansion of secondary education before being applied to higher education.

Higher education as the great equalizer

Hout (1988) formulated the *great equalizer hypothesis* based on empirical evidence showing that social origins impact the labour-market outcomes of those who do not have a bachelor's degree, but not those of college degree graduates. This central finding of social stratification research has led to the perception of higher education as the stage of the education system which fulfils the meritocratic ideal. The expansion of higher education is thus seen as a key mechanism towards greater equity and social mobility, since "the more college graduates in the work force, the weaker the association between origin status and destination status for the population as a whole" (Hout, 1988). However, the idea that higher education diplomas eliminate the intergenerational occupational association has been seriously challenged by more recent findings. Torche (2011) shows that although the net impact of social origin on labour-market outcomes is almost null for bachelor's degree holders, it is substantial for advanced degree holders and is actually comparable to those with low levels of education. These results were confirmed in some European countries. For example, Triventi (2013b) found that in Norway, Italy, and Spain, tertiary graduates with tertiary-educated parents reach higher occupations than graduates from lower social backgrounds, and only Germany is an exception to this pattern. In France, recent research confirmed a U-shaped pattern of the effect of social origin on class destination: the effect of social background is stronger among

those without a tertiary degree, and graduates from master's programmes and prestigious institutions (Falcon & Bataille, 2018). Results on income, instead of class or occupation, further suggest that the association between social origin and labour-market outcomes is actually stronger at higher levels of education in a number of European and non-European countries (Bernardi & Ballarino, 2016). Overall, these findings "strongly question the unqualified interpretation of increasing meritocracy among higher levels of education" (Torche, 2011).

The waning effect of social origin over the educational career

Turning to the effect of social background on educational attainment, it has also been argued that higher education is the stage of the education system where social origin matters the least. One of the most influential works regarding education and social stratification is undoubtedly Mare's model of educational transitions (1980, 1981). A large body of literature has applied it to various countries and historical periods and one of the most consistent findings is that the effect of family background on the probability of making an educational transition decreases along the educational career. The transition from secondary school to higher education, and transitions during higher education, thus appear to be the least influenced by social origins. As summarized by Shavit and Blossfeld (1993), two main theoretical explanations were put forward to account for this phenomenon. The life course hypothesis assumes that "with growing maturity, a person will be more able to decide on his or her own and will also be less dependent on parental resources" (Müller & Karle, 1993). In this perspective, social origins are not expected to be as relevant in higher education that deals with adult students, or at least, as the authors note, if there are no major economic barriers to entry into higher education (i.e. tuition fees). The Differential Selection Hypothesis was put forward by Mare himself (1980, 1981) who attributed the decline of social origin coefficients across transitions to the differential attrition during educational careers, leading the disadvantaged group to be positively selected at the highest levels of the education system. Thus, higher education is expected to have a much smaller role, per se, in the transmission of social inequalities, because the unequal attendance patterns at this level would be mainly the product of the social inequalities produced earlier in the education system. This view was supported, for example, by Hout (1989) who states that "the class differences in third-level enrolments found in other research are attributable to the

cumulation of class effects at low levels in the educational systems and not to extraordinary class bias in the advancement to third level."

However, the validity of this waning effect has also been significantly questioned, given that it results from the comparisons of logit coefficients across models which have been shown to be problematic (Mood, 2010). Mare himself (in Shavit & Blossfeld, 1993) acknowledges that unobserved heterogeneity may be the cause of the decrease in the coefficients and warns against a hasty interpretation in terms of differences between the social selectivity across transitions. Cameron and Heckman (1998) further consider that the decrease of coefficient across transitions is an artefact of the logit functional form, showing that other statistical models do not confirm the waning pattern of the influence of social background over the educational career. Similarly, Lucas, Fucella, & Berends (2011a) modify the classic model to develop a "neo-classical" model of educational transitions which corrects for the most common criticisms made to Mare's model, and test it on U.S. data. They conclude that "socioeconomic background coefficients do not wane across the transitions studied."

Thus, the conclusion that social origin has little impact in higher education, what Davies & Guppy (1997) name the "dissipating effects" hypothesis, has been seriously questioned, and further arguments endorsing the hypothesis of "lingering effects" of students' social background have been put forward, especially in the context of expansion and differentiation of higher education systems.

The stratifying power of higher education in times of educational expansion

As a result of educational expansion, higher education can be expected to play a significant role in the making of social inequalities and in the social stratification process. Firstly, the expansion of the lower levels of education may translate into an increase in social inequalities at the higher level of education. Bourdieu & Passeron already hypothesize that educational expansion would decrease the unequal selection of disadvantaged students along the educational career and, as a consequence, strengthen social selection at the highest level: "If the proportion of working-class students entering university were significantly increased […] we would see the reappearance of the direct correlation between academic performance and social-class background in higher education"(Bourdieu & Passeron, 1990, p. 76). This idea is further developed by the *postponed selection hypothesis* (Rijken, 1999). As secondary

education expanded, students eligible for higher education should have become more heterogeneous in their abilities, social origins, etc. This increasing heterogeneity is expected to lead to an increasing social selectivity in the transition to higher education, which would play a more significant role in the social stratification process. Regarding the expansion of higher education itself, Shavit et al. (2007) further note that the consequences of the expansion of the highest level of education may be different from the consequences of the expansion of the lower levels. Since the level of inequality is related to the variance in educational attainment, expansion of the lowest levels of education, such as the lengthening of compulsory education, should reduce the variance and inequalities in attainment. In contrast, "a rapid expansion of higher education can increase the variance of education by stretching out the right-hand tail of its distribution" and thus increase the level of inequality.

Indeed, educational expansion does not necessarily lead to a decrease in social inequalities. The theory of *maximally maintained inequality* predicts that inequalities remain stable, or even increase, as the education system expands, because the most advantaged groups are more able to take advantage of these new educational opportunities (Raftery & Hout, 1993). Only when a level of education is saturated for the upper class, i.e. almost 100% of advantaged students access it, can further expansion decrease inequalities in educational outcomes. Regarding higher education, this implies that its expansion is expected to mainly benefit upper class students and thus widen social inequalities. Furthermore, the importance of qualitative, or horizontal, inequalities in education may limit the effect of educational expansion on reducing inequalities. According to Lucas (2001) and his theory of *effectively maintained inequality*, even when a level of education becomes universal, advantaged families will use strategies to transmit their advantages to their children through qualitative differences such as tracks or fields of education. However, Lucas also expresses the possibility that "even when quantitative differences are common, qualitative differences are also important; if so, […] the socioeconomically advantaged will use their socioeconomic advantages to secure both quantitatively and qualitatively better outcomes"(Lucas, 2001). This hypothesis is especially relevant for higher education where both quantitative and qualitative differences in outcomes are widespread (Triventi, 2013a). Closely related to the effectively maintained inequality theory, the increasing differentiation which has accompanied the expansion of higher education systems has been interpreted as a diversion mechanism which contributes to the

maintaining of social inequalities. Looking at the development of community colleges in the U.S., Brint and Karabel (1989) argue that these two-year institutions no longer serve as stepping stones to four-year institutions but instead divert the aspirations of students, especially from the lower social background, by channelling them into vocational programmes.

Overall, the structure and evolution of higher education systems raises new concerns about the role of social origin in the last stage of educational careers. I now turn to the most influential theories regarding the mechanisms that can explain the effect of social origin on educational outcomes.

Mechanisms of educational inequalities

Broadly speaking, two theories have been most influential in describing the mechanisms that bring about social inequalities in education: the *cultural capital theory* (CCT) which emphasizes the unequal transmission of cultural competences across social classes and the *relative risk aversion* theory (RRA), which builds on rational choice models to explain differences in educational attainment, by social origin.

The Cultural Capital Theory

Bourdieu & Passeron's model of educational inequalities (1964, 1970) states that each social class shares a set of cultural and linguistic norms, codes and competences which are transmitted to children in the form of their *habitus*. This form of cultural inheritance provides upper class children with cultural and linguistic competences which are valued by society as the legitimate and dominant culture. Thus, upper-class families transmit a close familiarity with the dominant culture which takes the form of cultural capital. The school system, through its curriculum, pedagogy and assessment methods, is also framed by the dominant culture. Since cultural capital is unequally distributed across social classes, children from a lower social background are much less familiar with the school culture, perform worse and drop out earlier. In Bourdieu's approach, the school system is thus the major channel to legitimize social inequalities and allows class reproduction.

It goes well beyond the scope of this work to summarize the numerous, and often conflicting, empirical findings about the effect of cultural capital on educational attainment (for an

overview, see for example Jæger, 2011; Tzanakis, 2011). Suffice it to say that it has been noted that the imprecise definition of cultural capital, which can be operationalised in various ways, makes empirical results difficult to compare (Sullivan, 2002). Studying the effect of parental cultural capital on years of education in the Netherlands, De Graaf & al (2000), for example, distinguish between two forms of cultural capital, participation in beaux arts and reading behaviours, and conclude that "the effect of parental reading behaviour is about four times as large as the effect of parental beaux arts participation" (De Graaf, De Graaf, & Kraaykamp, 2000). Similarly, cultural capital was found to have a positive causal effect on academic achievement (Jæger, 2011). However, the causal effects estimated by a family- and individual-fixed effect design, are smaller than what was estimated with cross-sectional data. Interestingly, cultural participation is mainly beneficial for academic achievement in a high-SES environment while the number of books owned by the child has a larger effect in low- and medium-SES families, suggesting that the effect of different dimensions of cultural capital varies with the social and economic environment of the family (Jæger, 2011).

The Relative Risk Aversion model

In opposition to this "structuralist" approach of educational inequalities, there has been a growing attention for rational choice models, building on methodological individualism, to explain social inequalities in education (Boudon, 1973; Breen & Goldthorpe, 1997; Gambetta, 1987). In his seminal book, Boudon (1973) developed a central distinction between primary and secondary effects of social background on educational attainment, first introduced in pioneering empirical work by Girard & Bastide (1963). Primary effects of social origin on educational attainment refer to the impact of social background on academic performance, while secondary effects refer to the impact of social background on educational choices, net of performance. Boudon does recognize the relevance of cultural capital to explain the effect of social origin on school performance as "the familial cultural level must be considered as an essential dimension of the social status of the family when it comes to explaining the relationship (at a young age) between the educational performance of the child and the social status of the family" (Boudon, 1973, p. 59). But he further states that, as the child progresses in the educational pipeline, social inequalities are increasingly driven by differentiated choices, net of performance differences, at each transition of the educational system (secondary effect). According to Boudon, the differentiated choices by social background can

be explained by the different evaluation of the investment cost in further education, the expected probability to succeed and, most importantly, by different educational aspirations which result from the social position of the family because "as there is no 'objective' way of determining the destination status that is worth looking for, the original status is almost self-evident as a natural landmark" (Boudon, 1990). The influence of social origin on educational choices was further formalized by Breen and Goldthorpe (Breen & Goldthorpe, 1997; Goldthorpe, 2007). Drawing on Boudon's work, this model develops the idea of differential levels of educational aspirations by introducing the concept of relative risk aversion (RRA): all students try to avoid downward mobility by securing a social position which is, at least, at the level of their parents and thus aim to reach, at least, the educational level that allows them to enter such a social position. Differences in parental social positions mean that advantaged and disadvantaged students have different thresholds for this minimum education level, thus translating to a relative risk aversion. Breen & Goldthorpe (1997) define three factors which influence students' educational choices at a given transition point: the cost of continuing education, the perceived probability of success and the perceived returns of each educational outcome. The combination of these three mechanisms is expected to lead to class differentials in educational choices at each transition point, with upper-class students showing a stronger preference to continue in education in order to avoid downward mobility than their working-class counterparts.

The distinction between primary and secondary effects of social origin has been central in conceptualizing and measuring educational inequalities. Jackson (2013), for example, compares the relative weight of primary and secondary effects in eight Western countries to explain inequalities of educational opportunities. The conclusion states that "cross-national differences in inequalities in educational opportunity between members of advantaged and disadvantaged social groups are fundamentally driven by cross-national differences in the size of secondary effects" (Jackson & Jonsson, 2013, p. 327). It is sometimes argued that cultural capital theory provides a good framework for explaining inequalities in performance at school (primary effects of social background) while RRA is best suited to explain differences in choices, net of performance (for example, Jackson, 2013). Although only few studies tried to empirically contrast these two mechanisms, results from Van De Werfhorst & Hofstede (2007) in the Netherlands confirm the greater explanatory power of cultural capital on inequalities in

performance, while relative risk aversion strongly affects school ambitions and thus secondary effects of social origin.

The core mechanisms of the relative risk aversion model were also empirically tested but the results are mixed. For example, experiment evidence confirms that framing outcomes as losses, rather than gains, "induce[s] participants to choose to continue further and take more risks", although this framing effect mainly affected men (L. Page, Levy Garboua, & Montmarquette, 2007). Testing the full Breen & Goldthorpe's model to explain choices of track in secondary school in Germany, Stocké (2007) finds partial support for the model, as relative risk aversion and perceived probability of success are strong predictors of tracking decisions but not expected costs. However, these mechanisms did not mediate the effect of social class on educational choices, which remains largely unexplained by the relative risk aversion model. Similarly, in the Israeli system, the relative risk aversion model did not mediate inequalities in subject choices which were almost fully explained by social differences in performance (Gabay-Egozi, Shavit, & Yaish, 2010). Further recent findings suggest the necessity to incorporate information biases and misperceptions into the RRA model (Barone, Assirelli, Abbiati, Argentin, & De Luca, 2017) as well as taking into account students' time discounting preferences and aversion to risk (Breen, Werfhorst, & Jæger, 2014) to increase the explanatory power of the RRA framework.

The relative risk aversion model allows us to test mechanisms of inequalities at single transitions. Nevertheless, educational attainment should also be understood as the result of the educational career over many years. Thus, I now turn to the life course perspective which is the approach chosen in this dissertation, and which highlights that the time dimension and the cumulative nature of educational outcomes is crucial to understanding inequalities in higher education.

The life course perspective on educational inequalities

From the life course perspective, the educational career can be defined as "a transition-rich long-term trajectory within a highly structured institutional system" (Crosnoe & Benner, 2016). This approach highlights that each educational achievement, choice, or transition shapes educational opportunities at the next step and should be analysed as a longitudinal process taking place in a specific institutional setting which frames opportunities. Given that

higher education comes at the end of a long road in school, the life course perspective is especially relevant to the study of inequalities in higher education outcomes (Hillmert & Jacob, 2010).

Cumulative (dis)advantage and diverging pathways

The concept of cumulative advantage was not developed specifically to study inequalities of opportunities in education but has been applied to a large range of topics in social sciences and in the stratification literature. Popularized as the "Matthew effect", in essence the idea that "*the rich get richer and the poor get poorer"*, the concept originated in Merton's work on success in scientific careers (Merton, 1968). The central idea of this approach is that the current level of resources has a direct causal effect on its future level, i.e. a favorable outcome at time *t* becomes a resource which brings additional gains in time *t+1*. As a consequence, it is "difficult for an individual or group that is behind at a point in time in educational development, income, or other measures to catch up" (DiPrete & Eirich, 2006). As pointed by DiPrete & Eirich, cumulative advantage as a mechanism, goes beyond the description of a pattern of growing inequality over time and further implies a causal relationship between the current level of resources and its future levels. However, the empirical assessments of cumulative (dis)advantage have often focused on its descriptive dimension, by establishing the patterns of increasing dispersion of outcomes over time, given the difficulty to address selection biases in the current level of resources. In educational research, cumulative (dis)advantage can thus refer to the increasing dispersion of educational outcomes along the educational career. One of its related concept in educational research deals with the impact of track allocation on further educational or occupational outcomes, and the importance of path-dependency in students' trajectories (Kerckhoff, 1993a). In this perspective, school performance before track allocation has a direct effect on later outcomes as it allows to enter or avoid specific tracks, which causally impact the future level of performance and educational outcomes. The track allocation process is thus seen as contributing to the increasing dispersion of school performance and educational outcomes, over educational careers. With the increasing availability of detailed longitudinal datasets on educational careers, it has become easier to build on the cumulative (dis)advantage approach to study the development of educational inequalities along the educational career and provide a dynamic account of inequality formation.

The compensatory advantage hypothesis

The compensatory advantage hypothesis complements the general mechanism of cumulative advantage by stressing that the accumulation of disadvantage over time differs by social origin. The compensatory advantage can be defined as "a general mechanism of stratification, due to which individuals from advantaged social backgrounds are buffered against the negative consequences of a prior adverse outcome" (Bernardi, 2014). More generally, it states that "relying on other resources, if available, can effectively compensate for having a lower level of another resource" (Prix & Erola, 2017). This mechanism therefore further contributes to increasingly diverging pathways by social background over time. For example, Torche (2016) uses a natural experiment and shows that the negative effect of prenatal stress on children' cognitive abilities fully disappears among advantaged families who "mobilize multiple resources that compensate for the early shock experienced by children" (Torche, 2016). In the field of educational inequalities, the compensatory hypothesis predicts that a negative outcome will lead to worse later outcomes for disadvantaged children than for children from the upper class and points out the heterogeneous effects of previous performance on further educational outcomes. Boudon had already noticed that "the influence of the social origin on educational choices depends on the school performance: weaker when performance is good, it becomes stronger when performance is low" (Boudon, 1990). This finding has been recently confirmed on the transition to post-compulsory education in France as "upper-class students with poor school results are much more likely to move to the academic track than their disadvantaged counterparts" (Bernardi & Cebolla-Boado, 2014). The study of the effect of birth date, parental separation or paternal death also confirmed that the compensatory advantage mechanism plays a role in the making of social inequalities in educational outcomes (Bernardi, 2014; Grätz, 2015a; Prix & Erola, 2017). However, this mechanism has so far been tested on outcomes in compulsory education or transition to high school, but less is known about its applicability during higher education.

Implications of existing research on social inequalities in higher education

There is a long tradition of research on higher education (as illustrated, for example, by Tinto's work, 1975) but post-secondary education emerged only recently as a central topic for social stratification research. The aim of this section is not to summarize the findings of this growing

literature but to highlight the directions of the most recent research which have framed the questions raised in the empirical chapters of this dissertation.

The vast majority of studies on social inequalities in higher education have focused on access and participation in higher education. The most significant comparative book on social stratification in higher education compares trends in access to higher education in fifteen countries (Shavit, Arum, et al., 2007). The authors conclude that the expansion of higher education has been associated with "much stronger evidence of inclusion than of diversion". But entering higher education does not mean graduating from it nor reaping its benefits. Social inequalities in access patterns can only account for inequalities in participation, and this ignores the large proportion of university students dropping out without a degree. In most recent years, there has therefore been an increasing interest in studies which link access to attainment by focusing on intermediate outcomes like dropout (Reisel & Brekke, 2010) or students' trajectories within higher education (Goldrick-Rab, 2006; Milesi, 2010). Their results confirm that a fine-grained analysis of students' trajectories, using longitudinal data, is a powerful way to shed light on socioeconomic inequalities in higher education attainment and to "reveal the cumulative nature of postsecondary attainment" (Pfeffer & Goldrick-Rab, 2011). The need to go beyond participation in higher education has also been acknowledged by policymakers who are increasingly concerned with finding ways to increase completion rates (Bettinger, 2015). On average in OECD countries, around 30% of students who enter a tertiary programme do not graduate at this level of education (OECD, 2013). A better understanding of students' trajectories within the higher education system is thus increasingly recognized as a necessary approach to identify policies or interventions that could improve students' outcomes (Leinbach & Jenkins, 2008).

Another central dimension of recent research on social stratification in higher education is the increased interest in qualitative differences across fields of study or types of institutions. Social inequalities in education can be distinguished based on two dimensions (Charles & Bradley, 2002; Gerber & Cheung, 2008; Triventi, 2013a). Vertical stratification refers to differences in the level of degree attained, for example getting a higher education degree or not, or differences between short and long degrees. Horizontal stratification encompasses differences in quality or prestige between types of institutions or between fields of study, within one single level of education. Traditionally, social stratification research has focused

mainly on vertical stratification but there has been a growth of interest in horizontal inequalities (Gerber & Cheung, 2008). As described earlier, the effectively maintained inequality (EMI) theory posits that when an educational transition becomes universal, qualitative differences between institutions or programmes becomes highly relevant for social stratification, as the most socially-advantaged families secure the qualitatively better educational outcomes for their children to "effectively maintain" their advantage (Lucas, 2001, 2009). Although initially developed to account for the evolution of social stratification in secondary education, this theory is increasingly applied to the higher education context where horizontal stratification is highly relevant for two reasons. First, higher education has expanded quickly, often through the diversification of the institutions or programmes offered at this level. As accessing higher education is becoming increasingly common, one should thus expect qualitative differences between types of programmes to become more relevant for social stratification at this level of education. In addition, the differences in prestige across fields of study or institutions in higher education have a direct effect on labour-market outcomes and are thus especially relevant for the study of social mobility. For example, In Sweden, the exact degree obtained matters more to explain the effect of social origin on labour-marker outcomes among tertiary graduates than at any other level of attainment (Hällsten, 2013). However, most studies have focused on only one of these forms of stratification, so our understanding of the transmission of social advantage in higher education can benefit from analyses which consider inequalities both in their vertical and horizontal dimensions (Triventi, 2013a).

Finally, many studies on social inequalities in higher education access or attainment have focused on the gross association between social origin and higher education outcomes (for example, Shavit et al., 2007). However, in order to contribute to the theoretical debate regarding the role of higher education in the social stratification process, it is crucial to distinguish between inequalities created earlier in the education system and the specific role of the higher education system in maintaining, amplifying or reducing them. Furthermore, a better understanding of the processes of accumulation of inequalities in higher education is still lacking. Recognizing the cumulative dimension of educational inequality formation is especially fruitful from a policy perspective since it allows key bottlenecks in the educational pipeline for disadvantaged students to be identified (Hillmert & Jacob, 2010). In the French

context, the usefulness of accounting for the development of social inequality over a long time has been highlighted as early as 1993, to understand social inequalities in access to the high school academic track. Results point to the increasing diverging pathways of pupils from the first grade to the end of lower secondary school, depending on social origin, and to the mechanisms which allow social origin to be "converted in a school performance capital" over the school career (Duru-Bellat, Jarousse, & Mingat, 1993). Going beyond secondary education attainment, the interpretation of the level of inequalities observed in higher education would thus be enriched by taking into account differences in performance in previous stages of educational careers and this dissertation further aims to investigate how previous academic achievements are converted into higher education outcomes, depending on social origin.

The French higher education system

The majority of the literature on social inequalities in higher education access, dropout or attainment has focused on the U.S. system and it had been noted that research should be extended to countries with different institutional arrangements (Gerber & Cheung, 2008). In this dissertation, I focus on the case of France which differs from the American system in many aspects relevant to social stratification mechanisms. Although more detailed characteristics are provided in the following chapters, I introduce here some of the main features of the French higher education system.

Organisation and admission criteria

Graduation from high school (in any track) is the main pathway to gain eligibility to higher education in France[1]. After high school graduation, students can choose between three broad types of programmes: short and professional programmes, academic programmes in universities, and programmes preparing for admission to prestigious institutions, *grandes écoles*. Short-vocational programmes are offered in upper secondary schools or in universities and typically grant a degree after two years of postsecondary studies. A few longer professional programmes are also provided in specialized institutions, typically nursing and social work programmes, which last three to four years and grant a degree equivalent to a

[1] A central online platform to process students' choices was implemented in 2009 and admission criteria were changed in 2018 (although a high school diploma still grants access to higher education). This description thus focuses on the admission rules in place when the data analysed in this dissertation were collected, that is in 2008, and which were overall still valid until 2017.

professional bachelor's degree. Students need to apply to these programmes and are selected mainly based on their secondary school records, motivation and interviews. Bachelor's programmes are offered in universities and only require a high school diploma to register. In case of successful progression, students are awarded a bachelor's degree after three years of studies. Finally, prestigious programmes preparing for admission to grandes écoles (CPGE) last two years and are offered in upper secondary schools or in private institutions. There is an initial selection and students must have excellent secondary grades to gain access to these prestigious programmes. Some grandes écoles, however, are now organised with a five-year programme and select students directly after upper secondary graduation, with specific competitive examinations. Usually, these institutions do not grant any degree before the equivalent of the master's degree, after five years of study (Table 1.1).

Table 1.1: Main first-level tertiary programmes, by type of programme and admission criteria

	Guaranteed admission with high school diploma	Selection based on high school record	Selection based on competitive examinations
Professional	-	**University Technical-IUT** (2 years; in university) **Higher Technical Section-BTS** (2 years; in high school)	-
Academic	**Bachelor's programme** (3 years; in university)	**Programmes preparing for admission to grandes écoles (CPGE)** (2 years; in high school)	**Prestigious long master's programmes** (5 years; in grandes écoles)

Regarding second-level programmes, graduates from short-vocational degrees have the possibility to complete their education with a professional bachelor's programme, which lasts one year (although direct entrance to the labour market is the most common path for these graduates). For academic university programmes, the first year of a master's programme used to be accessible to all bachelor's graduates in the relevant field of study. Quite commonly, students were then selected to enter the second and last year of master's programmes based on their academic records. In contrast, students who went through a preparatory programme – the CPGE, must take competitive examinations to gain access to grandes écoles where programmes last three additional years (Table 1.2).

Table 1.2: Main second-level tertiary programmes, by type of programme and admission criteria

	Guaranteed admission with relevant degree	Selection mainly based on school career/ GPA	Selection based on competitive examination
Professional	-	**Professional bachelor's programmes** (1 year; in university)	
Academic	**First year of master's programmes** (1 year; in university)	**Second year of master's programmes** (1 year; in university)	**Prestigious Master's programmes** (3 years; in grandes écoles)

The French higher education system is thus diversified and stratified as the most prestigious programmes are organised differently and provided in separate institutions than universities. One of its specificities is also that university studies are non-selective, while it is necessary to go through a selection process for any kind of short vocational programme.

The cost of higher education

French tertiary institutions rely heavily on public funding (79% of their total expenditure in 2014), with only 12% contributed by students and families. Comparatively, the share of public funding in France is very close to the EU average but much higher than any Anglo-Saxon country where the public contribution ranges from only 28% in the U.K, to no more than 51% in New Zealand (35% in the U.S.). French higher education also receives more public support than in southern European countries where tertiary institutions receive around 65% of their expenditure from public sources (Italy, Portugal and Spain). In contrast, the situation of French higher education is still far from the "Nordic model" of higher education where students and their families do not contribute to tertiary institutions funding, from 0% in Finland to no more than 5% of all private sources in Denmark (OECD, 2017).

Tuition fees are fixed at the national level for most public tertiary institutions. Importantly, there are no tuition fees for (public) short vocational programmes provided in high schools ("BTS": the least prestigious of higher education programmes). For short-vocational programmes in university and bachelor's programmes, tuition fees were set at 184€ a year in 2017/2018, and at 256€ at the master's level. In addition, students must contribute to their social security coverage (217€ per year in 2017, although this contribution is about to be

reformed and largely reduced). The situation for elite education (the grandes écoles) is quite different, because there is a large variation across institutions and a much larger proportion of private institutions. For an engineering programme in a public institution, the tuition fee was set at 610€ a year in 2017 (Direction de l'information légale et administrative, 2017). Business schools, on the other hand, are almost exclusively private and the most prestigious of them charges up to 10,000€ a year, although the fees may be adjusted based on parental income. In contrast some of the most prestigious and famous grandes écoles give the status of civil servants to their students: not only are they exempted of any tuition fees but they also receive a salary from the state during their studies (European Commission/EACEA/Eurydice, 2017).

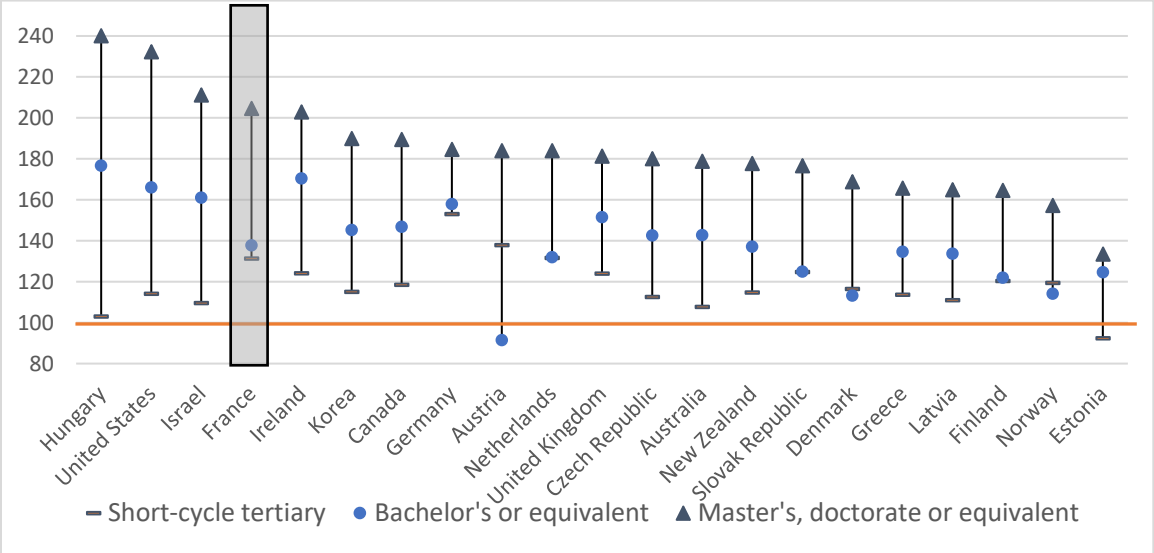
The French higher education system is also characterised by a large need-based grant programme. In 2017, this grant scheme was organised with nine levels of grants. Students eligible at the lowest level are exempted from tuition fees and social security contributions. From the second level, additional cash allowances meant to cover living costs are provided, ranging from 1,009€ to 5,551€ a year. Eligibility is calculated mainly based on parental taxable income and a composite score, which takes into account the number of siblings, the distance of the study institution from parental home and the institution attended (Fack & Grenet, 2015). These grants are awarded on a yearly basis for a maximum of seven years of postsecondary studies. The scope of this grant scheme is large: in 2017, almost 40% of all students in French higher education benefited from it and received, at least, fee-waivers (European Commission/EACEA/Eurydice, 2017). Given the low or moderate level of tuition fees and the large need-based grants scheme, the cost of higher education studies in France is thus mainly driven by living costs and the total average budget for a nine-month academic year was estimated to amount to 6,300€(Fack & Grenet, 2015).

Higher education outcomes

The French higher education system has experienced a dramatic expansion over the last decades as the number of students at this level has multiplied by eight between 1960 and 2015 (Ministère de l'Enseignement supérieur, de la Recherche et de l'Innovation, 2017). In 2016, 44% of 25-34-year-olds had graduated from tertiary education, compared to 31% in 2000 (OECD, 2017). It is important to highlight that the benefits in the labour-market associated with a higher education degree are especially large in France. In terms of

employment, 86% of young adults (25-34-year-olds) with a tertiary degree were employed in 2016 which is 13 percentage points more than high school graduates and 36 p.p. higher than young adults without a high school diploma. Among OECD countries, only the U.S. and Israel show such a large gap in employment rates between secondary and tertiary graduates. In both the U.S. and France, employment opportunities for high school graduates declined steadily since 2000, while they were stable for tertiary graduates, leading to increasing relative benefits for the latter group (OECD, 2017).

Figure 1.1: Relative earnings of workers, by type of tertiary degree
In European and Anglo-Saxon countries; 100=earnings of high school graduates



Source: *OECD, countries with available data (OECD, 2017)*

In terms of earnings, workers with higher education in France earn 54% more, on average, than workers with only a high school diploma. This relative earning benefit is close to the average in OECD countries (56%) but the breakdown by type of higher education degree draws an interesting pattern, as shown in Figure 1.1. On the one hand, the benefits associated with holding at least a master's degree are very high in France: master's degree graduates earn around twice as much as high school graduates, and this is only the case in a few other countries. On the other hand, short-vocational degree and bachelor's degree graduates have very similar average earnings (31% and 38% more than high school graduates, respectively). This situation is quite different from the other countries with large benefits for master's degrees, where there is also large earning gap between short-cycle graduates and bachelor's graduates (for example in the U.S.). In France, choosing a university programme over a short-

cycle programme is mainly beneficial (in financial terms) for those who continue until, at least, the master's level.

Overall, I argue that France is a good case to contribute to the literature on inequalities during higher education, which has been overwhelmingly focused on the American system. Like in the U.S., there are large economic incentives for individuals to invest in higher education. However, higher education is organised very differently, with lower financial barriers and with a stratified system that combines very selective and non-selective institutions. Which kind of inequality formation patterns can be observed in such context? I now turn to the structure of the dissertation to describe the analytical strategy chosen to answer this question.

Structure of the dissertation

This dissertation aims to provide a comprehensive account of the development of social inequalities in French higher education and to contribute to the identification of policy solutions to improve equity at the last stage of the education system. Each chapter focuses on a central outcome of the higher educational career, from access to attainment, with a focus either on the vertical or on the horizontal dimension of social stratification, as summarized in Table 1.3.

Table 1.3: Overview of the chapters

	Vertical dimension	Horizontal dimension
Patterns of Inequalities	**Chap.2**: Access to higher education **Chap.3:** Dropout patterns	**Chap.2:** Access to higher education **Chap.4:** Attainment in elite programmes
Policy solutions	**Chap.6:** Causal effects of outreach and financial aid on access and graduation	**Chap.5:** Alternative pathways to enter elite programmes

In Chapter 2, I analyse social inequalities in access to higher education, by social origin. Building on the life course perspective on educational inequalities, I more specifically focus on the processes of performance accumulation and compensation from the beginning of secondary education until the transition to higher education. I further investigate the

relevance of the horizontal dimension of inequalities in French higher education by estimating the effect of social origin on access to different types of programmes. The results show that social inequalities in high school graduation contribute more than inequalities in the transition to higher education, in bringing about the social gap observed in access to higher education. In line with the compensatory advantage hypothesis, I find that students performing poorly at entrance to secondary education are more likely to become eligible for higher education if they have highly-educated parents. In contrast, I find that in the transition to higher education, among eligible students, the largest inequality by parental education is found among good performers who are much more likely to enter a prestigious selective programme than equally good performers from disadvantaged backgrounds.

In Chapter 3, I investigate the relationship between academic failure in higher education and dropout behaviours. I apply a discrete-time method for competing risks event history analysis and test the compensatory advantage hypothesis. Results confirm that academic failure in the first year of higher education is a strong predictor of dropout, even after controlling for academic readiness for higher education. I further find that students from advantaged backgrounds are less likely to drop out after academic failure than disadvantaged students, even when controlling for academic readiness; and that the advantage due to social origin is much larger in the case of failure than success in the first year of higher education. I discuss how endogeneity may bias these results and provide additional analyses which suggest that they are robust to different estimation strategies.

Chapter 4 addresses the question of the horizontal dimension of stratification in higher education attainment by focusing on attainment of prestigious programmes. I more specifically ask to what extent specific dimensions of social background are associated with attainment of elite programmes. Results show that parental education, social class and, to a lesser extent, parental status all independently contribute to the social gap observed in elite attainment and point to the importance of both parents in the transmission of advantage in higher education: students with two, rather than one, highly-educated or upper-class parent, are more likely to attain an elite programme in higher education. In addition, results from a mediation analysis show that the advantage associated with parental education is largely transmitted via better academic results in high school graduation, but this is the case of only half of the effect of parental class.

In Chapter 5, I investigate the whole trajectories of students attaining prestigious institutions and estimate the association between alternative entrance pathways and the social composition of the student body of these elite institutions. Using conceptual and methodological advances from sequence analysis, I estimate differences, by social origin, in the complexity and de-standardisation of trajectories of students attaining elite institutions. I find that students from lower social backgrounds have trajectories in higher education which are less linear and further from the traditional pathway than socially advantaged students, consistent with some recent findings in the U.S. context. In addition, results point to a greater diversity in the social background of students entering elite institutions by alternative pathways compared to students entering through traditional pathways. Overall, the results suggest that the implementation of alternative pathways may affect the social composition of elite institutions, although a quasi-experimental design would be necessary to distinguish between a democratisation or a diversion effect of these pathways.

Finally, Chapter 6, co-written with Koen Geven, provides a systematic review of the (quasi-) experimental literature on various policy interventions aimed at reducing inequalities in higher education. We selected 75 studies and rigorously gathered and compared more than 200 causal effects of outreach and financial aid interventions on access and graduation rates of disadvantaged students in higher education. We find that outreach policies are broadly effective in raising access of disadvantaged students when they include active counselling or simplify the university application process, but not when they only provide general information on higher education. In terms of financial aid, we find that need-based grants do not systematically raise enrolment rates but only lead to improvements when they provide enough money to cover unmet need and/or include an early commitment during high school. Still, need-based grants quite consistently appear to improve completion rates of disadvantaged students. In contrast, the evidence indicate that merit-based grants only rarely improve outcomes of disadvantaged students. Finally, interventions combining outreach and financial aid have brought promising results in helping disadvantaged students to access and complete higher education, although more research on these mixed-interventions is still needed.

Chapter 2
Cumulative (dis)advantage and heterogeneity of performance effects in access to higher education

Introduction

Access to higher education is a crucial step on the long road toward higher education attainment, and social inequalities in college entry have been a major concern of recent social stratification research (Shavit, Arum, et al., 2007). Despite the rapid expansion of higher education systems over the last decades, access to higher education is far from universal and varies greatly by social origin. For example, among 23 developed countries, young adults whose parents attained tertiary education were estimated to be, on average, four and a half times more likely to participate in higher education than individuals whose parents have not attained upper secondary education. In France, young adults from highly-educated families were six times more likely to participate in higher education than their counterparts from low-educated families (OECD, 2014). How does this very large gap in participation in higher education by social origin come about?

The aim of this chapter is to expand the understanding of social stratification in access to higher education by investigating how social inequalities unfold over the whole of secondary school careers. Empirical evidence on social inequalities in access to French higher education have shown that performance in high school diplomas, and most notably the track of the diploma, largely mediates social inequalities in access patterns (Duru-Bellat & Kieffer, 2008; Ichou & Vallet, 2013). This chapter offers a longer-term perspective to identify the critical points in the development of social inequalities in higher education access, along the educational career. In order to design efficient policies to reduce inequalities, it is indeed crucial to identify when social inequalities arise on the long path towards higher education. This chapter thus first aims to estimate the respective contributions of inequalities in both secondary education attainment and in the transition to higher education, to bringing about the social gap observed in participation in French higher education. Furthermore, it extends the existing literature on access to higher education by testing mechanisms of inequality accumulation during secondary school. Building on the cumulative and compensatory advantage mechanisms, I examine more specifically to what extent the accumulation of

negative educational outcomes in secondary education mediates social inequalities in high school attainment, and whether previous outcomes influence access patterns differently across social groups, both in the vertical and horizontal dimensions of social stratification.

Using longitudinal data on French students who entered secondary education in 1995, this chapter makes use of a rich set of secondary education outcomes to shed light on the diverging trajectories of students with different social origins, from the beginning of secondary education until higher education. Results first show that the inequalities in access to higher education in France are mainly driven by inequalities in upper secondary graduation, while the transition to higher education after high school graduation is less critical in terms of social inequalities. I also find support for the compensatory advantage hypothesis during secondary education, as students with low initial performance from privileged backgrounds are much more likely to become eligible for higher education than disadvantaged students. Finally, results on access patterns to different types of higher education programmes confirm the importance of the horizontal dimension of social stratification in access to higher education. They also show that the compensatory advantage mechanism among low-performing students found in secondary education is complemented by a "reinforcement advantage" as students from higher social origins seems to be better able to capitalize on good educational outcomes, in order to enter the most prestigious tertiary programmes, compared to high-performers from lower social backgrounds.

Theoretical background

Social inequalities in higher education participation

Although this dissertation does not study trends, I focus on a segment of the educational system which has seen dramatic changes in recent decades as a "mass" and diversified higher education system has emerged in many countries. Does the expansion of education systems reduce social inequalities by increasing opportunities for disadvantaged students, or does it maintain, or even amplify, them? This question has been central to research on social stratification (Breen et al., 2009; Shavit, Arum, et al., 2007; Shavit & Blossfeld, 1993). The theories on the consequences of educational expansion thus allow us to develop hypotheses about inequalities in higher education. As summarized in the first chapter of this dissertation, the maximally maintained inequality (MMI) theory states that educational expansion

maintains inequalities between social classes until a specific education level or transition becomes universal for the upper class: only after this point does a further expansion lead to a reduction in the association between social origin and attainment (Raftery & Hout, 1993). On the other hand, the effectively maintained inequality (EMI) theory posits that socioeconomically advantaged individuals secure their advantage both by securing quantitively more education, but also by securing qualitatively better educational outcomes (Lucas, 2001, 2009). Thus, even if an educational outcome or transition becomes universal, social inequalities are expected to be maintained in their horizontal dimension, that is, through qualitative differences between programmes or institutions.

Few studies have been able to rigorously test these two theories for higher education with a sufficiently long time span, but all concluded that inequalities in higher education access have been both maximally (in their vertical dimension) and effectively (in their horizontal dimension) maintained despite educational expansion, whether in the U.K (Boliver, 2011), in Denmark (J. P. Thomsen, 2015) or in Germany (Reimer & Pollak, 2010). Only in Norway and Finland was higher education expansion found to be associated with a reduction of inequalities in higher education participation, including in the most prestigious fields of study (Thomsen, Bertilsson, Dalberg, Hedman, & Helland, 2017). A second strand of research builds on EMI to identify social inequalities in the most prestigious or lucrative fields of study or institutions. Many studies have tested horizontal inequalities in access to higher education and have consistently highlighted their importance in various national contexts. This was the case for example in Denmark (Munk & Thomsen, 2018), in France and Germany (Duru-Bellat, Kieffer, & Reimer, 2008); in the U.S. (Andrew, 2017), in England, Australia and the United States (Jerrim, Chmielewski, & Parker, 2015) or in Israel (Feniger, Mcdossi, & Ayalon, 2015). This chapter follows these applications of EMI by focusing both on quantitative inequalities (access to higher education) and horizontal patterns of inequalities across different types of institutions. I further complement the estimation of these inequalities by testing mechanisms of accumulation of advantage during educational careers, building on the life course perspective and the compensatory advantage hypothesis.

The life course perspective on higher education inequalities

The life course perspective can be defined as a broad research paradigm which "has made time, context, and process more salient dimensions of theory and analysis" (Elder, 1994). For social stratification studies in education, this approach brings our attention to the emergence and dynamic development of inequalities throughout educational careers, in a longitudinal perspective (Hillmert & Jacob, 2010), and is especially relevant for the purposes of this dissertation for three reasons. First, higher education comes at the end of a long educational career. Since educational performance, choices and outcomes at each step of the educational pipeline shape opportunities in the next one, social stratification in higher education outcomes must be understood in light of social inequalities at previous stages of the educational system (Duru-Bellat, 2009). Second, it is crucial to acknowledge that "both overall selection on various steps of the system and social selectivity at these transitions are specific for a particular educational system" (Hillmert & Jacob, 2010). As the majority of research on higher education inequalities comes from the United States, it is important to estimate whether the development of inequalities until students reach higher education follow comparable patterns in other national contexts, or how they differ. Finally, the notion of a triggering or critical event is a cornerstone of life course research (Andrew, 2014; DiPrete & Eirich, 2006) and is especially relevant in a policy-oriented perspective. In order to develop policies which efficiently reduce inequalities in higher education outcomes, it is indeed fruitful to identify the stages which are the most critical for social inequalities and to know where the education system loses its potential tertiary graduates (Hillmert & Jacob, 2010).

Within the life course framework, two theories are especially useful to account for the development of educational inequalities over time. On the one hand, the cumulative (dis)advantage theory posits that the current level of resources has a direct causal effect on its future level, leading the disadvantage of one individual or group to grow over time (DiPrete & Eirich, 2006). For education inequalities, this mechanism of path-dependency has been best illustrated by Kerckhoff's work which has shown how students' placements in different ability groups or tracks lead to diverging trajectories and achievements (Kerckhoff, 1993b; Kerckhoff, Haney, & Glennie, 2001). The compensatory advantage hypothesis complements the cumulative (dis)advantage perspective by highlighting that socially advantaged individuals are able to compensate for a negative event and reduce its negative consequences on their life

courses (Bernardi, 2014). It thus points to the heterogenous effect of negative events depending on social origin and contributes to an explanation for further diverging pathways over time. Formally, the compensatory advantage predicts that, after experiencing failure at time t, the probability of success at time t+1 is higher for socially advantaged individuals than disadvantaged ones, and that this social origin advantage is larger in the case of failure than in the case of success at time t (Bernardi, 2014). In France, patterns of compensatory advantage have been identified in the transition to post-compulsory education (Bernardi & Cebolla-Boado, 2014) and in progress through primary education (Bernardi, 2014). Two main hypotheses have been formulated regarding the mechanisms which drive the compensatory advantage (Bernardi, 2014). As described in the theoretical chapter, the relative risk aversion (RRA) theory posits that families take educational decisions with the goal of avoiding downward mobility for their children (Breen & Goldthorpe, 1997). Despite poor educational outcomes, families in the upper class are thus more likely to maintain high educational aspirations in order to avoid downward mobility, while socially disadvantaged families are expected to have educational aspirations that are more sensitive to the performance of their children. In addition, families in the upper class have more financial, time and cultural resources, which can be mobilized if their child experiences a negative event or educational outcome (Grätz, 2015b).

Building on the life course perspective I thus first aim to disentangle the respective contributions of secondary education attainment and transition to higher education to explaining the social gap in access patterns to French higher education. Furthermore, I test whether performance translates into different probabilities to become eligible for and to enter higher education, by social origin. I more specifically formulate two hypotheses building on the compensatory advantage mechanism: I first expect students from socially advantaged backgrounds with initial poor performance (at entrance to secondary education) to graduate more often from high school, which in the French context gives eligibility to higher education, than similarly low-achieving students from disadvantaged backgrounds. In addition, based on the effectively maintained inequality theory (Lucas, 2001), I expect students from socially advantaged backgrounds who are performing poorly in high school, to be able to enter qualitatively better higher education programmes than disadvantaged students with similar performance.

Organisation of French secondary education

Since 1975, lower secondary education has been unified and lasts four years. Figure 2.A in Appendix 2 describes the French system as it was until 2009, when a major reform of the vocational high school was implemented. Theoretically, students are 11 when they enter secondary education and finish at age 15. However, grade repetition used to be very common and, in 2003, as much as 38% of 15-year-olds reported having already repeated at least one grade (OECD, 2004). School is compulsory until age 16 which, for on-time students, means the end of the tenth grade. However, given the large number of students repeating one or two grades during primary and secondary education, students who are the most at risk of leaving school early are often still enrolled in lower secondary education when they reach this age.

At the end of ninth grade, a national degree, the *Brevet des collèges* is awarded to students who meet certain requirements. The organisation of this degree has been reformed multiple times in the last decades, but at the beginning of the 2000s, students had to obtain at least an average of 10/20 on a grade calculated through a combination of both their yearly GPA during the last two years of lower secondary education in seven subjects, and three written national examinations (French, math, and history and geography; Ministère de l'Education, 1999). However, this degree was never a formal requirement needed to enter high school and, in theory, not obtaining it does not prevent a student continuing a normal secondary school career. Upper secondary starts in the tenth grade and is organised with two main tracks: the general-technological track and the vocational track, offered in separate schools. Until 2009, the vocational track included two types of programmes. The "CAP" and the "BEP" which both lasted two years and ended with a specialised vocational degree meant to allow immediate entrance to the labour market. The main difference between the two degrees was that the BEP was designed to allow a student to continue to a vocational high school and to take the vocational high school diploma in two years (*baccalauréat*). The choice of track for entrance in high school occurs during the ninth grade when families are asked to express their wishes (general-technological, CAP, BEP, or grade repetition) and teachers either validate it or give another recommendation. The final decision is taken by the school head. Similarly, students in the general-technological track in the tenth grade must further decide whether to continue in the general track or in the technological track, and the choice of track follows the same procedure as the one in the ninth grade.

Finally, high school ends with the baccalauréat, the national diploma which grants access to higher education. Three types of high school diploma exist, depending on the track taken in high school (general, technological and vocational). It is useful to note that, before 2009, the general and technological high school diplomas were awarded after three years in high school, while the vocational high school diploma required four years of study (typically two years of BEP + two years of vocational high school). The high school diploma is awarded to students who reach at least 10/20 in a set of examinations (mainly written) at the end of the year. Students with an average of between 8/20 and 10/20 take a second session with oral examinations to try to reach the 10/20 average. The content of the examinations and the grading are standardised at the national level. The performance of the student during the whole year (GPA) is not used in the award of the high school diploma (although this is currently being reformed) and students failing the examinations have to repeat the twelfth grade or re-take the examinations as independent candidates in the following year. Until 2009, there was no centralized system for applying to higher education and during the twelfth grade, students had to apply separately to each programme. As described in the previous chapter, the higher education system is organised around three broad types of programme: two are selective (vocational higher education and prestigious preparatory programmes to grandes écoles) and academic university programmes (bachelor's) which are open to any high school graduate.

Social inequalities in eligibility and access to French higher education

Several studies, relying on different data sources and methods, have all concluded that the expansion of secondary education during the second half of the 20th century has coincided with a decline in social inequalities in upper secondary graduation (Duru-Bellat & Kieffer, 2008; Givord & Goux, 2007; Ichou & Vallet, 2011). For example, Ichou & Vallet (2011) have estimated that social class inequalities have fallen by more than one quarter in only 35 years (for students who entered secondary school between 1960 and 1995). However, results have also suggested that the impact of parental education on educational attainment has not been decreasing as much as social class inequalities have, and rather, has been stable over the last decades (Duru-Bellat & Kieffer, 2008; Givord & Goux, 2007). The overall expansion of secondary education has been accompanied by a differentiation of high school diplomas, notably with the creation of the technological track (1965) and of the vocational one (1985), and empirical analyses have consistently concluded that social inequalities in graduation from

the general track have actually remained constant over time (Duru-Bellat & Kieffer, 2008; Ichou & Vallet, 2011) .

Regarding the mechanisms driving these inequalities, Ichou & Vallet (2013) assessed the relative weights of inequalities in school performance and inequalities in choices, net of performance. Their conclusion highlights that, for the most recent cohort, inequalities in performance and in choice have the same magnitude in creating class inequality in the transition to upper secondary school, and that there is no class differential in transition to university but only to prestigious preparatory programmes for entry to grandes écoles (CPGE). This last finding is consistent with the conclusions from Duru-Bellat, Kieffer, & Reimer (2008) who found that social background has a significant impact on the probability of entering prestigious programmes in higher education, but not on access to university more generally. Overall, these studies emphasise the increasing importance of horizontal stratification, i.e. differences in prestige between types of institutions or tracks within one single level of education in France.

Data & methods

The analysis draws upon the survey "Panel d'élèves du second degré, recrutement 1995 - 1995-2011" (DEPP, 1995) which collected detailed information on the educational careers and family background of more than 17 000 students who entered lower secondary education (usually at age 11) for the first time in September 1995. Students were followed until they stopped studying for two consecutive years or graduated from a master's degree. Data was collected between 1995 and 2011 from administrative sources and questionnaires filled out by families, school heads and students themselves. Educational trajectories until access to higher education is complete for around 84% of the 14 857 students for whom families filled out the background questionnaire. I only focus on students born in France, independently of their nationality, and who are expected to have followed their entire school career in the French system. I thus excluded around 300 students born abroad who accounted for 2.4% of the original sample.

The main dependent variable refers to "access to higher education", defined as being enrolled in a postsecondary secondary programme classified at the tertiary level (i.e. excluding postsecondary non-tertiary programmes) any time after high school graduation. The second

dependent variable in this chapter refers to eligibility to higher education, defined as graduation from upper secondary (i.e. obtaining the baccalauréat) from any track. Finally, I classify the first programme enrolled in after high school graduation in four categories. “No higher education” refers to students who did not enrol in any programme or first enrolled in a non-tertiary one. “Vocational programmes” includes short and long programmes classified as vocational higher education (mainly BTS, IUT and professional programmes in the health and social sector). “University” includes all programmes which are not selective and offered in universities, that is bachelor’s programmes and the first year of the medicine track. Finally, students who were first enrolled in a preparatory programme for admission to grandes écoles (CPGE) or in a grande école itself are classified as accessing “selective prestigious institutions”.

Two indicators are used to measure students’ social background. These are parental education, which is coded as the highest degree obtained by both parents (if information was available for only one parent, it was used as the highest) in four categories: lower secondary or less, vocational degree, upper secondary degree and tertiary degree; and social class, which is coded based on the simplified version of the Erikson-Goldthorpe-Portocarero (EGP) class schema: the “working class” when the highest parental occupation belongs to class VI and VII; the “intermediate class” when the highest parental occupation belongs to class III, IV and V: and the salariat when the highest parental occupation belongs to the salariat (class I and II).

Initial performance at the entrance of secondary education (age 11 for on-time students) is captured through the scores in the French and Math tests that all students took when they entered secondary education until 2009. These tests had two characteristics that make them especially relevant to compare the initial performance of students. First, they were standardised at the national level and are therefore expected to be much less sensitive to the average level of the school or classroom than, for example, school grades. In addition, they were low-stakes assessments administered in the first days of September for diagnostic purposes only, so it is less likely that children prepared for it.

Three key outcomes of secondary school careers are used to test the cumulative and compensatory mechanisms on eligibility to higher education: grade repetition in secondary education, graduation from the lower secondary school degree (Brevet des collèges) and the track in which students enrolled at the transition to high school (either a vocational track or the general-technological one).

Regarding the transition to higher education for eligible students, analyses are carried out using the three main indicators of performance in the upper secondary examination: age at graduation, track of the degree, and final grades in the standardised written examinations (first session). The frequency distribution of these variables for the analyses on eligibility and on the transition to higher education is summarised in Table 2.1.

Table 2.1: Descriptive statistics for the analytical samples on eligibility and transition to higher education

Variable		Sample for eligibility analyses (in %)	Sample for access conditional on eligibility (in %)
Dependent variables (binary)			
High school graduation		**71.6**	
Access to higher education			**87.7**
First programme in higher education	**No higher education**		**15.9**
	Vocational programmes		**38.3**
	University, including medicine		**35.1**
	Selective prestigious programmes		**10.6**
Independent variables			
Gender	Men	48.6	44.6
	Women	51.4	55.4
Parental education	Lower secondary or less	22.7	17.0
	Vocational (CAP/BEP)	32.4	29.7
	Upper secondary (Bac)	17.6	19.5
	Tertiary	27.3	33.8
Parental social class	Working class or inactive	23.2	17.3
	Intermediate	54.3	55.3
	Salariat	22.5	27.3
Performance in standardized tests in French and Math in 95	1st tertile	24.6	
	2nd tertile	34.2	
	3rd tertile	41.2	
Grade repetition in secondary school	Repeated once or more	45.4	
Graduation from lower secondary degree "Brevet des collèges"	No graduation	82.1	
	Graudation	17.9	
Track at transition to high shool	Academic & technologic track	68.3	
	Vocational track	31.7	
Age at upper secondary graduation	18 year-olds or less		50.3
	19 year-olds		29.1
	20 year-olds or more		20.6
Track of upper secondary degree	Academic		58.0
	Technological		28.7
	Vocational		13.3
Position in score distribution in upper secondary diploma	1st tertile		32.6
	2nd tertile		33.2
	3rd tertile		34.2
Number of observations		**11 176**	**7 844**

Source: Panel d'élèves du second degré, recrutement 1995.

Exploratory analyses on missing data in outcomes during secondary education careers reveal that students with initial low performance (more often from lower social backgrounds) are much more likely to have missing outcomes in secondary education. Around 13% of the 13,000 students for whom we have data on high school graduation, parental background, and initial performance, have missing data on at least one of the subsequent outcomes in secondary education (especially lower secondary graduation), but this is the case for 20% of students

with low-educated parents and only 6% of those with at least one tertiary-educated parent. Similarly, 28% of students in the lowest tertile of performance are excluded from the analytical sample on eligibility because of missing data on outcomes during secondary education, but less than 2% of the students initially performing in the top tertile. It is thus important to keep in mind that the analyses on high school graduation focus on the cumulative and compensating mechanisms but are expected to underestimate the inequalities associated with parental education and the differences by initial performance.

In order to obtain a less biased estimation of the total social gap in access to higher education, a first analysis is carried out on a larger sample, which includes all students with data on high school graduation and higher education access, independently from whether they have data on their secondary school career. The frequency distribution of social background variables in this sample are presented in Table 2.2. A summary variable, combining information on parental education and parental class is created to estimate the total gap in higher education access associated with students' social origin.

Table 2.2: Descriptive statistics for the analytical sample on social gap in access to higher education

Variable		Sample for unconditional analysis on HE access (in %)
Dependent variables (binary)		
High school graduation		**66.7**
Access to higher education		**58.2**
Independent variables		
Gender	Men	50.1
	Women	49.9
Parental education	Lower secondary or less	25.1
	Vocational (CAP/BEP)	33.5
	Upper secondary (Bac)	16.6
	Tertiary	24.8
Parental social class	Working class or inactive	25.8
	Intermediate	54.0
	Salariat	20.2
Summary of social origin	Less than high school & working class	24.6
	Less than high shool & intermediate/salariat	34.0
	High school & working class/intermediate	13.4
	High school & salariat	3.2
	Tertiary & working class/intermediate	9.9
	Tertiary & salariat	14.9
Number of observations		**12 332**

Source: Panel d'élèves du second degré, recrutement 1995.

This chapter focuses on the interpretation of interaction terms and their comparisons across nested models. In order to avoid the pitfalls associated with comparison of nested logistic models (Mood, 2010) and allow for a straightforward interpretation of the interaction terms, I use linear probability models, with robust standard errors. Three models are especially discussed:

(1) An unconditional model on the probability of entering higher education;

(2) A model on the probability of becoming eligible for higher education for students with data on all secondary outcomes;

(3) A conditional analysis (on eligible students only) on the probability of entering higher education.

Finally, the analyses on the types of programme entered after high school graduation are based on multinomial logit models, but I mainly discuss the average marginal effects and predicted margins obtained for different social groups to identify patterns of horizontal inequalities in initial access to higher education.

Results

Social inequalities in key transitions to access higher education

The first analyses estimate the total association between social origin and the probability of accessing higher education, in order to estimate the size of social inequalities in the French system. In order to identify the critical point(s) for higher education access in students' educational careers, I further disentangle the effect of social origin on high school graduation (i.e. eligibility to higher education) and access to higher education, conditional on eligibility (Table 2.3). Among all students entering secondary education, there is a colossal gap in the probability of entering higher education, by social origin. Both parental education and social class independently have large effects, and combining these two indicators of social origin, I find that the most disadvantaged students are 59 percentage points less likely to ever enter higher education compared to their most privileged peers (column 2). As shown in columns 3 & 4, these large social inequalities in access to higher education are largely driven by inequalities in high school graduation: disadvantaged students are already 51 p.p. less likely to become eligible for higher education than the most advantaged students. Finally, results

on access to higher education, conditional on eligibility, confirm that the total effect of social origin is still substantial (- 21.3 p.p.) but smaller than what is observed in the unconditional model or for high school graduation. These estimates are robust to the type of model chosen as I replicated these results with logit models instead of linear ones and obtain extremely similar estimates (marginal effects in Table 2.A in Appendix 2).

Table 2.3: Association between social origin and eligibility or access to higher education, students entering lower secondary education in 1995

Linear probability models with robust standard errors

		Access to higher education (unconditional)		High school graduation (eligibility)		Access to higher education conditional on eligibility	
Variables		(1)	(2)	(3)	(4)	(5)	(6)
Gender	Male (reference category)						
	Female	0.147*** (0.01)	0.147*** (0.01)	0.136*** (0.01)	0.135*** (0.01)	0.054*** (0.01)	0.054*** (0.01)
Parental education	Lower secondary or less	-0.355*** (0.01)		-0.336*** (0.01)		-0.087*** (0.01)	
	Vocational (CAP/BEP)	-0.286*** (0.01)		-0.242*** (0.01)		-0.099*** (0.01)	
	High school	-0.104*** (0.01)		-0.079*** (0.01)		-0.035*** (0.01)	
	Tertiary (reference category)						
Parental social class	Working class or inactive	-0.259*** (0.02)		-0.213*** (0.01)		-0.121*** (0.02)	
	Intermediate	-0.115*** (0.01)		-0.070*** (0.01)		-0.062*** (0.01)	
	Salariat (reference category)						
Summary of social origin	Less than high school & working class		-0.588*** (0.01)		-0.511*** (0.01)		-0.213*** (0.01)
	s than high shool & intermediate/salariat		-0.427*** (0.01)		-0.344*** (0.01)		-0.156*** (0.01)
	High school & working class/intermediate		-0.226*** (0.01)		-0.157*** (0.01)		-0.094*** (0.01)
	High school & salariat		-0.163*** (0.02)		-0.113*** (0.02)		-0.065*** (0.02)
	Tertiary & working class/intermediate		-0.138*** (0.01)		-0.083*** (0.01)		-0.067*** (0.01)
	Tertiary & salariat (reference category)						
Constant		0.840*** (0.01)	0.849*** (0.01)	0.871*** (0.01)	0.875*** (0.01)	0.949*** (0.01)	0.951*** (0.01)
Observations		12,332	12,332	12,332	12,332	8,227	8,227
R-squared		0.199	0.193	0.176	0.168	0.053	0.051
BIC		14884	14982	14113	14235	4866	4884

Source: Panel d'élèves du second degré, recrutement 1995

Robust standard errors in parentheses

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

These results can be interpreted in light of similar findings from the United States to compare patterns of higher education inequality between the two countries. I replicate computations by Bailey & Dynarski (2011) to estimate the contribution of high school graduation inequalities and inequalities in the transition to higher education in bringing about the gap in college entry, by social origin. In the U.S., they found that, for a cohort of youths born in the early 80s, the gap in college entry between lowest and highest-income families amounts to 51 percentage points and that the absolute difference in high school graduation is already 37 percentage points. In their sample, the average transition rates to higher education amounts to 70%, so if there were no variation in the transition rates by social origin, they estimate that the absolute differences observed in high school graduation would already lead to a college entry gap of 26 percentage points (0.37*0.70=25.9), that is around half of the college entry gap

which is actually observed (51 p.p.; Bailey & Dynarski, 2011). Although my estimates combine parental education and social class and are thus not completely identical, I estimate this gap for a very similar cohort (most of the students are born in 1984). In the case of France, I estimate that the absolute difference between the most disadvantaged and advantaged students in high school graduation is already 51.1 p.p. The transition rates to higher education among eligible students is as high as 87.3% and if there were no variation in the transition rates by social origin, the absolute differences observed in high school graduation would translate into a higher education entry gap of 44.6 percentage points (0.511*0.873). Inequality in high school graduation thus accounts for around 75% of the gap of 58.8 p.p. observed in access patterns. Although the estimated difference in access to higher education by social origin is quite similar in the U.S. and in France, it is striking to see that different patterns of inequality bring about this gap in the two countries. Social stratification during secondary education careers is even more crucial in understanding inequalities in access to higher education in France, while the transition to higher education for eligible students is comparatively more relevant in the American system. I thus now turn to inequalities in high school graduation to understand how differences in initial performance accumulates during secondary education depending on social origin.

Cumulative and compensatory advantage during secondary education

In this section, I am interested in the diverging trajectories of students of different social origins from entrance to secondary education until graduation. I thus focus on the interactions between initial performance and social origin. Since some combinations of parental education and social class are very rare, the summary variable lead to categories with very few individuals, making the estimations of these interactions imprecise. The exploratory analyses reveal that initial performance has a different effect on high school graduation mainly by parental education, but that the interaction between initial performance and social class is much smaller and often statistically not significant (Table 2.B, Model 2 in Appendix 2). For the sake of clarity and to proxy the total effect of social origin during secondary trajectories, I thus use parental education alone in the rest of this chapter. However, I test for the robustness of my findings by additionally controlling for parental class when necessary and discuss the results below.

When they enter secondary education (around age 11), students from different social backgrounds are already in very different positions in terms of performance in French and Math. Around 44% of the children with low-educated parents (no more than lower secondary education) are in the lowest tertile of performance and only 21% are in the top tertile of performance. In contrast, around 60% of children with at least one tertiary-educated parent score in the top tertile of performance and 9% only are in the bottom tertile of performance (Figure 2.B in Appendix 2). Initial performance is thus expected to already explain social inequalities observed in high school graduation, and I first check to what extent the accumulation of negative (or positive) outcomes during secondary education mediate social inequalities in high school graduation.

Table 2.4: Eligibility for higher education, all students entering lower secondary education in 1995

Linear probability models with robust standard errors

Variables		(1)	(2)	(3)	(4)	(5)
Gender	Male (reference category)					
	Female	0.104*** (0.01)	0.080*** (0.01)	0.071*** (0.01)	0.049*** (0.01)	0.017*** (0.01)
Parental education	Lower secondary or less	-0.398*** (0.01)	-0.213*** (0.01)	-0.212*** (0.01)	-0.166*** (0.01)	-0.088*** (0.01)
	Vocational (CAP/BEP)	-0.289*** (0.01)	-0.168*** (0.01)	-0.163*** (0.01)	-0.132*** (0.01)	-0.051*** (0.01)
	Upper secondary (Bac)	-0.106*** (0.01)	-0.064*** (0.01)	-0.058*** (0.01)	-0.049*** (0.01)	-0.021** (0.01)
	Tertiary (reference category)					
Position in standardized test in 95	1st tertile		-0.327*** (0.01)	-0.317*** (0.01)	-0.218*** (0.01)	-0.111*** (0.01)
	2nd tertile (reference category)					
	3rd tertile		0.156*** (0.01)	0.135*** (0.01)	0.096*** (0.01)	0.026*** (0.01)
Grade repetition in secondary school	Did not repeat (reference category)					
	Repeated once or more			-0.092*** (0.01)	-0.099*** (0.01)	-0.110*** (0.01)
Lower secondary degree	Graduation (reference category)					
	No graduation				-0.357*** (0.01)	-0.152*** (0.01)
Track at transition to high school	Academic-technological track (reference)					
	Vocational track					-0.440*** (0.01)
Constant		0.865*** (0.01)	0.806*** (0.01)	0.855*** (0.01)	0.903*** (0.01)	0.981*** (0.01)
Observations		11,176	11,176	11,176	11,176	11,176
R-squared		0.129	0.281	0.291	0.363	0.468
AIC		12378	10228	10084	8887	6866
BIC		12415	10279	10142	8953	6939

Source: Panel d'élèves du second degré, recrutement 1995

Robust standard errors in parentheses

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

Table 2.4 shows that, in this sample, students from low-educated families are almost 40 p.p. less likely to graduate from high school. As expected this association is largely reduced (by around 50%) once controlling for initial performance at age 11. Being in the lowest tertile of performance at entrance to secondary school reduces the probability of graduating from high school by almost 33 p.p. seven years later (Model 2). Models 3 to 5 add the subsequent outcomes of secondary school careers and, as expected given the cumulative nature of performance in the education system, the effect of initial performance on high school

achievement is largely mediated by subsequent outcomes. Two results deserve to be highlighted in this table. First, grade repetition during secondary education appears to mediate neither the effect of initial performance nor the effect of parental education (Model 2 & 3). Despite being negatively associated with high school graduation, grade repetition in secondary education does not contribute to explaining the gap between children from low- and highly-educated families in high school graduation. In contrast, choosing to follow a vocational track at the end of lower secondary school has the largest negative impact on the probability of graduating from high school (-44 p.p.) and reduces largely the net effect of parental education and initial performance. Adding the track at the transition to high school reduces the negative net effect of low parental education from 16.6 p.p. to 8.8 p.p. Similarly, it reduces the negative effect of low initial performance from 21.8 p.p. to 11.1 p.p. (comparison between Models 4 and 5). This suggests that the track followed at the transition to high school is a critical juncture in secondary educational careers, especially with regards to social inequalities in high school graduation.

These results confirm the cumulative nature of performance in educational careers and its mediating role of the effect of social origin on high school graduation. Building on the compensatory advantage hypothesis, I now turn to the heterogeneous effects of performance by social origin. To what extent does the attainment of students with initial similar performance but different social origin differ? As can be seen from Model 2 in Table 2.5, the interaction terms support the compensatory advantage hypothesis because initial low performance is much more detrimental for disadvantaged students. Being in the bottom tertile of the score distribution at age 11 (instead of the second tertile) decreases the probability of graduating from high school by around 19 points for students with at least one tertiary-educated parent. However, the impact of this negative early outcome reaches -34 percentage points for students with parents with only lower secondary education or short vocational degrees, and -31 p.p. for those with parents with at most a high school diploma. Conversely, good performance at entrance to lower secondary largely reduces the impact of social background on high school graduation. Also, the estimated interaction terms between parental education and initial performance are robust to the inclusion of social class as an additional control: in Table 2.B in Appendix 2, the comparison between Model 2 (the main model) and Model 3 (adding social class) shows that controlling for parental class reduces the

main effect of parental education, as expected, but only marginally affects the estimated interaction terms between parental education and performance (at most a difference of 0.8 percentage points).

How does this heterogenous effect on initial performance unfold during secondary school careers? It may be that low performance leads to further negative outcomes mainly for disadvantaged students. For example, poor-performing students from disadvantaged backgrounds would be much more likely to repeat a grade, not graduate from lower secondary and follow the vocational tracks, hindering their chances to obtain a high school diploma, In contrast, initially poor-performing students from privileged origin would be able to avoid this accumulation of negative outcomes either by improving their performance, or making more ambitious choices to avoid grade repetition or a less prestigious track. If this is the case, controlling for these subsequent outcomes would reduce largely the interaction terms between initial performance and parental education. Alternatively, it may be that initial low performance translates into subsequent negative outcomes for most students but that these subsequent outcomes have different consequences for high school graduation depending on social origin. It is important to remember that in the French system, lower secondary graduation or vocational tracks do not formally prevent high school graduation. It is possible to progress to high school without a lower secondary qualification and it is possible to both take a vocational high school diploma after the short vocational degree (BEP) or to take a bridge year to transfer to a technological high school. If socially privileged students are able to compensate for the consequences of negative outcomes during their whole secondary school career, the inclusion of the interactions between grade repetition, lower secondary degree and/or vocational tracks would most reduce the size of the interaction between initial performance and parental education. I thus focus on the evolution of the coefficients for the interaction between parental education and early performance when adding the subsequent outcomes of secondary education and their interactions with parental education (Models 2 to 9).

Table 2.5: Eligibility for higher education with interaction terms between performance and parental education, all students entering lower secondary education in 1995

Linear probability models with robust standard errors

Variables		(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)		(9)	
Gender	Male (reference category)																		
	Female	0.080***	(0.01)	0.080***	(0.01)	0.071***	(0.01)	0.070***	(0.01)	0.049***	(0.01)	0.049***	(0.01)	0.017***	(0.01)	0.017***	(0.01)	0.017***	(0.01)
Parental education	Lower secondary or less	-0.213***	(0.01)	-0.251***	(0.02)	-0.254***	(0.02)	-0.255***	(0.02)	-0.209***	(0.02)	-0.204***	(0.02)	-0.104***	(0.02)	-0.076***	(0.02)	-0.060***	(0.02)
	Vocational (CAP/BEP)	-0.168***	(0.01)	-0.215***	(0.02)	-0.215***	(0.02)	-0.227***	(0.02)	-0.174***	(0.02)	-0.169***	(0.02)	-0.064***	(0.02)	-0.047***	(0.02)	-0.043***	(0.02)
	Upper secondary (Bac)	-0.064***	(0.01)	-0.087***	(0.02)	-0.086***	(0.02)	-0.081***	(0.02)	-0.076***	(0.02)	-0.077***	(0.02)	-0.031*	(0.02)	-0.020	(0.02)	-0.015	(0.02)
	Tertiary (reference category)																		
Position in standardized test in 95	1st tertile	-0.327***	(0.01)	-0.191***	(0.03)	-0.176***	(0.03)	-0.175***	(0.03)	-0.123***	(0.03)	-0.129***	(0.03)	-0.037	(0.03)	-0.067**	(0.03)	-0.068**	(0.03)
	2nd tertile (reference category)																		
	3rd tertile	0.156***	(0.01)	0.090***	(0.01)	0.062***	(0.01)	0.060***	(0.01)	0.036***	(0.01)	0.039***	(0.01)	0.001	(0.01)	0.013	(0.01)	0.016	(0.01)
Interaction: Position in standardized test in 95*parental education	1st tertile*Lower secondary			-0.148***	(0.04)	-0.154***	(0.04)	-0.155***	(0.04)	-0.093***	(0.04)	-0.084**	(0.04)	-0.078**	(0.03)	-0.034	(0.03)	-0.030	(0.04)
	1st tertile*Vocational			-0.146***	(0.04)	-0.150***	(0.04)	-0.153***	(0.04)	-0.111***	(0.03)	-0.102***	(0.04)	-0.093***	(0.03)	-0.059*	(0.03)	-0.057*	(0.03)
	1st tertile*Upper secondary			-0.120***	(0.05)	-0.117***	(0.05)	-0.115**	(0.05)	-0.075*	(0.04)	-0.080*	(0.05)	-0.052	(0.04)	-0.026	(0.04)	-0.033	(0.04)
	3rd tertile*Lower secondary			0.127***	(0.03)	0.138***	(0.03)	0.139***	(0.03)	0.111***	(0.02)	0.107***	(0.02)	0.057**	(0.02)	0.035	(0.02)	0.028	(0.02)
	3rd tertile*Vocational			0.128***	(0.02)	0.138***	(0.02)	0.143***	(0.02)	0.112***	(0.02)	0.107***	(0.02)	0.049***	(0.02)	0.035*	(0.02)	0.032*	(0.02)
	3rd tertile*Upper secondary			0.047**	(0.02)	0.054***	(0.02)	0.053**	(0.02)	0.050**	(0.02)	0.050**	(0.02)	0.018	(0.02)	0.008	(0.02)	0.006	(0.02)
Grade repetition in secondary school	Did not repeat (reference category)																		
	Repeated once or more					-0.097***	(0.01)	-0.103***	(0.01)	-0.102***	(0.01)	-0.103***	(0.01)	-0.112***	(0.01)	-0.113***	(0.01)	-0.100***	(0.01)
Interaction: grade repetition in secondary*parental education	Repeated once or more*Lower secondary							0.001	(0.02)									-0.033*	(0.02)
	Repeated once or more*Vocational							0.022	(0.02)									-0.007	(0.02)
	Repeated once or more*Upper secondary							-0.009	(0.02)									-0.014	(0.02)
Lower secondary degree	Graduation (reference category)																		
:	No graduation									-0.350***	(0.01)	-0.312***	(0.04)	-0.150***	(0.01)	-0.148***	(0.01)	-0.160***	(0.04)
Interaction: Lower secondary degree (Brevet) *parental education	No graduation*Lower secondary											-0.048	(0.05)					0.009	(0.05)
	No graduation*Vocational											-0.050	(0.05)					0.000	(0.05)
	No graduation*Upper secondary											0.000	(0.06)					0.066	(0.06)
Track at transition to high school	Academic-technological track (reference)																		
	Vocational track													-0.436***	(0.01)	-0.325***	(0.04)	-0.321***	(0.04)
Interaction: Track at transition to high school*parental education	Vocational track*Lower secondary															-0.148***	(0.04)	-0.151***	(0.05)
	Vocational track*Vocational															-0.121***	(0.04)	-0.120***	(0.04)
	Vocational track*Upper secondary															-0.100**	(0.05)	-0.121**	(0.05)
Constant		0.806***	(0.01)	0.836***	(0.01)	0.892***	(0.01)	0.895***	(0.01)	0.934***	(0.01)	0.931***	(0.01)	0.990***	(0.01)	0.978***	(0.01)	0.971***	(0.01)
Observations		11,176		11,176		11,176		11,176		11,176		11,176		11,176		11,176		11,176	
R-squared		0.281		0.289		0.299		0.299		0.368		0.368		0.470		0.471		0.472	
AIC		10228		10128		9967		9971		8817		8819		6841		6820		6824	
BIC		10279		10223		10070		10095		8927		8951		6958		6959		7007	

Source: Panel d'élèves du second degré, recrutement 1995

Robust standard errors in parentheses

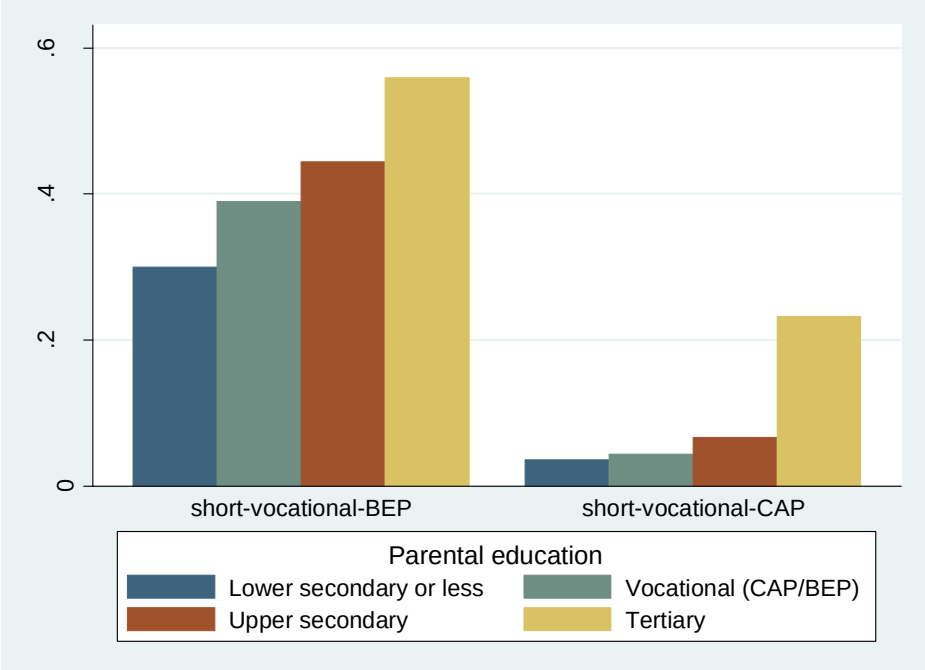
*** p<0.01, ** p<0.05, * p<0.1

First, controlling for grade repetition in secondary education actually slightly increases the compensatory advantage evidence found for early performance. The consequences of grade repetition for high school graduation also do not appear to vary by social origin, when controlling for initial performance (Model 4). In contrast, controlling for lower secondary graduation reduces the heterogenous effect of initial performance. Not graduating from lower secondary education seems to be slightly more detrimental for disadvantaged children but the size of this interaction is not statistically significant and is small compared to the total negative effect of no graduation (Model 5 and 6). These results suggest that the compensatory advantage in early performance is partly driven by the fact that low performers from disadvantaged backgrounds are more at risk of not graduating from lower secondary school than equally struggling students with highly-educated parents. But not graduating from lower secondary school has relatively similar consequences for all groups and does not further contribute to the compensatory advantage of students with highly-educated parents. Finally, further controlling for the track at the transition to high school slightly reduces the heterogeneous effect of initial performance (Model 7) but I also find a large heterogenous effect of the vocational tracks on the probability of high school graduation by parental education (Model 8) which appears to contribute the most to the compensatory advantage observed for initial performance. Controlling for all outcomes during secondary education and the interactions with parental education (Model 9) does not affect the coefficients of the effect of track and its interaction with parental education.

It is especially striking to find evidence of a compensatory advantage in the case of enrolment in a vocational track at the transition to high school, since previous research has shown that "upper-class students with below-average grades have a higher probability of taking the academic track than students with similar grades from other social classes" (Bernardi & Cebolla-Boado, 2014). Thus, not only do poor-performing children from advantaged families tend to avoid the vocational tracks, but even those who still enrol in them and who would therefore usually be expected to be negatively selected compared to children from disadvantaged background, are still more likely to obtain a high school diploma. As described earlier, at the time of the survey, students could choose from two vocational tracks after lower education. The first mainly allowed students to obtain a vocational degree in two years in order to enter the labour-market (CAP), while the second track first led to a vocational degree

in two years (BEP) after which students had the possibility to continue studying for two more years to take the vocational upper secondary degree. Thus, it may be that students from higher social backgrounds who had to enter the vocational pathways more often chose the BEP track. However, the detail of the enrolment of the 3,533 students of the analytical sample who entered the vocational tracks at the transition to high school does not support this hypothesis. The proportion of students going to the BEP varies by parental education but the difference is relatively modest: 73% of students with low-educated parents in the vocational tracks went to a BEP while this was the case of 81% of students with at least one tertiary-educated parent. In contrast, the proportion of students in each track who eventually graduated from high school varies largely by parental education, as illustrated by Figure 2.1.

Figure 2.1: Proportion of high school graduates in vocational tracks by parental education



Graduation rates after a BEP ranges from 30% for students with low-educated parents to 56% for those with highly-educated parents. It is also particularly striking that the proportion of students who become eligible for higher education after a CAP is negligible for all levels of parental education, except for those with at least one tertiary-educated parent (23%). This pattern further supports the compensatory advantage hypothesis and would require further research to identify which mechanisms drive the diverging pathways of students in vocational tracks by social background.

Overall these results confirmed the relevance of the compensatory advantage hypothesis in our understanding of social inequalities in eligibility to higher education in France. Disadvantaged students at entrance to secondary education are already more likely to be performing poorly, but the accumulation of poor outcomes over secondary educational careers differs largely by social origin. It points to the importance of the track chosen at the transition to high school as a critical point in shaping further opportunities for high school graduation, but it also highlights that the negative impacts of vocational tracks on high school graduation differ largely by social origin. I now turn to the analyses of social inequalities in access to higher education among eligible students.

Vertical and horizontal inequalities in the transition to higher education

The analysis of transition patterns of eligible students to higher education (Table 2.6), first confirms that transition rates in France are very high and social inequalities much smaller than what is observed in the probability of high school graduation. Model 1 shows that, without controlling for any performance indicators, eligible students who have parents with no more than lower secondary education are 15 percentage points less likely to enter higher education than students with highly-educated parents. However, once controlling for the indicators of performance in high school diploma, the difference across social groups becomes close to zero, except when parental education is at most a short vocational degree (a small net effect of around -2 percentage points, Model 2).

Confirming findings from the previous literature, only the track of the high school diploma has a very large impact on the probability of entering higher education, as students from the vocational tracks are 47 p.p. less likely to make this transition (while the difference between the technological and the academic track amounts to only 6 percentage points in favour of the latter). In addition, the interaction terms suggest a larger negative impact of late graduation and poor performance for students with low-educated parents, in line with the compensatory advantage hypothesis, but the effect is small. It is mainly positive outcomes (graduating on-time and being in the third tertile of performance) which appear to reduce the effect of social origin in the transition to higher education.

Table 2.6: Access to higher education, conditional on eligibility

Linear probability models with robust standard errors

Variables		(1)		(2)		(3)		(4)		(5)	
Gender	Male (reference category)										
	Female	0.048***	(0.01)	-0.002	(0.01)	-0.002	(0.01)	-0.003	(0.01)	-0.001	(0.01)
Parental education	Lower secondary or less	-0.149***	(0.01)	-0.005	(0.01)	-0.035*	(0.02)	-0.028	(0.02)	-0.032*	(0.02)
	Vocational (CAP/BEP)	-0.143***	(0.01)	-0.023***	(0.01)	-0.041***	(0.02)	-0.043**	(0.02)	-0.037***	(0.01)
	Upper secondary (Bac)	-0.061***	(0.01)	-0.008	(0.01)	-0.009	(0.02)	-0.020	(0.02)	-0.019	(0.01)
	Tertiary (reference category)										
Age at upper secondary graduation	18 year-olds			0.027***	(0.01)	0.005	(0.01)	0.028***	(0.01)	0.029***	(0.01)
	19 year-olds (reference category)										
	20 year-olds or more			-0.027**	(0.01)	-0.007	(0.02)	-0.027**	(0.01)	-0.026**	(0.01)
Track of upper secondary degree	Academic			0.056***	(0.01)	0.057***	(0.01)	0.036***	(0.01)	0.057***	(0.01)
	Technological (reference category)										
	Vocational			-0.466***	(0.02)	-0.460***	(0.02)	-0.455***	(0.05)	-0.471***	(0.02)
Position in score distribution in upper secondary degree	1st tertile			-0.029***	(0.01)	-0.029***	(0.01)	-0.029***	(0.01)	-0.015	(0.01)
	2nd tertile (reference category)										
	3rd tertile			0.042***	(0.01)	0.044***	(0.01)	0.042***	(0.01)	0.002	(0.01)
Interaction : Age at graduation*parental education	18 year-olds*Lower secondary					0.047**	(0.02)				
	18 year-olds*Vocational					0.042**	(0.02)				
	18 year-olds*Upper secondary					0.014	(0.02)				
	20 year-olds or more*Lower secondary					0.005	(0.04)				
	20 year-olds or more*Vocational					-0.027	(0.03)				
	20 year-olds or more*Upper secondary					-0.056	(0.03)				
Interaction : Track of upper secondary degree*parental education	Academic*Lower secondary							0.023	(0.02)		
	Academic*Vocational							0.032*	(0.02)		
	Academic*Upper secondary							0.021	(0.02)		
	Vocational *Lower secondary							0.016	(0.06)		
	Vocational *Vocational							-0.012	(0.06)		
	Vocational *Upper secondary							-0.059	(0.07)		
Interaction : Position in score distribution in upper secondary degree*parental education	1st tertile*Lower secondary									0.001	(0.02)
	1st tertile*Vocational									-0.036*	(0.02)
	1st tertile*Upper secondary									-0.013	(0.02)
	3rd tertile*Lower secondary									0.077***	(0.03)
	3rd tertile*Vocational									0.075***	(0.02)
	3rd tertile*Upper secondary									0.036**	(0.02)
Constant		0.930***	(0.01)	0.904***	(0.01)	0.914***	(0.01)	0.919***	(0.01)	0.914***	(0.01)
Observations		7,844		7,844		7,844		7,844		7,844	
R-squared		0.042		0.324		0.325		0.325		0.327	
AIC		4481		1761		1756		1762		1732	
BIC		4516		1838		1874		1881		1851	

Source: Panel d'élèves du second degré, recrutement 1995

Robust standard errors in parentheses

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

These results overall suggest that social inequalities in the transition to higher education are fully mediated by differences in performance at the end of high school. However, it is necessary to remember that transition rates to higher education among eligible students are high in France, reaching almost 90%. As described earlier, the effectively maintained inequality theory posits that, even when a transition becomes nearly universal, the socioeconomically advantaged students secure qualitatively better outcomes to maintain their advantage (Lucas, 2001, 2009). In the case of the transition to higher education in France, one should thus expect larger inequalities when considering the horizontal dimension of social stratification and access to the qualitatively better programmes. I thus now turn to the results on social inequalities in access to different types of programmes in higher education.

Table 2.7: Initial access to different types of higher education programmes, conditional on eligibility

Average marginal effects from multinomial logit models

		Model 1				Model 2			
		No HE	Vocational	University	Prestigious	No HE	Vocational	University	Prestigious
Gender	Male (reference category)								
	Female	-0.019** (0.01)	-0.103*** (0.01)	0.164*** (0.01)	-0.042*** (0.01)	0.030*** (0.01)	-0.069*** (0.01)	0.109*** (0.01)	-0.071*** (0.01)
Parental education	Lower secondary or less	0.135*** (0.01)	0.147*** (0.02)	-0.097*** (0.02)	-0.186*** (0.01)	-0.004 (0.01)	0.023 (0.02)	0.070*** (0.02)	-0.089*** (0.01)
	Vocational (CAP/BEP)	0.145*** (0.01)	0.166*** (0.01)	-0.137*** (0.01)	-0.173*** (0.01)	0.026** (0.01)	0.052*** (0.01)	-0.005 (0.01)	-0.074*** (0.01)
	Upper secondary (Bac)	0.070*** (0.01)	0.106*** (0.02)	-0.053*** (0.02)	-0.123*** (0.01)	0.021* (0.01)	0.033** (0.01)	-0.004 (0.01)	-0.050*** (0.01)
	Tertiary (reference category)								
Age at upper secondary graduation	18 year-olds					-0.046*** (0.01)	-0.025* (0.01)	0.005 (0.01)	0.066*** (0.01)
	19 year-olds (reference category)								
	20 year-olds or more					0.010 (0.01)	0.012 (0.02)	0.007 (0.02)	-0.029*** (0.01)
Track of upper secondary degree	Academic					-0.063*** (0.01)	-0.402*** (0.01)	0.359*** (0.01)	0.106*** (0.01)
	Technological (reference category)								
	Vocational					0.441*** (0.02)	-0.313*** (0.02)	-0.103*** (0.01)	-0.025*** (0.01)
Position in score distribution in upper secondary degree	1st tertile					0.032*** (0.01)	-0.034*** (0.01)	0.032*** (0.01)	-0.030*** (0.01)
	2nd tertile (reference category)								
	3rd tertile					-0.044*** (0.01)	-0.025** (0.01)	-0.061*** (0.01)	0.131*** (0.01)
Log likelihood		-9387				-7543			
Number of individuals		7,844				7,844			

Source: Panel d'élèves du second degré, recrutement 1995

Standard errors in parentheses

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

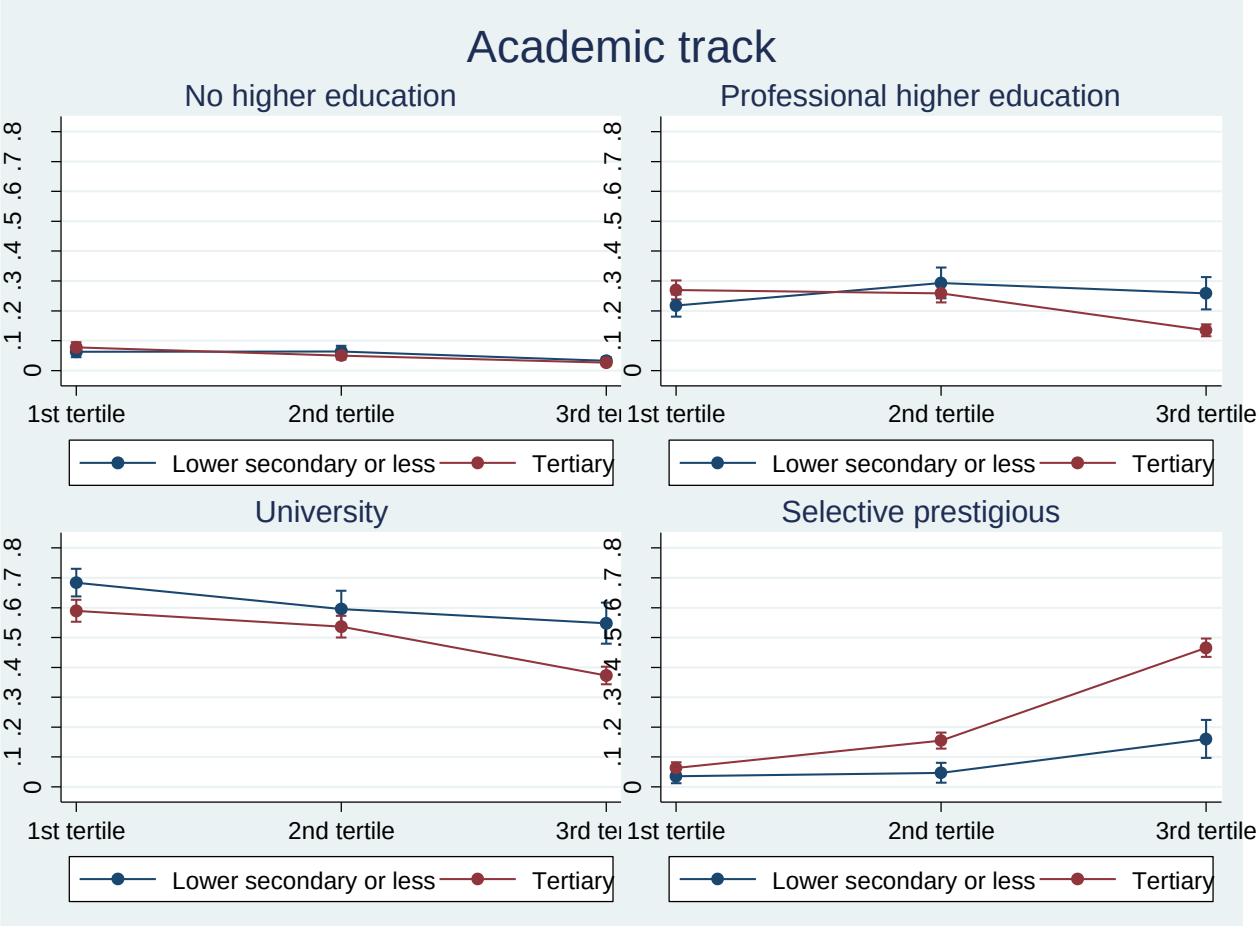
The average marginal effects of the multinomial logit models are presented in Table 2.7. The gross association between parental education and the different outcomes in initial access (Model 1) shows that the differences between eligible students with low-educated parents and students with at least one tertiary-educated parent range from almost 10 p.p. on entering a bachelor's programme to almost 19 p.p. in favour of the latter for selective prestigious programmes, while disadvantaged students are more likely not to enter higher education or to go to vocational programmes. However, once controlling for performance in the high school diploma (Model 2), it is striking to see that the negative net effect of low parental education is zero or small for all types of programmes, except in the case of selective prestigious programmes, where it still amounts to almost 9 p.p. In contrast, students who have parents with at most lower secondary education are 7 p.p. more likely to enter a university than the most advantaged students.

The compensatory advantage hypothesis predicts that low-performing students with socioeconomically advantaged backgrounds will be able to enter a qualitatively better programme than their disadvantaged counterparts with similar low performance. For example, in the U.S., Andrew found that low-achieving, high-SES students are three times more likely to enter a regular university compared to low-achieving, low-SES students (2017). In order to test this hypothesis, I add to the previous multinomial logit model (with all controls of high school diploma performance) an interaction term between parental education and tertile of performance. In order to ease interpretation, I present the predicted probabilities for all access outcomes, by parental education at different levels of performance and track (Table 2.C in Appendix 2). Social origin appears to be most relevant for patterns of attendance by performance among graduates of the academic track and the results are plotted below (Figure 2.2). The results do not support the compensatory hypothesis in terms of choice of programmes: students in the bottom tertile of performance with highly-educated parents are almost 10 p.p. *less* likely to enter a bachelor's programme at university than similarly low-performing disadvantaged students with an academic degree, and are 5 p.p. more likely to enter a short professional programme. The same pattern is found among low-performers from the technological track while there is no difference by social origin among low-performers of the vocational tracks. In contrast, the largest heterogeneity in the effect of performance on initial access to higher education is found among good performers. It is striking to see that

only 16% of high-achievers (third tertile) from a disadvantage background in the academic track enter a selective prestigious institution as a first programme, while this proportion reaches 46% among similarly performing students with at least one tertiary-educated parent, a difference of 30 percentage points. High-achievers from a disadvantaged background (in the academic track) are more likely to go to non-selective universities (+17 p.p. compared to socially advantaged students) or short professional programmes (+ 12 p.p.). Students from higher social backgrounds with good performance are thus three times more likely to enter a selective prestigious programme. As a comparison point, in the U.S., it was estimated that high-achieving high-SES students were twice as likely to enter a selective university than high-achieving low-SES students (Andrew, 2017).

Figure 2.2: Initial access to higher education by performance and parental education, for high school graduates from the academic track

Predicted probabilities from multinomial logit model with an interaction between tertile of performance in high school diploma and parental education



While I have found that students from advantaged social origins are better protected from the consequences of initial poor performance during secondary education, I do not find support for the compensatory hypothesis in the horizontal dimension of social stratification in the transition to higher education. Instead these results suggest that students with highly-educated parents are better able to capitalize on positive educational outcomes in the transition to higher education. I further refer to this mechanism as the "reinforcement advantage mechanism" to highlight how it may complement the compensatory advantage mechanism in the development of social inequalities over time.

Discussion

In this chapter, I have tried to provide a comprehensive account of the development of social inequalities on the long path until access to higher education in the French context. This chapter builds on a long tradition of research which has conceived educational careers as a sequence of transitions, following Mare's seminal model (Mare, 1980, 1981). It adopts the classical analytical strategy from the literature on social stratification in education (For example, Shavit, Arum, & Gamoran, 2007; Shavit & Blossfeld, 1993) by decomposing access to higher education as a sequence of two key transitions: first, high school graduation (which defines eligibility to higher education in the French context) then, transition to higher education, conditional on eligibility. However, I have complemented this classical analytical strategy in three distinct ways.

First of all, I estimated the contribution of these two transitions in bringing about the social gap in the final outcome of interest: access to higher education. The sequential model of educational attainment focuses on the effect of social origin at each transition, which are usually estimated and discussed independently from one another. In contrast, I additionally estimated the contribution of high school graduation inequalities and inequalities in the transition to higher education in bringing about the gap in access to higher education in France. This approach echoes the work by Buis (2017) who highlights the importance to go beyond a separate discussion of the estimates at each transition as "effects on passing each transition and effects on the final outcome are not competing descriptions of the process being studied but natural complements."(Buis, 2017). With a simple decomposition calculation, replicating results from the U.S. (Bailey & Dynarski, 2011), I estimated that about three-quarters of the

college entry gap by social origin in France comes as a result of the gap in high school graduation. This significant impact of secondary education inequalities in creating the college entry gap is an important characteristic of the French system comparatively to the U.S. context.

Second, this chapter has complemented the existing literature on access to higher education by testing mechanisms of inequality accumulation during secondary school and systematically evaluating the interplay between performance and social origin in shaping access patterns. Building on the cumulative and compensatory advantage mechanisms, I have examined how the accumulation of negative educational outcomes in secondary education mediates social inequalities in high school graduation and to what extent previous academic achievements influences access patterns differently for different social groups. I conclude that students from disadvantaged backgrounds are much less likely to graduate from high school because they are more likely to perform poorly already when they enter lower secondary education at age 11. But my results also reveal that the trajectories of low-performers diverge largely depending of their social origin, and more specifically, by parental education. I find evidence of a compensatory advantage for initial low-performers with highly-educated parents, who are much more likely to graduate from high school than equally struggling students with low-educated parents. These results also point to the crucial role of formal tracking in shaping opportunities for high school attainment and suggest that track assignment is a turning point for the cumulative dimension of bad or good performance over secondary school careers. However, the few students from highly-educated background who are allocated to a vocational track are still much more likely to graduate from high school, and this further contributes to the diverging pathways of low-performing students by social origin.

Finally, I have complemented the analysis of the effect of social origin on access to higher education (any programme) with the estimations of access inequalities in their horizontal dimension. The traditional sequential model of educational transitions has been criticized for ignoring the multiple parallel alternatives students face at each transition (Breen & Jonsson, 2000; Karlson, 2011). As discussed in the first chapter of this dissertation, this is especially problematic for studying stratification in higher education as the differences in prestige across fields of study or institutions in higher education have a direct effect on labour-market outcomes and are thus especially relevant for the study of social mobility. In the case of

France, I indeed found that the effect of social origin on the transition to higher education (among eligible students) differs greatly in the vertical and horizontal dimension of stratification. When considering access to any tertiary programme, social inequalities in the transition to higher education, conditional on eligibility, are fully mediated by performance in the high school diploma, and especially by the track of the degree. In contrast, taking into account the qualitative differences between types of programmes, social origin has a large association with the type of programmes entered. In addition, the interaction between performance and social origin shows that social inequalities are larger among good-performers, who are much more likely to first enter a selective prestigious institution if they have highly educated parents. I interpret this result as the existence of a complementary mechanism to the compensatory advantage which allows socially advantaged students to capitalize on positive previous educational outcomes to a greater extent than students from disadvantaged backgrounds. In this case, the heterogeneous effects of previous educational outcomes on educational trajectories, by social origin, would not only create inequalities among low-performing students but, in certain circumstances, among good-performing ones. The combination of these two mechanisms, compensatory and reinforcement, could explain how the social gap widens in a cumulative perspective, on both ends of the performance spectrum.

These results raise important questions for future research. First of all, it is necessary to clarify how the reinforcement advantage mechanism differs from the most classical interpretation in terms of self-selection of disadvantaged students. The evidence presented here regarding the access to prestigious programmes has already been identified and interpreted as evidence of self-selection from students of disadvantaged background (for example Caille & Lemaire, 2009). The most distinctive feature between the two interpretations lies in the mechanisms which are used to explain the heterogeneous effect of good performance on further educational outcomes. As highlighted by Broccolichi & Sinthon (2011) the focus on self-selection emphasised the role of choice by disadvantaged students or their lower ambition, in creating inequalities in enrolment. In the case of access to prestigious programmes, interpreting the same access patterns in terms of a reinforcement advantage mechanism does not imply that educational aspirations have no role in the making of these inequalities, but also recognizes that entering a prestigious programme goes beyond a mere choice of track of

study. Strategic actions, such as extra tutoring, preparation for competitive examinations, multiple applications, etc... may be central in gaining access to these institutions and, because these actions are more accessible to students from higher social origin, participate in the making of inequalities among good-performing students.

Another compelling question for further research refers to *when* these two mechanisms play a role during educational careers. The results presented here suggest the prevalence of the compensatory advantage mechanism for graduation in upper secondary education and of the reinforcement advantage for entrance into prestigious programmes in higher education. It may be the case that the compensatory advantage mechanism has the larger implications for lower levels of education as it allows socially advantaged families to guarantee a minimum level of education to their children, despite their low performance. Conversely, the reinforcement advantage mechanism could be more powerful in explaining later and more prestigious educational outcomes. However, it may also be that these two mechanisms take place simultaneously along the educational career, especially depending on the nature of the education outcomes considered or the context of the educational system. For example, Bernardi & Triventi (2018) found, in Italy, a clear pattern of compensatory advantage in university enrolment after high school graduation from the academic track; and Andrew (2017) found evidence of both "protection from low achievements and greater boosts from high achievements" for high-SES students in the type of institutions attended at the transition to higher education. In contrast, I do not find evidence of a clear compensatory advantage in access to higher education in France. These differences point to the role of institutional features in shaping the compensatory or reinforcement mechanisms. As noted by Bernardi & Cebolla-Boado, (2014) "the compensatory effect will be larger in those educational systems and for those educational transitions that allow more space for manoeuvre to families". The example of the compensatory advantage identified in upper secondary graduation for students in the vocational tracks, is especially revealing in this regard. At the time of the survey, graduating from the upper secondary vocational track required four years of study after lower secondary school (compared to three years for all other upper secondary tracks) with an additional educational transition after two years, where many students chose to leave after obtaining a first-level vocational degree (BEP). Interestingly, this track has been reformed in 2009 and is now organised over three years, like other upper secondary tracks, and the

additional educational transition has been abolished, with the BEP becoming an intermediary degree. This reform has been implemented with the objective to raise the number of students from the vocational tracks reaching upper secondary graduation and data suggests that it has been very efficient in this regard, as the number of students taking the vocational upper secondary examination has increased by almost 70% between 2010 and 2014 (DEPP, 2015). It could thus provide a valuable opportunity to empirically test the importance of institutional features in the development of social inequalities by checking whether this reform has also impacted the existence and the size of the compensatory advantage for students of higher social origin in vocational upper secondary graduation.

Overall, the results presented in this chapter suggest that a longer-term perspective on the development of inequalities along the educational career has potential to increase our understanding of patterns of inequality in higher education attainment. However, two limits of these analyses must be highlighted, in relation with some central critics of the sequential model of educational transitions. From a methodological point of view, several authors (including Mare himself in Shavit & Blossfeld, 1993) have stressed that selection on unobserved variables can bias estimates from the sequential model and make the comparisons of coefficients across transitions problematic. At each transition, students at risk of experiencing it are increasingly selected on a number of unobserved variables and this unobserved heterogeneity can bias the estimated effect of social origin (for a detailed description of this issue see, for example, Lucas, Fucella, & Berends, 2011) . Several solutions have been proposed to correct for this selection bias (For example, Buis, 2011; Cameron & Heckman, 1998; Holm & Jæger, 2011; Karlson, 2011; Lucas et al., 2011a). In this chapter, however, I have applied a "conventional" sequential model (yet preferring linear models to avoid the pitfalls of estimate comparisons across logit models). This approach is still valuable in a descriptive approach to capture patterns of inequalities (Mare, 2011; Xie, 2011) but does not allow causal claims. It is thus important to keep in mind that the social inequalities estimated here say nothing about what would happen, for example, if more students would become eligible for higher education as the selection into high school graduation would be changing.

A second important limit of the school transitions approach is that it conceives the educational career as a single sequence of irreversible transitions, while in diversified education systems,

unordered transitions and alternative pathways may be common (Breen & Jonsson, 2000; Karlson, 2011). I have indeed focused on only two crucial steps along the educational career, high school graduation and transition to higher education. But recent research suggests that a detailed account of students' transitions during secondary education, especially in and out of the different tracks, can be especially useful to capture the dynamic dimension of inequality development as individual educational careers often deviate from the simplified main pathways (Hillmert & Jacob, 2010). Such an approach would be especially useful to further estimate how initial assignment into different tracks, and downward or upward mobility across them, contributes to the compensatory advantage of socially advantaged students identified here in high school graduation. Finally, I have only focused on initial access to higher education programmes, which is only one crucial step on the road to tertiary attainment. Going beyond access, I thus now turn to the effect of social origin on dropout patterns in higher education.

Chapter 3
Overcoming failure in higher education: social inequalities and compensatory advantage in dropout patterns

Introduction

On average among OECD countries, 32% of students who enter higher education do not graduate from any degree at this level (OECD, 2013). This large proportion of dropout students[2] has been a major concern in many countries and especially in the United States, where almost one out of two new entrants leave higher education without any degree (OECD, 2013). In the wake of Tinto's seminal work (1975), a long tradition of research has explored the predictors of students' dropout behaviours, but social inequalities have rarely been the focus of this literature (Chen & DesJardins, 2008). In contrast, the more recent interest of social stratification research for higher education has mainly focused on access or attainment patterns (For example, Boliver, 2011; Reimer & Pollak, 2010; Shavit, Arum, & Gamoran, 2007; Triventi, 2013) and less is known on how social background influences students' progression within higher education. This chapter builds on these two strands of research to focus on the relationship between social origin, academic performance and dropout patterns in French higher education.

In order to progress and eventually graduate from a higher education programme, students need to validate a set of courses which, in many countries, are defined for every year or semester of study. Failing to meet these academic requirements often limits progression within the programme of study and Tinto (1975) highlighted the importance of performance in higher education for dropout behaviours by first introducing the distinction between "academic dismissal" (dropout following academic failure) and "voluntarily withdrawal". This distinction has proven useful to distinguish between different profiles of dropout students (Johnes & McNabb, 2004), but fails to account for heterogeneity in responses to academic failure, as students who experience academic failure can still persist in and eventually

[2] This chapter deals with higher education dropout in its stricter definition, which refers to students who have left definitely higher education without having graduated from any degree at this level. It should be noted that, in the literature, the term "dropout" is often used to refer to students who leave a specific programme before graduating or to refer to students who leave a specific tertiary institution without having graduated from it. Whenever necessary, I distinguish these situations by using the term "non-completion" for the former and "institutional dropout" for the latter.

graduate from higher education. The present chapter thus aims to contribute to the understanding of social inequalities in higher education by studying the heterogeneous effects of performance in higher education on dropout behaviours, depending of social origin. I build on the compensatory advantage theory, which predicts that children from advantaged families are better protected from the consequences of negative life or educational events (Bernardi, 2014) and investigate how students' trajectories diverge after early academic failure in higher education, depending on their social origin. I also aim to contribute to the literature on social inequalities in French higher education where evidence on dropout in a strict sense (leaving higher education without any degree) is surprisingly scarce. Instead, several studies have identified important predictors for academic failure and non-completion of bachelor's programmes (i.e. leaving one specific programme and not accounting for transfer or re-enrolment behaviours). As academic failure in the first year of higher education is a major concern in France (Morlaix & Suchaut, 2014), I contribute to the existing literature by estimating its impact on dropout behaviours and expand the analysis to all types of higher education programmes.

Using longitudinal data on students in French higher education, I aim to answer two questions: First, what is the association between social origin, students' academic readiness[3], early academic outcomes in higher education, and dropout patterns? Second, is there evidence of heterogenous effects of early academic performance in higher education, depending on social background, as predicted by the compensatory advantage theory? I apply a discrete-time method for a competing risks event history analysis to estimate the occurrence of dropout. Although event-analysis methods have become widespread to study dropout patterns, a competitive-risks framework has rarely been used, especially acknowledging the discrete dimension of time of educational data (Ortiz & Dehon, 2013). To my best knowledge, only one study has previously applied event history analysis to study dropout patterns in France (Gury, 2011) but through a single risk and continuous time framework, which may lead to misleading results for an outcome like dropout, which is, by definition, correlated with graduation outcomes (Allison, 1984; Scott & Kennedy, 2005).

[3] "Academic readiness" is used to refer to the academic outcome of secondary education. This term is meant to indicate that the type and quality of the diploma gained in secondary education is conceived as the result of both academic abilities and family choices during the secondary school career.

Results confirm that academic failure in the first year of higher education is a strong predictor of dropout, even after controlling for academic readiness for higher education. They also support the compensatory advantage hypothesis as students from advantaged backgrounds are less likely to drop out after academic failure than disadvantaged students; and the advantage due to social origin is much larger in case of failure than in the case of success in the first year of higher education. I finally discuss how endogeneity may bias these results and provide additional analyses to test for their robustness. Finally, I test this mechanism separately for each type of tertiary programme and find support for the compensatory advantage hypothesis in all of them, despite their very different patterns of failure and dropout.

Literature review

Predictors of dropout in higher education

One of the most influential theoretical frameworks to analyse students' dropout in higher education was developed by Tinto (1975) who formalised the dropout process "as a longitudinal process of interactions between the individual and the academic and social systems of the college" and argued that it is the individual's integration into the institution that most directly influences persistence or dropout patterns. Building on this interactionist framework, various empirical studies have investigated the role of individual characteristics, academic readiness, institutional context, or social integration on dropout patterns, most often in the American higher education system. However, the longitudinal nature of the dropout process has only started to be taken into account recently (DesJardins, Ahlburg, & McCall, 2002). In addition, it has been noted that the "existing studies of student departure have given only limited consideration to social class discrepancies" (Chen & DesJardins, 2008). In the U.S., where the cost of higher education has been a rising concern, it has been estimated that controlling for students' performance, social integration and institutional characteristics, high-SES students are still significantly less likely to dropout from their first institution compared to low-SES students (Chen, 2012), or that first-generation college students (i.e. whose parents never attended college) are 25% more likely to dropout, controlling for previous academic preparation and educational expectations (Ishitani, 2006). In the U.K., where dropout rates are lower than in the U.S., social origin has also been identified as a

predictor of dropout (Johnes & McNabb, 2004; Smith & Naylor, 2001) and has a direct effect on dropout behaviour even after accounting for differences in high school preparation (Vignoles & Powdthavee, 2009). In countries where the cost of higher education is much lower, such as Italy, it was estimated that the risk of dropout for students with parents who have at most compulsory schooling is about 50% higher than for more advantaged students, (Aina, 2013), and that the impact of parental education and of parental class remains substantial after controlling for academic preparation in high school (Contini, Cugnata, & Scagni, 2018). In the French community of Belgium, "having a mother with a higher education degree reduces the odds of dropping out by 20% and, at the same time, it increases the probability of graduation by 30%, all relative to continuous enrolment" (Ortiz & Dehon, 2013). As expected, good academic preparation (as measured by high school performance) and performance in higher education are consistently found to be positively associated with students' persistence in and graduation from higher education, and negatively associated with dropout (Arulampalam, Naylor, & Smith, 2005; DesJardins, Ahlburg, & McCall, 2006; Gury, 2011; Johnes & McNabb, 2004; Ortiz & Dehon, 2013). In addition, analyses in Norway show that there is a large association between social class and academic performance in higher education and that it is partially, but not fully, mediated by performance in secondary education (M. N. Hansen & Mastekaasa, 2006). However, heterogeneity in the effect of academic performance on dropout patterns, by social origin, remains largely unexplored. To my best knowledge, only Contini et al. (2018) recently estimate the social gap in persistence in higher education separately for different academic profiles of students, and find that social inequalities are much larger among students with the weakest academic background.

Inequalities in students' progression in French higher education

Results on the trends in French higher education attainment over the 20th century suggest that the impact of social background on postsecondary attainment, conditional on high school graduation, has increased for cohorts born after 1965, leading the authors to conclude that "as the access to high school became more and more general, the participation in higher education of culturally and socially disadvantaged children widened. But conditional on having a high school diploma, their relative chance to complete tertiary education has declined compared to children from more affluent backgrounds."(Givord & Goux, 2007). However, these results do not control for students' previous performance and it is possible that the

impact of social background on higher education attainment is fully mediated by differences in academic readiness for higher education.

A number of studies have investigated the effects of individual students' characteristics and contextual factors on students' failure, success or attainment in French higher education (for an overview see Duguet, Mener, & Morlaix, 2016). Results have consistently highlighted the importance of academic readiness, measured by performance in secondary education, on further success in higher education. For example, Morlaix & Suchaut (2014) conclude that the track of the high school diploma is the strongest predictor of grades in the first year of a bachelor's programme and accounts for a quarter of the observed variance. Similarly, Gury (2011) found that the track of high school diploma and the distinction obtained, significantly impact the probability of dropout. However, there is no consensus regarding the net effect of social background, once controlled for differences in performance in secondary education. While some authors have concluded that social origin plays a small or negligible role in students' success in higher education, (Brinbaum, Hugrée, & Poullaouec, 2018; Duguet et al., 2016; Félouzis, 2000), others found that social origin, even after controlling for secondary performance, has a significant impact on the probability of dropout (Gury, 2009, 2011) or on the probability of staying enrolled in higher education (Jaoul-Grammare & Nakhili, 2010). Finally, Fack and Grenet (2015) have shown that the large need-based grant system in France is successful in supporting low-income students' persistence in and graduation from higher education.

With a few exceptions, most of the studies discussed here have focused exclusively on predictors of success in bachelor's programmes in universities but much less in known on students' progression in short-cycle and prestigious selective programmes. In addition, the connection between academic failure in the first year of higher education and dropout behaviours has not been assessed, although this question is highly relevant to develop policies that aim to reduce dropout and inequalities in higher education.

Theoretical background

As described in the previous chapters, the compensatory advantage theory posits that socially advantaged individuals are less affected by prior negative events than disadvantaged ones; a mechanism which contributes to increasingly divergent trajectories over time by social origin

(Bernardi, 2014; Bernardi & Cebolla-Boado, 2014). Regarding higher education outcomes, Milesi (2010) found that in the U.S., interruption in enrolment and part-time enrolment is more detrimental to bachelor's completion for disadvantaged students, although the opposite is true for interruption of enrolment and attainment of an associate's degree. Similarly, a deviation from continuous enrolment in the first year of higher education appears to have larger negative consequences for disadvantaged students' trajectories, as the degree of path-dependency differs by social background (Pfeffer & Goldrick-Rab, 2011). Although this chapter only tests the relevance of the compensatory advantage hypothesis in dropout patterns, it is useful to discuss the specific mechanisms which could drive the compensatory advantage at the last stage of the education system. Most of the literature on the compensatory advantage has focused on younger students and discussed theoretical expectations which are related to parental investment responses to negative events (for example, Grätz, 2015a). As young adults in higher education should be more independent from their parents (Müller & Karle, 1993), why should we expect tertiary students to react differently to academic failure based on their social background? First, given that I am only looking at dropout behaviours and not completion of a higher education degree, the relative risk aversion model (RRA, Breen & Goldthorpe, 1997) implies that, independently of their chance of success, upper class students will choose to continue in school, except if they estimate their chance of staying the upper class to be greater by leaving school, than by staying and failing (Lucas, 2009). Independently of academic performance, persistence in higher education is thus expected to be greater for upper class students. Second, the literature on higher education has long highlighted financial barriers (for example, Goldrick-Rab, 2016; Kane, 1995) and more recently information biases (Abbiati & Barone, 2017; Usher, 2005) as drivers of social inequalities in higher education. Disadvantaged students may face these barriers to the same extent at every point of their higher education studies. However, it may be that the lack of information or the cost of higher education becomes more or less salient and problematic depending on the trajectories of the student: when everything goes well, a student can follow a structured path of study with a budget that can be anticipated. When something goes wrong along the path, it may become necessary to activate additional information to re-orientate, or additional funds to pay for an extra year of education, leading to larger inequalities in case of academic failure than in case of success. I am not aware of any empirical study which addresses these questions. But in a higher education system like the French one, with relatively low tuition fees, a large need-

based grant system and very structured higher education programmes, it is possible that barriers faced by disadvantaged students are significantly reduced in case of successful academic progression and become salient mainly in case of academic failure. Finally, another possible mechanism would be that disadvantaged students who fail at the beginning of their study are more responsive to this signal and more likely to lower their educational aspirations, compared to students from privileged backgrounds. The information that students receive about their academic performance in higher education through the grades they are given, is estimated to explain 45% of dropout in the first and second year of higher education in the U.S. (Stinebrickner & Stinebrickner, 2014), and it may be that disadvantaged students are more responsive to information about low performance when evaluating their chance of further success in higher education. Whether it is driven by relative risk aversion, financial and informational barriers, or responsiveness to ability information, I expect academic failure in the beginning of higher education studies to have a larger negative impact on dropout and persistence for disadvantaged students than for students from privileged backgrounds.

Methodological approach

Event history analysis is a method specifically developed to analyse the occurrence and timing of events. One of its major advantages is its capacity to deal with censored information which occurs when information is missing because of a limited observation period (Yamaguchi, 1991). The advantages of event history analysis (EHA) for educational research have been described as early as 1991 (Willett & Singer, 1991). Although, this method had first been used "infrequently" (DesJardins et al., 2002), a growing number of studies have relied on it to analyse student attrition.

Central concepts in event history analysis include the *event* of interest which refers to the transition from one state to another over time and the *risk set* which identifies the group of individuals at "risk" of experiencing the event during each time period. In the case of students' dropout, transition from enrolment to non-enrolment is identified as the event of interest and an individual must be enrolled in an educational programme in time *t* to be considered at risk of experiencing dropout. However, if we define dropout as leaving higher education without any degree, students who have graduated cannot experience dropout anymore and thus leave the risk set. Several authors have highlighted the fact that applying single-outcome models for

correlated outcomes may bring misleading results (Allison, 1984; DesJardins et al., 2002; Scott & Kennedy, 2005) and that "if we are to estimate and interpret hazards correctly, all nonignorable ways of leaving the risk set must be treated as outcomes of interest"(Scott & Kennedy, 2005). Since dropout and graduation can be considered as intrinsically discrete events (i.e. they can only occur in specific points in time), I further apply a discrete-time method for a competing risks event history analysis, developed by Scott & Kennedy (2005) and applied for example by Reisel & Brekke (2010), Ortiz & Dehon (2013) and Clerici et al. (2015).

This approach uses multinomial logistic analyses to model the impact of different predictors on the hazard of competing events. The discrete-time hazard in a single risk framework is defined as "the conditional probability that individual *i* will experience the event in time period *j*, given that he or she did not experience it in any earlier time"(Singer & Willett, 2003). In the case of competing risks, the hazard refers to the conditional probability that an individual experiences one of the competing events, given that he or she has not experienced *any of the competing events* before (Scott & Kennedy, 2005). The multinomial logistic regressions estimate the hazard of experiencing dropout (and graduation) by estimating a baseline logit function which models the hazard in each time period (in this case, with a set of time dummies) and by adding predictors to quantify the shift from the baseline logit hazard resulting from one-unit change in the values of the predictors. Formally, the hazards are estimated with:

$$Logit\left[\frac{h_i(k,t)}{h_i(0,t)}\right] = \left(\alpha_{k1}D_{i1} + \cdots + \alpha_{kJ}D_{iJ}\right) + \left(\beta_{k1}X_{i1} + \cdots + \beta_{kj}X_{iJ}\right)$$

where outcome k ranges from 1 to K (non-event 0 is not considered as an outcome), time j ranges from 1 to J, and $h_i(k,t)$ is the hazard for subject i to experience outcome k at time j. $[D_{i1}, \ldots D_{iJ}]$ are time dummies and each parameter α represents the level of hazard for each time period for the baseline group. $[X_{i1}, \ldots X_{iJ}]$ are the set of substantive predictors and each slope parameter β gives the effect of the predictor on the value of the logit hazard. In the competitive-risk approach, $e^{\beta k1}$ thus represents the multiplicative effect of a shift of one unit in the predictor on the hazard ratio $\left[\frac{h_i(k,t)}{h_i(0,t)}\right]$.

In order to carry out the discrete-time event history analysis, the data is set in the person-period format where, for each time period, three events are possible: either dropout of higher education, graduation, or non-event which, in most cases, refers to re-enrolment without graduation (but which in a few cases may be temporary interruption of studies or "stop-out"). In order to explore the patterns of dropout by social origin, I first discuss the hazards and cumulative probabilities for the outcome dropout. In a second step, I estimate the association between social origin, academic performance and dropout and graduation through the discrete-time hazard model. Finally, I add in this model an interaction term between social origin and academic performance in the first year of higher education and discuss the contrast of predicted hazards of dropping out by social origin and academic performance.

It is important to keep in mind that the hazard ratios in these models compare the hazard of the outcome of interest *to the hazard of the non-event*, which in our case, refers to persistence *without graduation*. This makes the hazard ratios especially difficult to interpret because the prevalence of the non-event, and its association with the different explanatory variables, depends of the graduation opportunities in each programme, and for each year of study. For example, given that professional programmes are usually organized to award a degree after two years while prestigious programmes typically award a degree only at the end of the fifth year, persistence without graduation is a much more common outcome in prestigious programme than in professional programme. Thus, persistence without graduation may capture either the top-performing students enrolled in long-programmes (mainly from socially advantaged background) or students in shorter programmes with academic difficulties (typically from socially disadvantaged background) so the association between the independent variables and the non-event is difficult to interpret. As a robustness check, the analyses are thus replicated separately for each type of programme. In addition, I discuss the average marginal effects and the contrast of predicted hazard of dropout, which captures the association between the explanatory variables and dropout without reference to the patterns of persistence without graduation.

Data description

The analysis draws upon the survey "Enquête sur le devenir des bacheliers - 2008-2012" (SIES, 2012) which collected detailed information on a representative sample of students who

became eligible for higher education (i.e. graduated from high school) in 2008. They filled out yearly questionnaires on their family background, educational experiences and living conditions for five years. In addition, the survey collected administrative data on the students' trajectories in secondary education and their performance in the high school diploma.

The aim of this chapter is to estimate the full association between social origin and dropout behaviours. Using only one indicator of social background can lead to an underestimation of this relationship, so I combine the indicators of parental education and parental class to estimate the total effect of social origin (Bukodi & Goldthorpe, 2013). I use the highest degree obtained by both parents and their highest social class. In order to avoid having too many combinations of social origin, I focus on the presence or absence of two key "resources" in the familial household: having at least one tertiary-educated parent and having at least one parent in the salariat. I thus distinguish between four combinations of social origin: not having any parent with a higher education degree nor in the salariat; not having a tertiary-educated parent but at least one in the salariat; having at least one tertiary-educated parent but none in the salariat; and having at least one tertiary-educated parent and at least one in the salariat. In the following results section, I mainly focus on the two extreme categories which account for the largest share of students among high school graduates (close to 50% for the least advantaged "no higher education & no salariat" and almost 30% for the most advantaged category "at least one higher education and one salariat"). Unfortunately, this database collects but does not make available information on students' nationality, but all students have graduated from a French high school.

Three indicators of high school performance are used as proxies of students' level of academic preparation. First, the track of the high school diploma (academic, technological, or vocational) is a good indicator of academic readiness for higher education, as their curricula differ greatly in how they prepare students either to continue in higher education or to enter the labour-market. Broadly speaking, the academic track most often leads to university or prestigious programmes, the technological track leads to short cycle vocational tertiary programmes, and the vocational tracks most often lead to the labour market (Ichou & Vallet, 2011). In addition, students' performance is measured with their age at high school graduation (on time, one year late, two years or more late) and with the distinction obtained in the high school diploma. In France, students graduate from high school through a nationally

standardised examination and are granted the degree if, despite below average grades in the written examinations, they can compensate with oral examinations (second session), or if they obtain at least 10/20 in the written examinations (pass in the first session). Students who obtain an average of at least 12/20 in the written examinations are awarded the diploma with distinction.

Academic progression in French higher education remains relatively structured. Although course organisation and requirements vary by programme and institution, each year in postsecondary education is typically organised in two semesters for which students need to validate a core set of courses which represent 30 ECTS. Students usually need to reach the pass mark (10/20) for each semester, to be allowed to register in the subsequent year. They may be allowed to register in the subsequent year if they pass only one semester but will need to further re-take the courses not validated. Students who do not pass any semester or are absent for any examination, are not allowed to register for the following year of the programme and must repeat the year. In addition, part-time studies do not exist. As an indicator of early academic outcome in higher education, I thus use the variable which indicates whether a student met the first-year academic requirements and was therefore allowed to enrol in the second year of the programme, or whether he or she failed to meet these requirements.

Information on the type of programme followed by students in this first year is also included. It is classified in three categories which broadly proxy three types of learning environment: professional programmes (including short cycle BTS or IUT, and social work and nursing programmes) which select students and offer relatively small or moderately sized class environments; academic programmes offered in universities (i.e. bachelor's programmes, including medicine) which are not selective and welcome every year very large cohorts of students; and academic programmes in prestigious institutions defined as being enrolled in a "preparatory programme for admission to grandes écoles" (CPGE) or in a grande école, which are characterised by small class sizes and tight social and learning communities.

It is important to note that the information on academic outcomes in higher education was only collected in 2009, i.e., in the first year following students' graduation from high school. The analysis is thus limited to students who enrolled in higher education immediately after high school graduation. In France, however, only a small minority of students delay their entry

into higher education: In the whole sample, among students who enter higher education within five years, 92% did so immediately after high school graduation. Students who delay their entrance to higher education drop out more often than those who made this transition immediately (30% of dropout versus 17%) so focusing on students enrolling immediately in a higher education programme is expected to lead to a small underestimation of dropout rates. However, the proportion of students delaying their entrance to higher education does not vary by parental education (7.6% for all levels of parental education) and only slightly by parental class (from 6.2% for the salariat to 8.2% for the intermediate class) so I do not expect their exclusion to systematically bias the estimations of the impact of social background on dropout patterns.

The analytical sample refers to 5,590 students who entered higher education (excluding postsecondary non-tertiary programmes) following their high school diploma and with complete trajectories. As can been seen from Table 3.1, failure in the first year of higher education is not a rare event: one student out of four experiences it. It should also be noted that the occurrence of failure is similar across social groups: 27.5% of students with no tertiary-educated nor in salariat parents fail in their first year, while this is the case for 25% of students with highly-educated, upper-class parents.

The main outcome of interest is dropout, which is defined as leaving higher education without any degree for two consecutive years. However, since enrolment data is available for five years, dropout in the fourth year is defined by non-enrolment for one year only. This may lead to an overestimation of dropout in the fourth year, by classifying what is actually a temporary interruption of studies as dropout. However, this bias is expected to be relatively small for the following reason: At the beginning of higher education, the share of students who stop their studies for one year, but further re-enter higher education is important, a fourth of the students (27%) not enrolling in the second year, actually re-enrol in the third year. However, this proportion decreases in every year of postsecondary studies. In the third year, among the 249 students who interrupted their studies, only 42 (17%) re-entered a tertiary programme after one year. This pattern confirms findings from the U.S. where it has been shown that the later students interrupt their enrolment, the less likely they are to return (Pfeffer & Goldrick-Rab, 2011). In addition, among students who leave higher education, re-enrolling after a year or more of interruption is more common for socially advantaged students: while 40% of

students from the most advantaged social backgrounds who left higher education eventually re-enrolled by the fifth year, this is the case for only 11% of the most disadvantaged ones. Thus, defining dropout in the fourth year as non-enrolment for one year only can be expected to *underestimate* the social gap in dropout patterns.

It should be noted that these data do not allow us to focus on graduation patterns: information on dropout and graduation is only available for the first four years of postsecondary education but many students are expected to graduate later (right-censored cases). This is especially the case of students following the most prestigious programmes (around 14% of all students) who can only graduate after at least five years of postsecondary education. Thus, graduation hazard is modelled in the following analyses only to estimate correctly the risk of dropout but is not directly interpreted.

Table 3.1: Descriptive statistics of the study sample

New entrants in higher education in 2008

Variable		Frequency	Percent
Gender	*Male*	2 553	45.7%
	Female	3 037	54.3%
Parental education	*Less than high school*	2 050	36.7%
	High school	1 025	18.3%
	Tertiary	2 515	45.0%
Parental social class	*Working class*	833	14.9%
	Intermediate	2 765	49.5%
	Salariat	1 992	35.6%
Summary parental background	*Less than HE & less than salariat*	2 708	48.4%
	Less than HE but salariat	367	6.6%
	HE but less than salariat	890	15.9%
	HE & Salariat	1 625	29.1%
Track of high school degree	*Academic*	3 343	59.8%
	Technological	1 497	26.8%
	Vocational	750	13.4%
Age at high school graduation	*On time or in advance*	3 587	64.2%
	One year late	1 501	26.9%
	2 years late or more	502	9.0%
Performance in high school degree examination	*Second session*	587	10.5%
	pass	2 142	38.3%
	Distinction	2 861	51.2%
Academic outcome in first year of higher education	*Pass*	4 127	73.8%
	Fail	1 463	26.2%
Type of higher education program in first year	*Professional*	2 856	51.1%
	Academic in university	1 955	35.0%
	Academic in prestigious school	779	13.9%
Number of observations		**5 590**	

Source: Enquête sur le devenir des bacheliers - 2008-2012.

Results

Hazards and cumulative probabilities of dropout

I compute the hazard profiles and cumulative probabilities using the measures developed by Scott & Kennedy (2005) for a competing risks discrete-time event analysis that accounts for the fact that students leave the risk set for dropout when they graduate. For each year after high school graduation, students are at risk of dropping out or of graduating if they are enrolled in a higher education programme and have not experienced *any of these two events* before. Table 3.2 shows that in the first year of higher education, among the 5,590 students with complete trajectories, 243 definitely left higher education and none graduated (since it is not possible in the first year). In the second year, only 5,258 students remain in the risk set because, in addition to the 243 students who dropped out, 89 students temporarily interrupted their study: they were not anymore enrolled in higher education in the second year, and thus did not contribute to the risk set at that time, but re-enrolled (and thus re-entered the risk set) later.

The graduation hazards are included to show the importance of this competing event in dropout estimations but, as mentioned earlier, a non-negligible share of students will only experience graduation in the fifth year.

Table 3.2: Discrete time hazards of dropout and graduation, students entering higher education immediately after high school graduation

		Frequency		Hazards		Cumulative probabilities	
Year	Population	Drop-out	Graduation	Drop-out	Graduation	Drop-out	Graduation
1	5590	243	0	4,3%	0%	4,3%	0%
2	5258	340	1965	6,5%	37,4%	10,5%	35,7%
3	2975	208	1234	7,0%	41,5%	14,3%	58,0%
4	1555	105	448	6,8%	28,8%	16,2%	66,0%

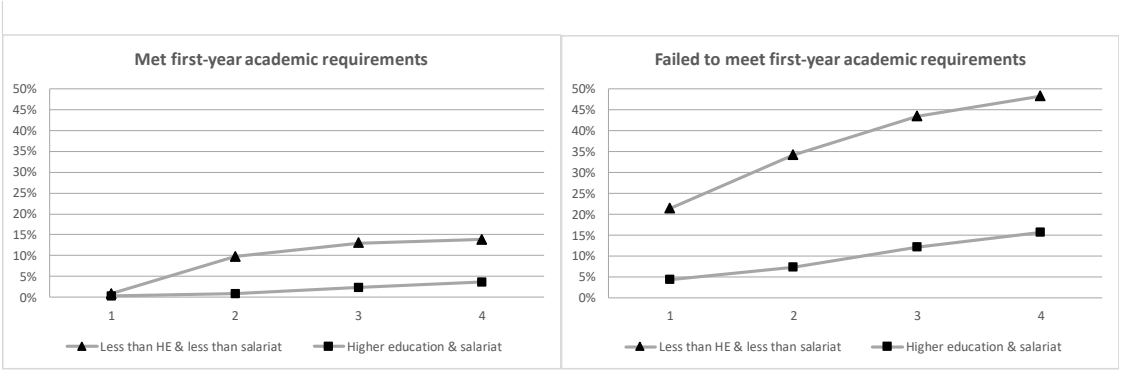
Source : Enquête sur le devenir des bacheliers-2008-2012.

In this sample, the hazard of dropout ranges from 4.3% in the first year to 7% in the third year, translating into a cumulative probability of dropout of 16.2% after four years. These are lower hazards than dropout estimates from other national contexts, but it is important to remember that, in many cases, studies rely on data from one specific university (Arulampalam et al., 2005; DesJardins et al., 2006; Meggiolaro, Giraldo, & Clerici, 2015; Ortiz & Dehon, 2013) and thus estimate institutional dropout (leaving one specific institution without accounting for

transfer), which is likely to be much larger than higher education dropout. In the French context, dropout had been estimated to amount to 22% for students entering university or professional programmes around 1996 and who were followed for seven years (Gury, 2009). With the same dataset that I use here, but without an event-history method, the French Ministry of Education estimated that 17% of students left higher education without any degree (Jaggers, 2015).

An interesting result from the hazard profile of dropout in France is that, contrary to what is usually thought, dropout does not happen mainly in the first year of higher education. Indeed, the annual dropout hazard is higher in the subsequent years and the cumulative hazard probability increases most in the second year. Turning to results by social background, the cumulative probability of dropping out by four years is about 6.6% for students from privileged backgrounds, while it amounts to 23.1% for the least advantaged ones. To explore the compensatory advantage hypothesis, it is possible to plot the social gap between the cumulative probabilities of students who failed to meet the academic requirements in the first year versus those who passed.

Figure 3.1: Cumulative probabilities of dropout by academic outcome in first year of higher education and social background; students entering higher education immediately after high school graduation



Source : Enquête sur le devenir des bacheliers-2008-2012.

As shown in Figure 3.1, the influence of social background is indeed much larger for students failing their first year: Almost one of two disadvantaged students have dropped out by the fourth year while this is the case of only 15.7% of advantaged students, i.e. a gap of 33 percentage points by social background. In case of success, however, there is only a 10 percentage point gap in cumulative probabilities, based on social background.

What is the relationship between social origin, academic performance, and the risk of dropout?

The results of the discrete-time competitive-risks event history analysis, using multinomial logit models, are presented in Table 3.3. As mentioned earlier, the focus of this paper is on dropout patterns so estimation results of graduation are only presented in Appendix 3 (Table 3.A). Similarly, as mentioned earlier, the non-event (persistence without graduation) captures different types of students depending on the opportunities of graduation in each programme, so I only discuss the average marginal effects which show the expected change in the hazard of dropout, independently from the hazard of persistence without graduation. The hazard coefficients and ratios are presented in Appendix 3 (Table 3.A).

Model 1 provides an estimation of the total effect of social origin on the hazard of dropout in each year of higher education in France. Not controlling for any indicators of students' academic performance, the total association between social background and students' dropout behaviours is very large: being from the least advantaged social origin multiplies by more than six the hazard ratio of dropping out, compared to staying enrolled without graduating. In absolute terms, there is 7.4 percentage points difference in the annual hazard of leaving higher education without a degree. Since the annual hazard of dropout is relatively low in France (between 4% and 7%), the estimated total effect of social background is substantial. The second model includes variables which control for students' academic preparation. Previous studies in France suggested that the effect of social origin in higher education is almost fully mediated by differences in high school performance (Duguet et al., 2016): As social background strongly influences the track and the performance of students in secondary education, students from lower social backgrounds enter less prepared, academically, to higher education and, as a consequence, drop out more often.

The results confirm that academic readiness is a strong predictor of dropout behaviours but also point to a non-negligible direct effect of social origin on dropout behaviours. The track of the high school diploma, which is the best indicator of students' academic preparation for higher education, has the largest effect on the hazard of dropout and this is consistent with prior research on dropout in French higher education (Gury, 2011). Students holding a vocational high school diploma are annually 15.1 p.p. more likely to leave higher education without a degree than students who graduated from the academic track. However, despite

the importance of academic readiness indicators on dropout patterns, I find a net effect of social origin which is still sizeable: controlling for indicators of academic readiness, students from a disadvantaged background have a hazard of dropping out that is 3.2 percentage points higher, *every year*, than students from the most privileged families.

Table 3.3: Estimation results for dropout, students entering higher education immediately after high school graduation

Average marginal effects from multinomial logit models

Variables		Model 1		Model 2		Model 3	
Gender	Male (reference category)						
	Female	-0.006*	(0.004)	0.004	(0.004)	0.001	(0.004)
Social background	Less than HE & less than salariat	0.074***	(0.004)	0.032***	(0.004)	0.030***	(0.004)
	Less than HE but salariat	0.034***	(0.007)	0.013*	(0.007)	0.022***	(0.008)
	HE but less than salariat	0.026***	(0.005)	0.021***	(0.006)	0.017***	(0.006)
	HE & Salariat (reference category)						
Age at upper secondary graduation	On time or in advance			-0.017***	(0.004)	-0.015***	(0.004)
	1 year late (reference category)						
	2 years late or more			0.008	(0.006)	0.008	(0.006)
Track of upper secondary degree	Academic			-0.042***	(0.004)	-0.045***	(0.005)
	Technological (reference category)						
	Vocational			0.151***	(0.012)	0.158***	(0.013)
Distinction in upper secondary degree	2nd session			0.048***	(0.008)	0.033***	(0.007)
	No distinction (reference category)						
	With distinction			-0.036***	(0.004)	-0.030***	(0.004)
Academic outcome in 1st year	Passed (reference category)						
	Failed					0.077***	(0.005)
Type of HE program-1st year	Professional					-0.002	(0.005)
	Academic in university (reference)						
	Academic in prestigious school					-0.016**	(0.008)
Years	1st year	Reference				reference	
	2nd year	0.021***	(0.004)	0.023***	(0.004)	0.030***	(0.004)
	3rd year	0.034***	(0.006)	0.054***	(0.006)	0.038***	(0.005)
	4th year	0.039***	(0.008)	0.076***	(0.010)	0.041***	(0.007)
LL		-9200		-8543		-7416	
Number of individuals		5 590		5 590		5 590	

Standard errors in parentheses

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

Source : Enquête sur le devenir des bacheliers-2008-2012.

Finally, Model 3 includes the indicators of early outcomes in higher education. Interestingly, controlling for failure in first year of higher education and the type of higher education programme, only reduces very slightly the net effect of social origin on dropout patterns (with the exception of the small group of first-generation college students with at least one parent in the salariat, for whom the disadvantage actually increases). In addition, results suggest that failing to meet academic requirements in the first year of higher education has a large impact on the hazard of experiencing dropout, even when controlling for students' academic preparation in high school. On average, the probability of dropout is 7.7 p.p. higher every year for students who fail to meet academic requirements in the first year. This is the largest effect in absolute terms, after the effect of the high school vocational tracks. This result highlights that early academic outcomes in higher education may have a large impact on dropout patterns, independently of students' academic readiness for higher education. Finally, and independently of academic performance, being first enrolled in a prestigious selective programme appears to reduce the hazard of dropping out without a degree by 1.6 p.p. every year. This finding is not surprising, as students in these programmes are expected to be positively selected on a number of unobserved variables that affect dropout (especially educational aspirations) and because these programmes offer better alternative options in case of failure (pathways to enrol directly in the last year of a bachelor's programme, for example). However, it is striking that students in professional and in university programmes do not differ, once controlling for their academic performance, in their hazard of dropout. As mentioned earlier, research on dropout or graduation in French higher education has almost exclusively focused on university students but these results indicate that students' dropout should also be a concern in professional programmes.

Does the effect of early academic failure on dropout vary by social background?

The compensatory advantage hypothesis predicts that the consequences of a negative educational outcome, such as failing to meet academic requirements in the first year of higher education, will be larger for disadvantaged students and that the influence of social origin will be smaller for students succeeding in their first year. In order to test this hypothesis, I included an interaction term between the academic outcome in the first year and parental education. Table 3.4 presents the change in the predicted hazard of dropout associated with being from the most advantaged background, versus the most disadvantaged one, by the academic

outcome of the first year in higher education. The estimates from the multinomial logit model are included in Appendix 3 (Table 3.B). I first estimate the total heterogeneity effect of failure by social background (Model 4). Not controlling for students' academic readiness for higher education, being from an advantaged background *annually* decreases the risk of dropout by 13.5 percentage points for students who fail in their first year. Supporting the compensatory advantage hypothesis, the advantage of students with highly-educated upper-class parents, although still substantive, is much smaller (4.5 percentage points) for students succeeding in their first year.

As mentioned earlier, failing in the first year of higher education is common in France for students from all social origins. However, it may be that students from different social backgrounds fail for very different reasons and this would explain the compensatory advantage of social origin identified here. For example, disadvantaged students, who tend to have a weaker academic background, may lack crucial skills to succeed in higher education and be unable to gain a degree. In contrast, students with a higher social origin, who are also better prepared academically for higher education, would fail because they had chosen programmes of study with higher risks of failure or because they lack interest and motivation for the specific programme. These students would further still be able to graduate from higher education, even if it is from a different programme than where they were initially enrolled. Although I do not test directly for these explanatory hypotheses, I introduce controls for students' academic readiness, measured as track, age and performance in the high school diploma to see if the compensatory advantage holds once considering the differences in students' academic skills.

Results from Model 5 show that controlling for academic readiness does largely reduce the advantage of students from advantaged social backgrounds, but the evidence of a compensatory advantage remains large. Social background only has a small (1.7 p.p.) effect on dropout hazard for students who meet academic requirements in the first year of higher education, net of academic readiness. Conversely, for students failing in the first year, the difference due to social origin is estimated to be 6.5 percentage points every year. Again, given that the baseline of dropout hazard in French higher education is between 4% and 7% every year, the social origin advantage, in case of failure and controlling for academic readiness, can be considered as a large one.

Table 3.4: Effect of social background on the hazard of dropout, by academic outcome in first year

Contrast of predicted hazards of dropping out from models including an interaction term between social background and academic outcome in first year of higher education

		Model 4			Model 5			Model 6		
Social background	**Academic outcome in 1st year**	Contrast of predicted margins	S.E.	P>chi2	Contrast of predicted margins	S.E.	P>chi2	Contrast of predicted margins	S.E.	P>chi2
HE & Salariat vs no HE & no salariat	Passed	-0,045	0,004	0,000	-0,017	0,004	0,000	-0,015	0,004	0,001
	Failed	-0,135	0,010	0,000	-0,065	0,011	0,000	-0,067	0,010	0,000
Controls										
Gender		YES			YES			YES		
Academic readiness		NO			YES			YES		
Type of HE program-1st year		NO			NO			YES		
Years		YES			YES			YES		
Log Likelihood		-8 764			-8 108			-7 410		

Source : Enquête sur le devenir des bacheliers-2008-2012.

Finally, previous research and the preceding chapter have shown that, even with a similar level of performance in high school, students from disadvantaged backgrounds tend to choose different programmes than their more advantaged counterparts (Caille & Lemaire, 2009). It may thus be that socially advantaged students fail in programmes that offer better options in case of academic problems (either to get academic support, repeat a year or to change programme). I thus additionally control for the broad three categories of programme (professional, university or prestigious) in which students were enrolled in their first year (Model 6). The evidence of the compensatory advantage is the same than in the previous model and confirms the larger negative impact of early failure for disadvantaged students on dropout patterns.

Table 3.C (in Appendix 3) displays the contrast of margins for each social background category compared to the most disadvantaged students ("no HE & no salariat") and suggests that it is parental education which mainly drives the compensatory evidence highlighted here. Having at least one tertiary-educated parent, even without any in the salariat, reduces the dropout hazard by 4.3 p.p. every year, with all control variables included. In contrast, having at least one parent in the salariat but none with a higher education degree (which is also a relatively uncommon combination, only 6.6% in the analytical sample) is not associated with any difference in dropout behaviours compared to the most disadvantaged students, once

controlling for all academic readiness variables and in case of success or failure in the first year in higher education.

Endogeneity concerns

Academic failure in the first year of higher education does not occurs at random and one can hardly argue that early failure is exogenous to dropout: students who fail in the first year of higher education are expected to differ from those who pass in many observed and non-observed traits and some of these traits are likely to be associated with dropout behaviours. My estimations of the compensatory advantage can thus be biased if the traits associated with both failure and dropout are unevenly distributed across social groups. Biases induced by selection on unobserved variables, typically cognitive or non-cognitive skills and anticipated choices, are a typical problem in research on the compensatory advantage (Bernardi, 2012) and it is important to identify how this may affect the present results.

The first obvious characteristic which may lead to both academic failure and dropout in higher education refers to lower academic ability. I argue that I was able to control well for ability differences by including variables for high school track, age at graduation and distinction. My indicators of academic ability and readiness for higher education are measured only one year before academic failure, come from administrative sources, and are comparable across students as they are based on curricula and examinations which are nationally standardised. However, I am not controlling for non-cognitive skills nor for anticipated choices. There are a number of non-cognitive skills that may be relevant to success in higher education: perseverance, critical thinking, autonomy, motivation etc. If salariat students perform better on these non-cognitive skills (for example, because we expect family background to be crucial for their transmission), then my estimates of the compensatory effect would be upwardly biased. On the other hand, one can argue that high school graduates coming from disadvantaged backgrounds are likely to be positively selected on some of these non-cognitive traits compared to their upper-class peers: since graduating from high school is much more common among upper-class students, those from lower backgrounds who reach this level and enrol directly in higher education can be expected to perform better on a number of non-observable skills (the differential selection during the school career as suggested by Mare, 1981). In this case, the estimated social gap in dropout after academic failure would be underestimated.

Finally, one can expect that some students fail their first year of higher education because they have already decided that they want to stop their studies. If such anticipatory decisions are more common among first-generation college students, then my estimates of the compensatory advantage after failure are again upwardly biased.

In order to check whether the evidence of the compensatory advantage found after failure in higher education is robust, despite these possible biases, I use two strategies. First, I distinguish between students who fail their first year because they failed in the examinations, from those who withdraw before the end of the academic year, in order to partly account for anticipatory choices. Second, I replicate the analyses on the best high school graduates only, since disadvantaged students in this group can be expected to be strongly positively selected on non-cognitive skills. The estimates of the compensatory advantage after failure in higher education in this specific group can thus be interpreted as a lower bound estimate of the compensatory advantage.

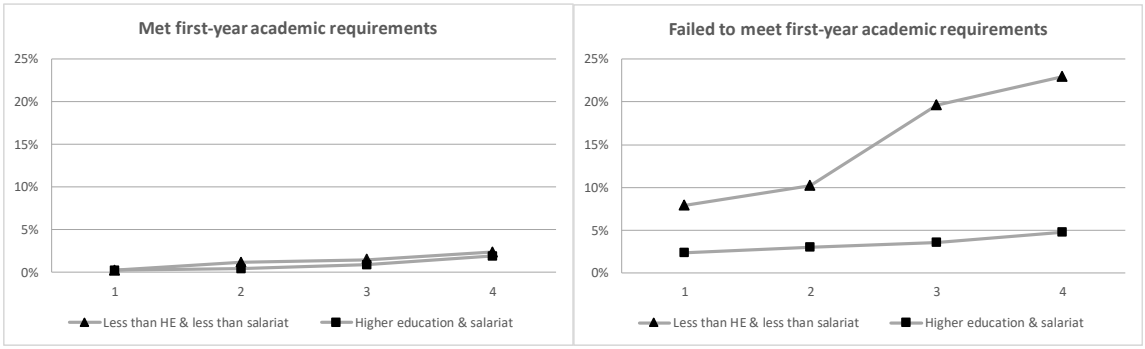
The information about failure and success in the first year of higher education allows us to distinguish between students who did not finish the academic year and thus to account partially for anticipatory decisions. Contrary to secondary education, students in higher education can easily stop their study at any point in the academic year, so one can argue that those who decide to take all examinations are less likely to have already decided to drop out from higher education. It may be that some students, although they have already decided not to re-enrol afterwards, still attend the whole academic year, but the anticipatory decisions bias should still be smaller in the group of students who reported failing their examinations. I thus replicated the previous analyses with a variable of performance in the first year which can take three values: pass, fail and withdrawal. The interaction terms between performance in the first year and social origin indicate that the impact of social background on dropout is much larger, -10 percentage points, for students who reported leaving the programme before the end of the academic year. Nevertheless, the compensatory advantage hypothesis is still confirmed for students who failed examinations: controlling for academic readiness and type of programme, students from a privileged background are every year 5.8 points less likely to dropout than disadvantaged students (Table 3.D in Appendix 3).

I then narrowed the sample to students who graduated on-time from an academic track and obtained a distinction: this group (N=1 672) represents around 30% of the initial analytical

sample and only includes high school graduates who are best prepared for successful higher education studies. The aim is to focus on students who are most homogenous in terms of ability for higher education, to reduce the potential bias of endogeneity (Bernardi & Triventi, 2018). Given the importance of social selection in the choice of tracks and grade repetition in France (Bernardi, 2014; Bernardi & Cebolla-Boado, 2014; Ichou & Vallet, 2013), it is further possible to argue that disadvantaged students who were able to graduate on-time from an academic high school diploma with distinction are likely to be strongly positively selected in terms of motivations, aspirations, and cognitive and non-cognitive skills, compared to students from more advantaged social backgrounds.

In this subsample, dropout from higher education is a marginal phenomenon: after four years, less than 4% of students have left higher education without a degree (Table 3.E in Appendix 3). This confirms that these best high school graduates are very well prepared and motivated for higher education. However, the cumulative probabilities of dropout by academic outcome in the first year suggest a very clear pattern of compensatory advantage (Figure 3.2). It is striking to see that, in case of success in the first year of higher education, social origin does not influence dropout behaviours of this group, but that, in case of failure, social background is associated with a large gap in dropout patterns.

Figure 3.2: Cumulative probabilities of dropout, by academic outcome in first year and social background; best high school graduates entering higher education immediately after high school graduation



Source : Enquête sur le devenir des bacheliers-2008-2012.

Among high-performing students failing their first year, more than one out of five disadvantaged students (22.9%) have dropped out by four years compared to only 4.7% of socially advantaged students. It is worth noting that academic failure is not such a rare event in this group (20%), which should not be surprising since these best-performing students are

also more likely to enrol in the most difficult programmes where failure rates are the highest (medicine, law, etc.). Results from the multinomial logit models are presented in Appendix 3 (Table 3.F) and the contrast of the yearly predicted hazards of dropout by academic outcome and social origin further supports the compensatory advantage hypothesis (Table 3.5 below).

Table 3.5: Effect of social origin on the hazard of dropout for best high school graduates, by academic outcome in first year

Contrast of predicted hazards of dropout for students graduating on-time and with distinction from the academic track in high school; from models including an interaction term between social background and academic outcome in first year of higher education

		Model 1			Model 2		
Social background	**Academic outcome in 1st year**	Contrast of predicted margins	S.E.	P>chi2	Contrast of predicted margins	S.E.	P>chi2
HE & Salariat vs no HE & no salariat	Passed	-0,003	0,003	0,387	-0,003	0,004	0,388
	Failed	-0,054	0,015	0,000	-0,054	0,015	0,000
Controls							
Gender		YES			YES		
Type of HE program-1st year		NO			YES		
Years		YES			YES		
Log Likelihood		-2 276			-1 955		

Source : Enquête sur le devenir des bacheliers-2008-2012.

Social origin is irrelevant for dropout in case of academic success in the first year but in case of failure, students from higher backgrounds are much less impacted than disadvantaged students. Students from the most advantaged social backgrounds are *every year* 5.4 p.p. less likely to dropout. Given the very low annual hazard of dropout among this subsample, this is a large advantage for students from privileged backgrounds.

Heterogeneity by type of programme in higher education

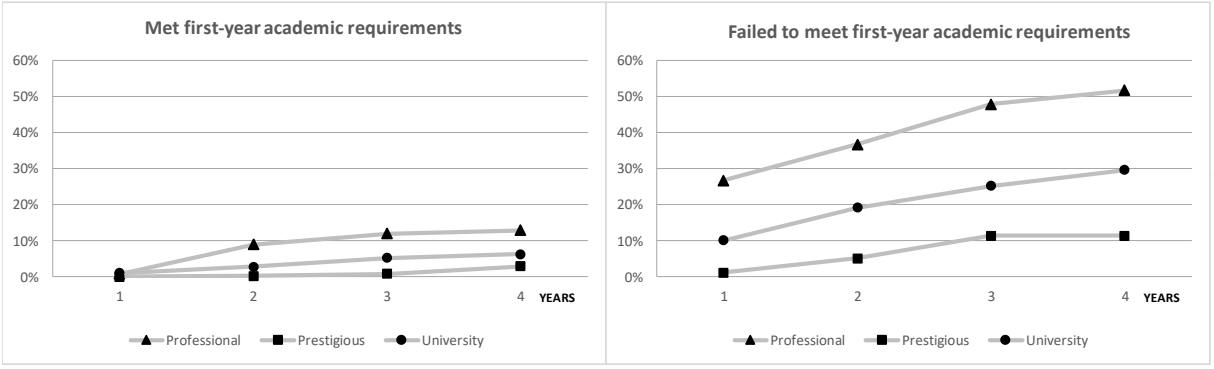
Finally, I check whether the evidence of the compensatory advantage in dropout behaviours after failure in the first year is specific to some programmes in higher education. Higher education programmes in France differ widely by the type of learning environment they offer. Although there is no data available on the student-professor ratio by type of programme, the average expenditure per student already gives an indication of these differences: The average expenditure for a student in university amounted to 10387€ in 2015 but was 32% higher for a

student in a short cycle professional degree and 45% higher for a student in a prestigious preparatory programme, CPGE (Ministère de l'Enseignement supérieur, de la Recherche et de l'Innovation, 2017). There is evidence that student-teacher ratio and expenditure per student have a large explanatory power for dropout behaviours (Bound, Lovenheim, & Turner, 2010; Montmarquette, Mahseredjian, & Houle, 2001) and that the relationship between students' characteristics and students' progression in higher education differ by field of studies (Clerici et al., 2015). It is thus possible that the association between social origin and dropout patterns estimated previously actually differ by programme of enrolment and that the compensatory advantage mechanism is only relevant in some institutional contexts. I thus replicated the analyses separately for each broad type of programme: professional, academic in universities and academic in prestigious institutions.

Results confirm that the different types of higher education programmes are associated with very different patterns of failure and dropout. Failing the first year is much more common in university programmes, as it is the case of almost one out of two students in this sample. In contrast, "only" 15% of students in a professional programme fail their first year and 10% of the students in prestigious small institutions (in the latter case, it has to be remembered that a second selection stage occurs at the end of the second year in higher education, so failure rates can be expected to be higher later in these higher education careers).

Despite these large differences in the prevalence of failure in the first year, university and professional programmes show a similar prevalence of dropout behaviours: the cumulative dropout hazard ranges from only 3.7% for students starting in prestigious programmes, to 17.4% in university and 18.7% for students starting in professional programmes. The association between social origin and dropout behaviours also appears to be similar in professional and university first programmes (see Table 3.G in Appendix 3) as less advantaged students have, in both cases, an annual probability of dropping out about 4 p.p. higher than the most advantaged social category, once controlling from academic readiness and performance (Model 3). The situation in prestigious programme is very different as social origin has almost no effect on dropout.

Figure 3.3: Cumulative probabilities of dropout, by type of programmes and academic outcome in first year; students entering higher education immediately after high school graduation



Source : Enquête sur le devenir des bacheliers-2008-2012.

However, in all three types of programmes, failure in the first year increases dropout behaviours by a large amount, as illustrated by Figure 3.3. Controlling for academic readiness, the net effect of failure ranges from 3.3 p.p. for prestigious programmes to 5.2 p.p. in university and up to 11.4 p.p. in professional programmes (Model 3, Table 3.G in Appendix 3).

Finally, the interaction terms between the academic outcome and social origin do not indicate that the compensatory advantage hypothesis is only relevant for some types of programmes.

Table 3.6: Effect of social background on the hazard of dropout, by academic outcome and type of programmes in first year

Contrast of predicted hazards of dropping out based on separate models for each type of programmes, with an interaction term between social background and academic outcome in first year of higher education

		Professional			University			Prestigious		
Social background	**Academic outcome in 1st year**	Contrast	S.E.	P>chi2	Contrast	S.E.	P>chi2	Contrast	S.E.	P>chi2
HE & Salariat vs no HE & no salariat	Passed	-0,030	0,008	0,000	-0,006	0,006	0,322	0,001	0,005	0,910
	Failed	-0,078	0,028	0,006	-0,064	0,011	0,000	-0,085	0,049	0,083
Controls										
Gender		YES			YES			YES		
Academic readiness		YES			YES			YES		
Years		YES			YES			YES		
Log Likelihood		-3 259			-2 980			-854		

Source : Enquête sur le devenir des bacheliers-2008-2012.

In the three cases, the most advantaged students are much less likely (between -6.4 to -8.5 p.p.) to dropout in case of failure than the most disadvantaged group (Table 3.6). The precision of the estimates is lower in these analyses, especially in the case of students starting in prestigious institutions which are a relatively small group in this sample (N=779) and with low failure rates. Still, the compensatory advantage hypothesis is supported for the three types of programmes as the effect of social origin is much larger in case of failure than after initial success.

Discussion

The results presented here have confirmed the relevance of the compensatory advantage as a mechanism of social stratification in higher education. Even in the last stage of the educational system, advantaged students appear to be buffered against the impact of a negative outcome such as academic failure, and this result is also confirmed for the specific group of high-performing high school graduates. Since disadvantaged students who reach eligibility and enter directly to higher education, and especially those graduating on-time from the academic track, can be expected to be positively selected on a number of unobserved variables, these results raise serious concerns about the equity of the system and challenge the unqualified conclusion of a dissipating effect of social origin in higher education. Following the identification of the waning effect of social origin over educational transitions (Mare, 1980; Shavit & Blossfeld, 1993), higher education has been seen as the most meritocratic segment of the educational system (Hout, 1989), either because of differential selection at the previous stages of the educational systems or because parental influence on educational outcomes should be smaller for adult students. In the words of Müller & Karle (1993), one could expect that "with growing maturity, a person will be more able to decide on his or her own and will also be less dependent on parental resources, particularly if higher education is a more or less free good and subsidies are available to support the economically less advantaged in acquiring it." Still, even in the French higher education which is characterised by modest financial barriers and a large need-based grant scheme, my results reveal a "lingering effect" (Davies & Guppy, 1997) of social origin on dropout patterns. It is especially interesting to note that looking at the average effect of social background on dropout patterns could suggest that social background has only a moderate effect on dropout patterns. Considering the heterogeneous impact of academic failure, instead, leads us to distinguish

between the very small impact of social background in case of success and the large inequality in case of failure. The compensatory advantage theory thus allows us to identify the situations in which social background still matters in higher education. This does not mean that the inequalities of performance produced earlier in the educational pipeline are not relevant to higher education outcomes. My results have indeed confirmed some of the earlier findings on dropout in French higher education, most notably that academic readiness, as measured by the track of the high school diploma, has the strongest impact on the probability of dropout. But the large social gap in dropout patterns identified in case of failure calls for caution in concluding that success in French higher education is almost fully explained by performance in primary and secondary education (Brinbaum et al., 2018).

These results also contribute to the current literature by highlighting that academic performance in higher education has a large association with dropout behaviours, even when controlling for academic readiness. With a comparable level of academic preparation, students who fail in their first year are much more likely to leave without any degree than those who succeed in their first year. The fact that it is also true for some of the best academically prepared students points to a worrisome loss of talented youths who had the skills to eventually graduate, even if in a different programme. This is an important finding because failure in the first year of higher education, especially in non-selective programmes, can be interpreted as an opportunity for students to learn about their performance and adjust their efforts or transfer to a better matched programme. For example, it has been noted that in France, “open access to public universities, with low fees, allows a certain number of students to try out courses and gives them time to find the right academic and career path for them [...] The possibility of trying things out and then changing direction if necessary is something that only universities can offer or, at least, facilitate, thanks to their non-selective or ‘open’ nature. This is a condition of success for many students who, for one reason or another, are not perfectly pre-adjusted to the courses they enrol on” (Bodin & Orange, 2018). Without denying that many students can benefit from a higher education system where trial and error is common, the results presented here challenge an unqualified interpretation of the high failure rates seen in French higher education as the expression of an open and flexible education system which gives youths the “right to make mistakes” (Butzbach, 2018). For a number of students, early failure in higher education does have lasting negative consequences

on their trajectories in higher education and their possibility of graduating. The fact that the negative consequences of early academic failure on dropout behaviours vary by social origin and mainly affect socially disadvantaged students further stresses that this is a legitimate concern for policy makers.

In the French diversified higher education system, with some non-selective programmes and high failure rates, students who are able to first enrol in a higher education programme which matches their skills and motivation, i.e. where they are more likely to succeed, seem to gain an important protection against dropout; and this is especially important for disadvantaged students. Policies which aim to improve the match between students' skills, motivation and their programme of enrolment would thus be important to address the problem of dropout in French higher education. However, it would also be crucial to address the question of academic support during higher education and to improve the support and guidance for students who have failed their first year. Although there have been many attempts to address these questions in recent years, most of the policy initiatives have targeted university bachelor's programmes exclusively (for example, the "Plan Réussite Licence" since 2007). With only 27% of students in bachelor's programmes able to graduate on time, it is not surprising that research and policy actions have focused on universities. Nevertheless, university students now only account for 58% of all higher education students in France (Ministère de l'Enseignement supérieur, de la Recherche et de l'Innovation, 2017) and this chapter has shown that dropout rates are as high among students who start in short-cycle professional programmes. Greater attention should thus be given to dropout in short-cycle and professional programmes if we want to address the problem thoroughly.

To conclude, two limits of the present study should be highlighted. On a methodological dimension, I cannot rule out that my estimates of the association between failure and dropout are biased by confounding variables. I found that the evidence of compensatory advantage after failure is robust to different estimations which attempted to account for endogeneity biases; but estimating the causal effects of failure in higher education on students' trajectories would require another analytical strategy. In addition, this chapter only distinguished between dropout and graduation but did not consider stop-out behaviours (temporarily leaving higher education) nor transfer behaviours (changing programmes). I mentioned earlier that, in this analytical sample, the probability of re-enrolling after one (or more) year(s) of interruption

was higher for students from privileged social backgrounds. Differences in stop-out and re-enrolment behaviours could both be driving the social inequalities identified in dropout patterns after failure in higher education and it would be necessary to distinguish between these two events to provide a more precise picture of inequalities in higher education trajectories. Recent evidence in the U.S. has highlighted the importance of interrupted enrolment in higher education and its role in social inequalities in graduation patterns (DesJardins et al., 2006; Goldrick-Rab, 2006; Milesi, 2010) and further research could fruitfully explore the role of transfer and interrupted enrolment behaviours in social inequalities formation in higher education.

Chapter 4
The multidimensional nature of inequalities in attainment of elite programmes

Introduction

As mentioned in the first chapter of this dissertation, social stratification along the educational career can be distinguished by its vertical and horizontal dimensions (Charles & Bradley, 2002; Triventi, 2013a). While vertical stratification refers to differences in the level of degree attained, horizontal stratification encompasses differences in quality or prestige within one single level of education. So far, I have mainly focused on social inequalities in access and dropout patterns, which are two major aspects of vertical stratification in higher education. I now turn to the horizontal dimension of social stratification in higher education by focusing on students' attainment in elite programmes, compared to other higher education outcomes. The extent of inequalities in graduation from the most prestigious higher education institutions is a central question to grasp the horizontal dimension of social stratification in higher education, but its study in European countries is relatively recent (Triventi, 2013a). In addition, in a country like France, where prestigious higher education institutions act as the gatekeepers to the political and economic top positions (Davoine & Ravasi, 2013), this question is highly relevant to identify the degree of social closure or openness of the ruling elite and, more generally, for social mobility.

The importance of social origin in French grandes écoles, which Bourdieu defined as "institutions entrusted with the education and consecration of those who are called to enter the field of power- in which most of them have their origins" (Bourdieu, 1996, p. 74), has indeed been widely discussed in the French political, media and academic spheres. The literature has consistently established the importance of social origin in reaching educational excellence and suggests that, contrary to the rest of the higher education system, its democratisation may have stopped in the 1980's (Albouy & Wanecq, 2003). However, A systematic understanding of how social origin contributes to elite educational attainment in the current higher education system is still lacking. Recent evidence suggests that a detailed investigation of which dimensions of social origin influence educational attainment can improve our estimation and understanding of inequalities of educational opportunities

(Bukodi & Goldthorpe, 2013; Erikson, 2016). This chapter thus aims to contribute to this emerging literature by disentangling the independent effects of parental education, class and status on elite education attainment and develop a more specific understanding of higher education social stratification in its horizontal dimension. In addition, there is little doubt that part of the effect of social origin on elite educational attainment is transmitted via academic excellence at the previous stages of educational careers. Nevertheless, a few studies have tried to rigorously estimate the mediating role of high school performance in the association between social origin and elite attainment. Ichou & Vallet (2013) provide the most rigorous evaluation of the importance of performance mediation but only for access to higher education and the question remains open regarding attainment and for all types of elite programmes. This question is crucial to assess the meritocratic value of elite higher education and to provide insights on what should be the focus of policy solutions to reduce social inequalities in these programmes. This chapter thus aims to answer two questions. First, to what extent are specific dimensions of social background associated with attainment of elite programmes? And to what extent is the effect of social origin on elite attainment transmitted via academic performance at the end of high school?

The focus of this chapter specifically deals with attainment of the most prestigious programmes, but I discuss the different higher education outcomes which serve as meaningful points of comparison, especially non-elite master's degrees, to assess the effect of sizes of inequalities found in elite attainment. Using recent data on eligible students to higher education, results confirm that parental education, class and status have independent effects on attainment in higher education, especially for the outcome of not obtaining any degree and for elite attainment. Results also highlight the importance of social and gender segregation between elite programmes and regular master's programmes in France, and thus the relevance of the horizontal dimension of inequalities in higher education. Finally, the mediation analysis confirms that social origin inequalities are, for a large part, transmitted via academic preparation in high school; but also points to a direct effect of social origin on elite education attainment, especially in the case of social class.

Theoretical background

The multidimensional nature of social origin

Recent sociological literature has brought attention to the multidimensional nature of social origin and has highlighted the importance of decomposing its different aspects to better understand inequalities in educational attainment (Bukodi & Goldthorpe, 2013; Erikson, 2016; Jæger, 2007). Although it has long been recognized that different indicators, such as class, education, income, etc.; could be used to capture position in the social space, it has been a common practice to use only one of these dimensions to capture social inequalities in educational attainment. The initial motivation for investigating the separate and independent effects of different dimensions of social origin was to explain divergent results in research on trends of inequalities of educational opportunities over time (Barone & Ruggera, 2017; Bukodi & Goldthorpe, 2013; Jæger, 2007) . Nevertheless, decomposing specific aspects of social origins can be more generally fruitful to improve our understanding of specific social stratification patterns. As formulated by Erikson (2016): "One indicator or another can be used if the sole purpose is to show that there are differences between social positions. However, a better understanding of the stratification process, of how life chances are structured by people's social positions, cannot be reached unless the analysis is based on fundamental stratification dimensions". This approach thus warns against the use of a single indicator to capture social origin because it leads to an overestimation of the specific association between this indicator and educational attainment (because of the cofounding effect of other dimensions which are correlated) and generally underestimates the importance of the association between social origins and educational attainment (Bukodi & Goldthorpe, 2013; Erikson, 2016). Overall, empirical results confirm that different dimensions of social origin; parental class, education, status and, in some studies, income; can have distinctive and independent effects on educational attainment (Bukodi et al., 2017; Bukodi & Goldthorpe, 2013; Erikson, 2016), although their effects may have similar evolutions over time (Barone & Ruggera, 2017). Comparative analyses further suggest that the specific dimension of social origin which has the largest effect on educational attainment can differ by country (Bukodi et al., 2017). Although decomposing social origin has mainly been applied to study the general association between social origin and education attainment and its trend over time, it may

prove fruitful to improve our general understanding of the horizontal dimension of stratification in higher education.

Horizontal stratification in higher education

Horizontal stratification encompasses differences in quality or prestige between types of institutions or between fields of study, within one single level of education. As higher education systems have expanded and diversified, the horizontal dimension of stratification at this level has become increasingly relevant (Shavit, Arum, et al., 2007). When participation in one level of education grows, qualitative differences across programmes and institutions can be expected to become increasingly relevant for social stratification, as formulated by the effectively maintained inequality theory (Lucas, 2001). A rich literature has further confirmed that differences in fields of study, or prestige of institutions, have large consequences on the returns of educational degrees in the labour-market (for an overview of the results see for example, Gerber & Cheung, 2008). Following a large comparative project on access to higher education, Arum, Gamoran, & Shavit (2007) conclude that differentiated higher education systems tend to be more inclusive, as differentiation is associated with greater access to higher education in general and does not seem to divert students from first-tier institutions. However, the under-representation of low-income (Furquim & Glasener, 2016; C. M. Hoxby & Avery, 2012) or minority students (Alon, 2007) in American top universities is well established. The importance of family income to access prestigious universities has also been established in Russia (Prakhov, 2016) and ethno-religious differences were found for enrolment in the most lucrative higher education programmes in Israel (Feniger et al., 2015). In Europe, class and gender differences were identified in access to the most prestigious fields of study in Sweden (Berggren, 2008). Similarly, social class effects were found for enrolment in medicine and law in the UK (Van De Werfhorst, Sullivan, & Cheung, 2003) and, in Germany, study-abroad opportunities were found to be socially selective (Netz & Finger, 2016). In a comparative study of eleven European countries, Triventi (2013a) further confirms that "students from culturally advantaged families have a higher probability of graduating from the best educational paths in terms of quality and future occupational outcomes". Overall, these empirical results confirm the importance of horizontal segregation in higher education.

Elite institutions in France

From the middle of the 18th century, elite education in France has been closely organised and monitored by the state through the creation of the grandes écoles, which initially aimed to provide highly qualified agents to the army and for national engineering projects (Van Zanten & Maxwell, 2015). Although, there are an increasing number of private institutions, especially with the development of business programmes which are overwhelmingly private, the public and private elite institutions are organised very similarly. Most notably, entrance to most of these elite institutions is usually granted on the basis of competitive examinations with the goal of guaranteeing a strict academic meritocracy. In addition, there is little doubt that graduation from a grandes écoles grants large benefits in the professional and social sphere in France. On average, in their first job, elite institution graduates earn 530€ and 300€ more *per month* than master's graduates in social sciences and scientific fields of study respectively (CEREQ, 2017). The political, administrative or economic top positions, are still overwhelmingly held by grandes écoles graduates (Davoine & Ravasi, 2013; Givord & Goux, 2007). To summarize, "one needs to demonstrate considerable competence before one acquires membership in France's elite institutions. But once that competence has been demonstrated at an early age, it is never again called into question"(Suleiman, 1978, p. 4). The social closure dimension of these small highly selective institutions which foster what Bourdieu calls a "state nobility" (1996), has been questioned regularly. With different methods, time frames or data sources, studies on the trends in attainment at elite institutions over the 20th century have reached different conclusions on the evolution of inequalities, but all consistently highlighted some persisting inequalities. Looking at cohorts born between 1915 and 1974, Givord & Goux (2007) demonstrated the stable under-representation of women, the stable impact of parental class and the slightly increasing effect of father's education in attainment of an elite degree. Euriat & Thélot (1995) also found that social inequalities in enrolment in four of the most prestigious grandes écoles have been stable over 40 years. In contrast, Albouy & Wanecq (2003) estimated that the association between social class and attainment in an elite institution has decreased in the first half of the 20th century, but this association has been strengthening again in the last cohort studied (born in the 1960s). Conversely, they found that social inequalities in the attainment of master's degrees in universities have declined steadily for the cohorts born between the 1920s and 1960s. For

cohorts born between 1918 and 1984, Falcon & Bataille (2018) concluded that inequality of educational opportunity has decreased, even for master's and grandes écoles, with one decrease for cohorts born in the 1940s and a second opening for cohorts born in the 1970s, although this result refers to class inequalities only and does not estimate the effect of parental education.

Finally, there has been a growing concern that children of teachers and professors are specifically advantaged to reach educational excellence. Benefiting from their parents' precise knowledge about the education system, they would "monopolize" elite programmes, as framed by some media controversies (Le Boucher, 2010; Soulé, 2010). Theoretically, it has been noted that the increasing complexity of the education system and the importance of individual choices along the educational career, could now favour "insiders", typically children of professors, and that "informational capital" may have become more relevant than cultural capital to educational inequalities (Draelants, 2014). In the 90's, Euriat & Thélot (1995) already noted that children of professors were more likely to attend an elite programme than the rest of the population, especially for the "Ecole Normale Supérieure" which is the elite institution most focused on fundamental research. However, the authors also conclude that this advantage, contrary to their expectations, has largely decreased, especially compared to children of other upper-class parents.

However, none of these studies controls for academic performance at the end of high school and it is crucial to know whether the persisting social gap in elite programme attainment is fully mediated by differences of performance at the end of secondary school. Undoubtedly, elite programmes are academically demanding and are meant to train good, if not excellent, students. If social origin translates during high school in radically different levels of academic preparation across social groups, there may be little room for improvement through interventions or reforms at the level of these elite institutions, and political actions should only focus on reducing inequalities of performance in secondary education. Indeed, elite institutions have succeeded in maintaining their legitimacy despite recurrent debates "by emphasising that the problem of social and gender inequality lies with society more generally, including within the family and the rest of the school system" (Van Zanten & Maxwell, 2015).

Research hypotheses

Based on these literature findings, I formulate four hypotheses regarding the effect of the distinct dimensions of social background and the mediation of academic performance. The operationalization of the variables is detailed in the next section, but I discuss here the expected effects of the different indicators I use to capture specific dimensions of social origin on attainment in elite programmes. Following Bukodi & Goldthorpe (2013), I interpret social class as the indicator of *family economic resources*. Social class not only captures differences in current income levels but also economic stability, security and prospects (Goldthorpe & McKnight, 2004). There are very few private universities in France and the vast majority of students who obtain a master's degree do so through public institutions with minimal tuition fees. In contrast, at least one-third of grandes écoles are private institutions (Van Zanten & Maxwell, 2015) and even the public grandes écoles charge higher tuition fees than universities. For this reason, I expect economic background to be more relevant for attainment in elite programmes than for other long degree programmes:

H1: The association between parental social class and attainment is larger for elite programmes, than for master's degrees.

I interpret parental education as capturing both *parental cognitive resources* (Barone & Ruggera, 2017) and *educational resources* i.e. the capacity of parents to support and guide the school career of their child (Bukodi & Goldthorpe, 2013). I thus expect that having highly-educated parents will translate to better grades along the education career and better choices of track. Thus, the advantage of parental education may be expected to be largely transmitted via better academic preparation:

H2: For attainment of elite programmes, the mediation of academic readiness is larger for parental education than it is for class and status.

In a Weberian's approach, parental social status is conceived as "a set of hierarchical relations that expressed perceived and typically accepted social superiority, equality or inferiority" (Chan & Goldthorpe, 2004). Using data on social interactions, social status captures patterns of inclusion and exclusion in sociability which reveals a status order in social groups. It has been shown that social status translates to distinctive lifestyles and is especially of central importance for cultural consumption (Chan & Goldthorpe, 2007). I am not aware of any study

which estimates the effect of social status on attainment in elite institutions in France although it seems particularly pertinent to analyse attainment in these small prestigious institutions. First, by its construction, parental social status is meant to capture *social networks*. Elite institutions are small and studying at them often leads to work in the same circles of the political or economic elite, so they create a strong sense of solidarity among students (Suleiman, 1978; Van Zanten & Maxwell, 2015). It may be that familial or social ties with former students of these institutions provide an advantage in the selection process to enter these institutions. In addition, since social status captures *distinctives lifestyles and cultural resources*, it could be especially relevant to perform well in some of the tests and oral examinations of these institutions. For example, the test of "general culture" used by some institutions until recently, has been regularly criticized for being socially biased and favouring students with high cultural capital. I thus expect that

H3: The association between parental social status and attainment is larger for attainment at elite institutions than for other master's programmes.

Finally, the literature on French elite institutions and the media debates have highlighted the large proportion of children of teachers and professors in elite programmes. Following Draelants and the concept "informational capital" (2014), I interpret the fact of having at least one parent who is a professor as a specific *informational resource* on the educational system. Given that admission in elite institutions follows much more complex application and selection processes that any university master's programme, one should expect "insider" information to be even more beneficial for these programmes:

H4: Having at least one parent who is a teacher has a larger positive effect on attainment from elite institutions than for other master's programmes.

Data and methods

I rely on the survey "Enquête sur le devenir des bacheliers - 2008-2012" (SIES, 2012) to identify students' attainment of elite higher education. The major limit of this survey is that students were interrogated for five years only after graduating from high school and the last information on degree graduation refers to their fourth year in higher education (if they transitioned immediately). Since elite programmes usually do not award degrees before 5

years of enrolment, information on graduation from elite programmes is missing. However, I argue that this database still provides good information to study elite programmes' attainment. First, it is the only French panel which includes a representative sample of eligible students to higher education. Second, it includes exhaustive administrative data on high school performance, which is of central importance for my research questions. Finally, and most importantly, I argue that enrolment in an elite programme in the fifth year is a good proxy for graduation from these programmes. Highly selective, these programmes take in only the best performing, highly motivated students and offer very good study conditions. As shown in Chapter 3, very few students drop out from higher education after entering one of these programmes. Regarding non-completion of these specific programmes, I used data from the panel 1995 which followed some students for nine years after they entered higher education, and estimated that among students enrolled in a grandes écoles in the fifth year, 96.7% obtained a degree from these elite programmes (own calculations; DEPP, 1995). I thus use enrolment in an elite programme in the fifth year as a proxy for attainment. Students with missing information in the fifth year but who were enrolled in the fourth year in an elite programme are also coded as having reached this level (this is the case of 72 students only, accounting for 6% of students coded as having attained a qualification in an elite programme).

Although the focus of this chapter is attainment in elite programmes, I consider the different possible outcomes in higher education in order to compare the effects of social origin indicators on elite versus other second-level programmes, and to get a more general picture of social stratification in French higher education. I thus distinguish students across six levels of higher education attainment:

(1) Students who are not enrolled in the fifth year and who did not graduate from any higher education degree (they may have dropped out from higher education or never entered it);
(2) Students who earned at most a short vocational degree (BTS or DUT) and left higher education by the fifth year,
(3) Students who left after earning at most a bachelor's degree (academic or professional).
(4) Students who are still enrolled in the fifth year (with a degree or not) in a first-degree programme are classified separately, since observations over a longer span of time would have been necessary to identify their final attainment.

(5) Students who are enrolled in master's programmes in universities or professional long degree programmes are classified as reaching the master's level.

(6) Elite programmes are defined as grandes écoles and the medical track. Grandes écoles include engineering schools, business schools as well as various prestigious social-sciences institutions (ENS, Sciences Po and other IEP, etc.). Although most authors only refer to grandes écoles when studying elite education in France, I also include the second cycle of medical studies, following the classification by Duru-Bellat & al. (2008). The medical track also selects students using a highly competitive examination and brings significant economic and social-status benefits during the rest of the life course.

To analyse social inequalities in attainment of elite programmes, I use information on both parents to be able to distinguish the most advantaged households where both parents are highly educated or in the salariat. It is indeed relevant to know whether the social assets of each parent can add up to shape attainment in the most prestigious programmes: for example, having both parents in the salariat, rather than one, may bring additional economic resources and security which would further favour elite educational attainment. Social class is thus coded in four categories inspired by the Erikson-Goldthorpe-Portocarero (EGP) class schema: the "working class" when the highest parental occupation belongs to class VI and VII; the "intermediate class" when the highest parental occupation belongs to class III, IV and V; and, finally, I distinguish between students with one parent belonging to the salariat (class I and II) and those with both parents in this class. Similarly, parental education differentiates first-generation students whose parents do not hold any higher education degree, students with one tertiary-educated parent, and students whose parents are both higher education graduates. For social status, I coded the two-digit PCS variables of father and mother occupations with the 2006 French status scale provided by the CAMSIS project. The CAMSIS status scale builds on the idea that social interactions express patterns of social stratification, as interactions are more likely to occur between people who are socially close, and is calculated based on the analysis of homogamy patterns in the 2006 French census (Lambert, 2011). Parental social status is coded using the highest score of both parents and ranges between 27 and 83. To ease interpretation, I standardised the variable at its mean and with a standard deviation of 1. All the variables of social origin are based on the answers of students interrogated in the first year after high school graduation and thus capture economic,

educational and cultural resources when the student started higher education. Academic readiness at the end of high school is measured by the age at graduation (on-time or late), the track of the degree which distinguishes between technological, vocational and the specific options of the academic track (scientific, humanities or economic sciences), and the distinction obtained in the final exam "baccalauréat".

Table 4.1: Descriptive statistics
High school graduates in 2008

Variables		% in analytical sample	% attained elite program
Situation in 5th year after high school graduation	*No higher education degree*	27.2	
	Left with short vocational degree	13.5	
	Left with Bachelor's degree	10.4	
	Still enrolled in first-level program	14.9	
	Attained Master's program	18.2	
	Attained elite program	15.9	
Gender	*Male*	45.8	20.5
	Female	54.2	12.0
Parental education	*Below higher education*	55.6	7.9
	One parent with higher eduation	21.9	18.1
	Both parents with higher education	22.5	33.5
Parental social class	*Working class*	14.8	5.6
	Intermediate	50.5	10.2
	One parent in salariat	24.4	24.8
	Both parents in salariat	10.3	37.6
Parental status (standardized)	Average	0	
	Standard deviation	1	
At least one parent is a teacher	*No*	89.2	14.9
	Yes	10.8	24.4
Track of high school degree	*Academic Scientific*	30.2	35.5
	Academic humanities	9.9	3.0
	Academic economics	18.3	15.0
	Technological	26.6	7.5
	Vocational	15.0	1.0%
Age at high school graduation	*On time or in advance*	58.6	22.6
	One year or more late	41.4	6.4
Distinction in high school degree	*Without distinction*	55.3	6.2
	Quite good	28.6	17.1
	Good	11.5	39.7
	Very good	4.6	65.1
Unweighted number of observations		**7,439**	

Source: Enquête sur le devenir des bacheliers - 2008-2012. With survey weights.

The analytical sample refers to students eligible for higher education in 2008 with complete data and amounts to 7,439 students. Compared to the initial survey sample, fifth-year attainment is missing for around 23% of eligible students because of respondent attrition. Students with missing attainment data are more often first-generation college students (63%) and from the intermediate social class (44%). All the analyses are thus carried out using survey weights to adjust for sample selection by the fifth year of the data collection. From the sample

with data on attainment, only 2% are excluded because of missing data on social origin (parental education or parental status). Table 4.1 displays the distribution of each variable and the proportion in elite programmes. Five years after becoming eligible for higher education, 27.2% of students are not enrolled in higher education and did not obtain any degree from it. It is important to keep in mind that this figure includes students who never entered higher education or those who dropped out without any degree. In contrast, almost 16% of eligible students have reached an elite programme while around 18% have entered regular master's programmes.

The impact of social origin indicators on attainment is estimated with multinomial logit models using the category "no higher education degree" as the base outcome (provided in Appendix 6) but I mainly discuss the average marginal effects of social origin indicators which are independent of the base outcome chosen. To rigorously answer my second research question on the mediation effect of high school preparation, I use the KHB method (Breen, Karlson, & Holm, 2013; Karlson, Holm, & Breen, 2012) to decompose direct and indirect effects of social origin and gender on attainment in master's and elite programmes. This method allows us to compare coefficients between two nested non-linear models by distinguishing the change in the coefficient that is due to true mediation, from the change that is due to rescaling of the coefficients; it is implemented with the Stata routine *khb* (Kohler, Karlson, & Holm, 2011).

Results

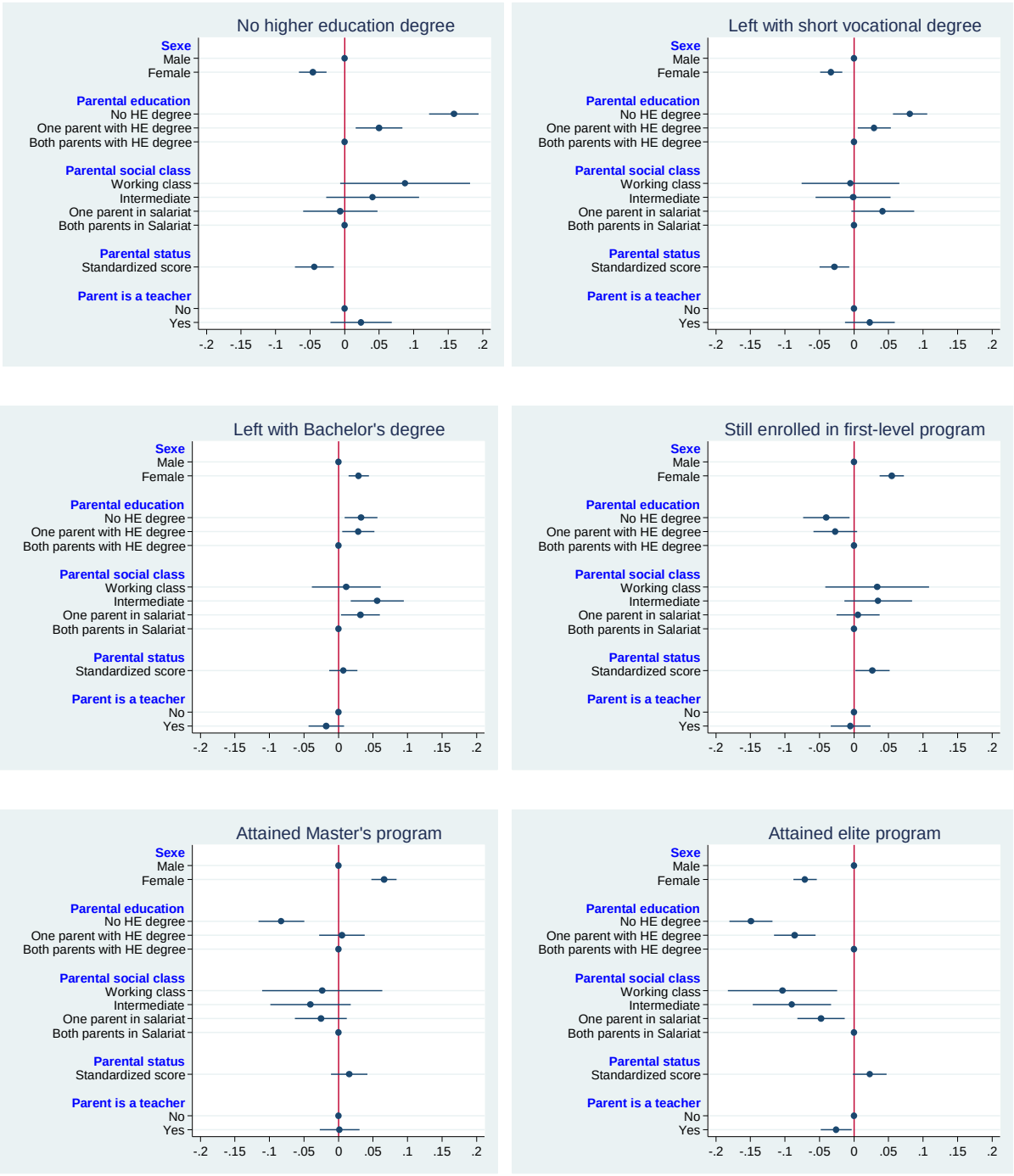
The independent effects of different dimensions of social origin

The first research question of this chapter deals with the independent effects of different dimensions of social origin on elite programme attainment, especially compared to regular master's programmes. The odds-ratio of the multinomial logit model are provided in Appendix 4 (Table 4.A) and Figure 4.1 compiles the average marginal effects for the six possible attainment outcomes in the fifth year after high school graduation.

Controlling for different variables of social origin together confirms that these different dimensions have independent effects on educational attainment, at least for some levels of higher education attainment.

Figure 4.1: Average marginal effects of total effects of social origin indicators on attainment in higher education; high school graduates in 2008

Estimations from multinomial logit model with no controls of academic readiness



Source : « Enquête sur le devenir des bacheliers - 2008-2012. » With survey weights.

Figure 4.1 suggests at first glance that the total independent effects of different dimensions of social origin are largest for elite programme attainment, and to a lesser extent, for not obtaining any degree.

Among eligible students to higher education, parental education has the largest and most systematic independent effect on attainment in the fifth year. First-generation college students, who account for more than half of the sample, are much more likely than students with both tertiary-educated parents not to graduate from higher education (+15.8 p.p.), to leave after a short vocational degree (+8.1 p.p.) or a bachelor's degree (+3.3 p.p.), but less likely to still be enrolled in the fifth year in any first-degree programmes (-4 p.p.), in master's programmes (-8.3 p.p.) or in elite programmes (-14.9 p.p.). These results confirm the importance of parental cognitive and educational resources on higher educational attainment, even when controlling for other dimensions of social origin. There are also statistically significant differences between students with one tertiary-educated parent versus those having two tertiary-educated parents, for all outcomes except for attainment in master's programmes. The disadvantage of having "only" one tertiary-educated parent is larger for not attaining any degree (+5 p.p.) and for attaining degrees from elite programmes (+8.6 p.p.). Overall, the total independent effect of parental education is largest for the lowest and highest possible outcomes in higher education: not having any higher education degree and elite programme attainment.

Social class appears to have an independent effect only for specific outcomes of higher education attainment. Students with both parents in the working class, which is the case of about 15% of the analytical sample, are 8.8 p.p. (statistically significant at the 10% level) more likely not to graduate from any higher education degree than students with two parents in the salariat. Students with parents who belong at most to the intermediate class appears more likely to leave higher education after an academic or professional bachelor's degree (+5.6 p.p.). But the largest independent effect of social class is found for attainment of elite programmes: controlling for all other indicators of social origin, students from the working or the intermediate class are 10.4 p.p. and 9 p.p. less likely to reach elite programmes than students with two parents in the salariat. In contrast, social class has a much smaller and a statistically insignificant effect for attainment in master's programmes and these results confirm my first hypothesis: economic constraints seem to matter much more for elite

programmes than for other long degree programmes. These results also highlight the proximity between the working and intermediate class for the probability of attainment in elite programmes. It confirms conclusions from the trend analysis of the effect of social class in four of the most prestigious institutions between 1950 and 1990: the authors noted a "collapse of opportunities for children from the employed intermediate class, both compared to the salariat and teachers' children, and to the working class" (Euriat & Thélot, 1995). With more recent data, looking at all elite programmes and controlling for other dimensions of social origin, I thus also find that the class divide for elite education attainment lies between the working and intermediate class on the one hand, and the salariat on the other hand, with further advantages for students with both parents in salariat (4.8 p.p.).

Regarding social status, results do not support my third hypothesis that it is more relevant for elite programme attainment than for other master's programmes. It is true that the increase of one standard deviation in parental social status is associated with a small increase in the probability to attain a degree from an elite programme (+2.3 p.p., statistically significant at the 10% level), while the effect of parental status is slightly smaller (+1.6 p.p.) and is not statistically significant for other master's programmes. However, the comparison of the logit estimates of parental status for the two outcomes shows that the effect of parental status is not statistically different between elite and master's attainment (p-value= 0.53). In contrast, the association between parental status and attainment in higher education is larger for not obtaining any higher education degree: the increase of one standard deviation in parental status is associated with a decrease of 4.4 p.p. in the probability of leaving the education system without any tertiary degree.

Although children of teachers are more often in elite programmes in the fifth year (24.4% versus 14.9% for students without a teacher parent as shown in Table 4.1), this advantage disappears once controlling for the other dimensions of social origin. In fact, compared to children with similarly highly educated and upper-class backgrounds, children of teachers are found to be *less* likely to reach elite programmes (-2.6 p.p.). This result thus does not confirm a specific informational advantage for "insiders" of the educational system in elite institutions (H4).

Finally, it is interesting to note the impact of gender on educational attainment in higher education: Eligible women are less likely to leave without any degree or with a short vocational

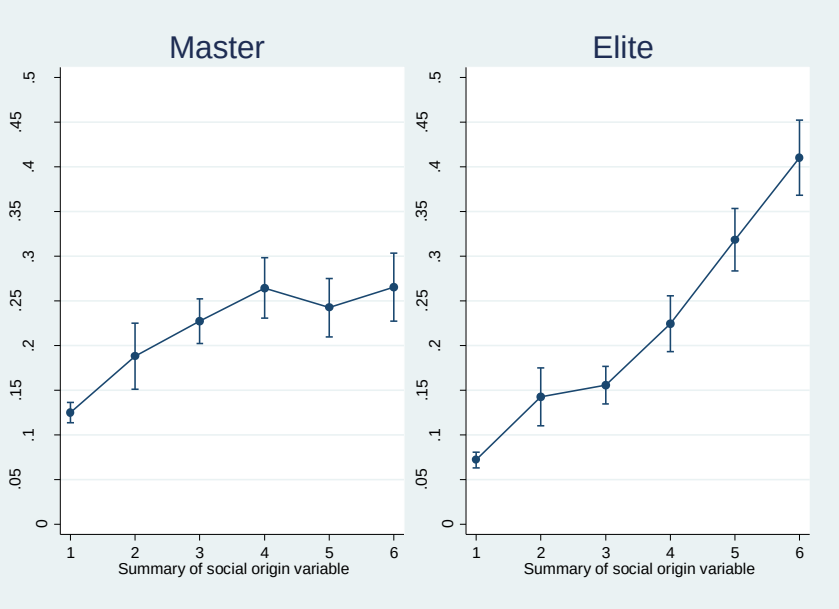
degree than men, and they are also more likely to reach regular master's programmes. However, they are less likely to reach educational excellence: Controlling for social origin, women are 7.1 p.p. less likely to reach an elite programme and 6.6 p.p. more likely to be in a master's programme, showing a clear pattern of horizontal stratification by gender among second-level degrees.

Overall, these results confirm that elite programmes are much more socially selective than regular master's programmes. Since the model controlled for multiple dimensions of social origin, the independent effects measured can be considered as large. To grasp the extent of the social gap in attainment in elite programmes, I next created a variable which summarizes information on parental education and social class. Since the working and intermediate classes have very similar patterns of attainment in elite programmes, students with no parent in the salariat are grouped together. In addition, some combinations of parental education and social class are very rare and are grouped together. This summary variable thus takes six categories, ranging from one, for students with no tertiary-educated parent and no parent in salariat, to six, for those with both tertiary-educated parents in salariat. Figure 4.2 displays the predicted probabilities of reaching master's and elite programmes for the different combinations of parental education and class.

It is striking to see that attainment in elite programmes ranges from 7% for students with no tertiary-educated parents not in the salariat, to 41% for students with both highly-educated parents in the salariat, and that parental educational and economic resources appears to substantially increase the probability of reaching these programmes. In contrast, this social gap ranges from 12% to only 26% for attainment in master's programmes and the confidence intervals for the categories where students have at least one tertiary-educated parent, no matter the situation of the other parent and their social class (category 3, 4, 5 and 6), largely overlap.

Figure 4.2: Predicted probabilities of attainment by social origin; high school graduates in 2008, with no controls of academic readiness

Estimations from multinomial logit model



Categories and weighted frequency in analytical sample

1: No tertiary-educated parent & no parent in salariat (49.2%)
2: No tertiary-educated parent & one or two parents in salariat (6.4%)
3: One or two tertiary-educated parents & no parent in salariat (16.1%)
4: One tertiary-educated parent & one or two parents in salariat (10.0%)
5: Two tertiary-educated parents & one parent in salariat (10.2%)
6: Two tertiary-educated parents & two parents in salariat (8.2%)

The mediation of high school academic preparation

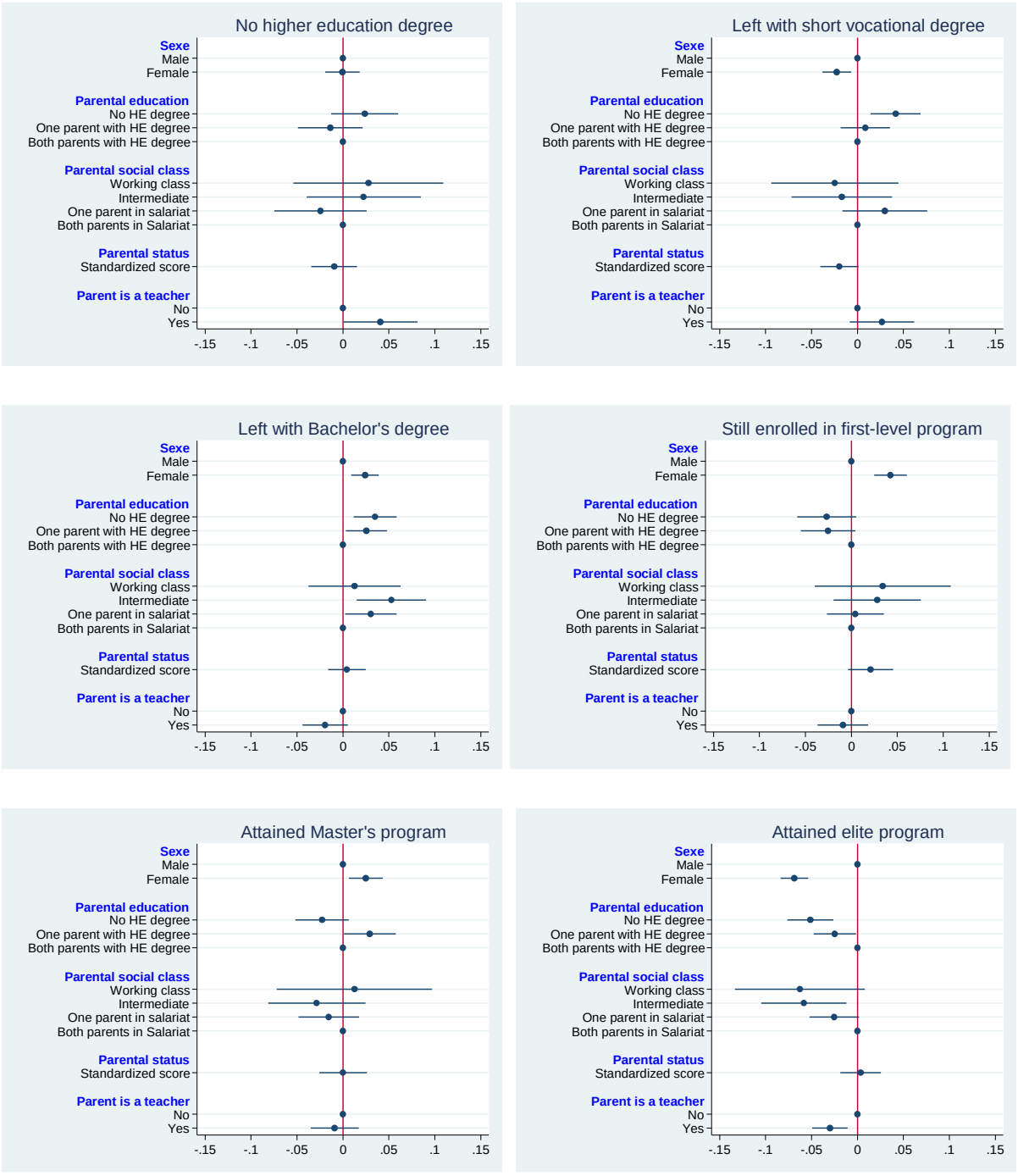
To what extent are the large effects of social origin on higher education attainment identified above transmitted via previous school performance and academic preparation? There is little doubt that academic performance at the end of high school constrains the choice of programme and trajectory in higher education, and it is important to know whether, controlling for precise indicators of previous performance, there are any direct effects of social origin indicators on tertiary attainment. This question is important to identify whether higher education plays a specific role in social stratification or mainly carries over inequalities already existing in high school. If the effects of social origin or gender are fully mediated by differences in academic preparation, the higher education system could be considered as showing a "meritocratic equity of conditions" (Hearn, 1991). As mentioned earlier, this is a central

question for the legitimacy of elite programmes and to further identify the political actions which may efficiently reduce social inequalities in attainment.

Figure 4.3 displays the effects of gender and the various dimensions of social origins on higher education attainment, when age, track and distinction in high school graduation are added to the multinomial logit model (Table 4.B in Appendix 4). Compared to Figure 4.1, which plotted the total effects of these variables (i.e. without controls of high school graduation performance), it is clear that the effects of gender and the different dimensions of social origin are largely reduced and, in most cases, become statistically insignificant. In other words, most of the effect of social origin on higher education attainment seem to be transmitted via high school performance. For example, the large total effects of social origin indicators on not having any higher education degree come close to zero once controlling for performance at the end of high school. However, there appears to be a "lingering" direct effect of social origin for some outcomes of higher education attainment. Controlling for high school performance, first-generation college students are still more likely to leave after a short vocational degree (+4.2 p.p.) or a bachelor's degree (+3.5 p.p.) and are less likely to reach an elite programme (-5.1 p.p.). Having parents in the intermediate class also has an independent direct effect on leaving with a bachelor's degree (+5.3 p.p.) and on reaching an elite programme (-5.8 p.p.). In contrast, the association of parental status with attainment is close to zero once controlling for high school performance, with the exception of leaving with a short vocational degree (-2 p.p.) and being still enrolled in first-level degree programmes (+2.1 p.p.). The independent negative effect of having one parent as a teacher actually increases once controlled for high school performance, in the case of not having any higher education degree by five years (+4.1 p.p.) and reaching an elite program (-3 p.p.). Finally, without academic preparation controls, women were found to be less likely to not have any higher education degree (total effect in first model amounted to -4.6 p.p.) but this advantage fully disappears once controlling for high school performance and is thus explained by the better academic preparation of women by the end of high school. In contrast, the disadvantage of women in reaching an elite programme is actually larger once controlling for their academic readiness and the direct effect of gender amounts to almost 7 percentage points.

Figure 4.3: Average marginal effects of direct effects of social origin indicators on attainment in higher education; high school graduates in 2008

Estimations from multinomial logit model with controls of academic readiness



Source : « Enquête sur le devenir des bacheliers - 2008-2012. » With survey weights.

Overall, Figure 4.3 shows that the association between gender and social origin with higher education attainment become small, once controlling for high school performance, with the sole exception of elite programme attainment. Using the summary variable of parental education and social class described previously, I estimate that, controlling for high school performance, the average predicted probabilities of attaining a master's degree ranges from 16.6% for students with no tertiary-educated parents and not in the salariat to 20.7% for students with both highly-educated parents both in salariat, a difference of around 4 percentage points. In contrast, the average predicted probability for attainment of an elite programme range from 11.8% for students whose parents have no tertiary degree and are not in the salariat, while students with highly educated parents both in the salariat are twice as likely to graduate from these top institutions, with an average predicted probability of 24.1%. Holding academic performance at the end of high school constant, there is thus still an absolute difference of 12.3 percentage points between the most socially disadvantaged and advantaged high school graduates.

The effects of academic preparation indicators are presented in Table 4.B in Appendix 4 and are generally consistent with the expectation that elite attainment is associated with academic excellence at the end of high school. Students who graduate with a "good" or "very good" distinction, who account together for only 16.1% of high school graduates and thus represent the very best performing students, are much more likely to reach an elite programme (+23 p.p. and + 38.6 p.p. respectively). Still, it is interesting to note that having repeated a grade during their educational career (which is the case of 41% of students in the analytical sample) has only a small independent effect on the probability of reaching an elite programme (-2.7 p.p.): although the proportion of on-time students who reach an elite programme is much larger than the proportion of students who have repeated a grade (22.6% versus 6.4%, see Table 4.1), it appears that this association is mainly driven by the cofounding effect of the other indicators of academic preparation (track and distinction). Finally, it is striking to see that, among students graduating from the academic track, who are the primary target of elite programmes, there are large disparities depending on the speciality of the degree: while the scientific option is associated with the highest probability of entering an elite programme, high school graduates with a speciality in humanities are 21.3 p.p. less likely to enter elite programmes, an effect very close to the one associated with being in a vocational

track. It is clear that many elite programmes, such as medicine and engineering schools, are inaccessible to students who do not have a strong background in sciences but this is not the case of social sciences and elite business programmes. And this should also be interpreted in light of the fall in enrolments in the humanities option over the last decades, and the deterioration of the image of this stream among students and families who increasingly consider it as a last choice option to avoid a non-academic track (Convert, 2003; IGEN, 2006).

The bias arising from the comparison of marginal effects in nested non-linear models is much smaller than with logit coefficients (Karlson, Holm, & Breen, 2012). Still, in order to estimate most precisely the mediation of high school performance, I perform a mediation analysis using the KHB method, with age at high school graduation, track and distinction as mediators of the effect of gender and social origin indicators on attainment in higher education. Table 4.2 shows the reduction in the coefficients of gender and social origin for the outcome "elite programme attainment", due to mediation of high school performance, that is the ratio of the indirect to the total effect. The mediation percentages for the other outcomes are displayed in Appendix 4 (Table 4.C). A percentage close to 100 indicates that academic readiness at the end of high school fully mediates the association between the variable and attainment in elite programmes. A negative percentage means that academic readiness acts as a "suppressor" of the effect of the variable on attainment: controlling for academic performance, the effect of the variable is actually larger than it is without controls, which is sometimes referred to as reversed mediation (MacKinnon, Krull, & Lockwood, 2000).

In the case of attainment of elite programmes, academic performance at the end of high school mediates more than half of the total association for parental education and parental status. In other words, the under-representation of students with lower-educated parents, or with lower parental status, is largely driven by their lower academic performance. The mediation percentage ranges from around two-thirds for the effect of not having any parents with a higher education degree, to more than 80% for the effect of parental status. Thus, although a large share of the total parental education effect is transmitted via academic preparation, the initial hypothesis that parental education should be more transmitted via academic performance than other indicators of social origin is not supported. The fact that the impact of social status on attainment in elite programmes is almost fully mediated by academic performance suggest that familial cultural resources are already translated into

academic performance in high school. This can be interpreted in line with Bourdieu's theory of cultural capital which states that the familiarity with the dominant culture is rewarded by the school system through better grades (Bourdieu & Passeron, 1990). However, it is important to keep in mind that the total independent effect of parental status on attainment in elite programme is small, especially compared to other indicators of social origin: an increase in one standard deviation is associated with an increase of only 2.3 p.p. in the likelihood of attainment of an elite programme.

Table 4.2: Reduction (in %) in the coefficients of gender and social origin due to mediation of academic readiness

Decomposition of average marginal effects in direct and indirect effects net of rescaling, using the KHB method

Variables		**Attained Elite programme**
Gender	Female	-6,0
Parental education	Below higher education	65,9
	One parent with higher eduation	71,3
Parental social class	Working class	37,5
	Intermediate	35,4
	One parent in salariat	48,4
Parental status (standardized)		83,4
One parent is a teacher	Yes	-17,6

Source: Enquête sur le devenir des bacheliers - 2008-2012. High school performance controls include age at graduation, track and distinction. With survey weights.

Interestingly, the total effect of social class on elite programme attainment is only moderately mediated by academic performance. The large independent effect of social class (between 9 and 10 p.p. for the intermediate and working class) is reduced by less than 40% once controlling for the details of academic performance at the end of high school. More than half of the effect of economic resources on elite programme attainment is thus a direct effect, contrary to what is seen with parental education. In contrast, the negative independent effect of having a teacher parent is not transmitted via their academic preparation which actually slightly hides its effect: despite their better performance in high school, children of teachers are less likely to reach an elite programme compared to other highly-educated and upper-class backgrounds. Finally, the under-representation of women in elite programmes is not explained by lower academic performance, confirming previous results of the literature (Dutercq, 2009; Van Zanten & Maxwell, 2015). The detailed contribution of each variable to

the effect of gender shows that the negative effect of being a woman is partly explained by their higher presence in the academic-humanities track, which rarely leads to elite programmes. However, it is also masked by the fact that women are less likely to be in the vocational tracks and are more likely to obtain a “very good” distinction.

Not obtaining any higher education degree is the only other outcome for which social origin total effects were comparable in size to the effects found for elite attainment. However, the results of the mediation analysis for this outcome, in Appendix 4 Table 4.C, shows that the pattern of mediation is quite different between the two outcomes. In the case of not obtaining any degree, parental education effects are almost fully mediated by academic preparation (more than 85% in contrast with 65% in the case of elite attainment). The gender difference in not obtaining any degree is also fully explained by the better academic preparation of women. And 70% of the effect of being from the working class is estimated to be mediated by academic preparation while this is the case of only 38% for elite attainment. Overall, academic preparation in high school appears to be the basic mechanism for the association between social origin and not obtaining any higher education degree among students who are eligible for tertiary education. In contrast, for elite attainment, academic preparation accounts for a large share of the effects of social origin but does not fully mediate it, especially in the case of social class.

Discussion

The aim of this chapter was to examine the relevance of the horizontal dimension of social stratification in higher education by identifying the independent effect of different dimensions of social origin. The results have confirmed that qualitative differences are central in the stratification of French higher education: the contrast between elite programmes, more often attained by men with highly-educated parents in the salariat, and other master’s degrees where social origin is much less relevant, is striking. With very recent data, the analyses confirmed that the social closure of the most prestigious education programmes in France is still a distinctive feature of its higher education system. Results also contribute to the existing literature by disentangling the independent effects of different dimensions of social origin on elite higher education attainment: parental education, social class, and to a lesser extent parental status all independently contribute to the social gap observed in elite attainment,

five years after high school graduation. In contrast, being the child of a teacher rather reduces the probability of reaching an elite programme, when controlling for the other dimensions of social origin. I thus do not find support for the hypothesis that differential access to detailed information on the education system has become an important driver of inequalities in contemporary French higher education. It is extremely interesting to see that the respective total effects of parental education and parental social class on elite higher education attainment are very similar in terms of effect sizes. In addition, the disadvantage is as large for the intermediate class as it is for the working class. if we assume that social class adequately captures the financial resources and economic stability of the family, this result suggests that only families with the highest level of resources are more likely to access elite education and that financial barriers contribute to explaining the under-representation of disadvantaged students in elite higher education. This is an important finding because financial resources are somehow less often discussed in the academic literature on French elite higher education. On the one hand, results from the mediation analysis suggest that the large impact of parental education on elite education attainment can only be reduced by improving the educational outcomes of first-generation college students in high school, especially in terms of tracks and distinction, and thus requires early interventions or reforms in secondary schools, or a change in the entrance requirements such as the implementation of alternative pathways or selection processes for disadvantaged students. On the other hand, the equally large effect of parental class is less transmitted via high school performance and has a direct effect on elite education attainment. There may be a number of elements which could explain why financial barriers are important for elite higher education. Not only are around 40% of grandes écoles private, but tuition fees have also been raised significantly in these institutions. Although there is no standardised data on tuition fee trends in grandes écoles, a report estimates that for business schools, which are overwhelmingly private, tuition fees were multiplied by 2.5 in the last twenty years (Institut Montaigne, 2014). In addition, grandes écoles are perceived as expensive by families and high school students: a recent opinion poll showed that half of the parents of 16-20 year-olds still identify financial costs as the main difference between university studies and grandes écoles (CGE & TNS sofres, 2016). The data used in this chapter does not allow us to identify public and private elite programmes, but this is undoubtedly an important issue to examine social inequalities more precisely in elite higher education.

The results also point to the importance of both parents in the transmission of advantage in higher education: children with two, rather than one, highly-educated parent(s), or with two upper-class parents, are more likely to reach an elite programme in higher education. The implication of this finding should be considered in light of results on homogamy patterns in France: between 1969 and 2011, homogamy is found to have strongly declined for both education (with a decline of around 40% over the time period) and social class. The only exception to this pattern is in graduates of grandes écoles for which endogamy has significantly increased (Bouchet-Valat, 2014). The increased endogamy of grandes écoles graduates is interpreted by the author as "the sign, in the realm of partner choice, of the reinforcement of the upper classes' separatism, which […] contrasts with the trend observed for practically all other groups." (Bouchet-Valat, 2014). As both men and women from elite higher education institutions have increased their homogamic behaviours, the finding that children with two socially advantaged parents have a specific advantage in reaching the educational elite, raises an additional concern for the social opening of these institutions over time and this should be an essential question for future research.

Chapter 5
Royal and side roads to excellence in higher education: social disparities in students' trajectories to grandes écoles

Introduction

The previous chapter highlighted the large gender and social inequalities persisting in elite institution attainment in French higher education. Over the last decades, many interventions or reforms have been discussed or experimented with, in an attempt to democratize access to grandes écoles (GE), which are the core institutions of elite education in France. These attempts to implement large-scale reforms at the national level, because many of these institutions are publicly funded, have nevertheless regularly met with strong opposition: for example, in 2010, the idea to set a quota of need-based grant holders in GE triggered a heated controversy between the government and representatives of GE, and was eventually dismissed. However, the political and public pressure has made it increasingly necessary for these institutions to address, or at least profess their commitment to addressing, the lack of diversity in their student body. The interventions developed by each institution often take the form of outreach actions to make the prestigious institutions known to good high school students in disadvantaged neighbourhoods and to provide tutoring to prepare them for the competitive entrance examinations (Van Zanten & Maxwell, 2015). So far, research on diversity policies in GE has overwhelmingly focus on these small-scale interventions, mainly to highlight the strategic function of these symbolic interventions for institutions who need to preserve their reputation and their legitimacy in a competitive higher education system (Allouch & Buisson-Fenet, 2009; Buisson-Fenet & Draelants, 2010; Redon, 2016). However, a major change in the recruitment of GE have been largely overlooked by the literature: GE have been offering an increasing number of places for students who want to transfer after a short vocational degree in higher education or a bachelor's degree. Although the proportion of transfer opportunities vary largely across grandes écoles, these alternative pathways now account for around 40% of all GE new entrants (CGE, 2014). Because these alternative pathways do not set eligibility based on social origin nor residency in disadvantaged neighbourhoods, but based on the degree obtained in higher education, they are rarely labelled as a "social openness" interventions. But these alternative pathways are quantitatively much larger than outreach programmes and can thus be expected to be much

more relevant to the composition of the student body of elite institutions. However, to my best knowledge, there has not been any empirical estimation of the effect of these alternative pathways on the profile of GE students and on inequalities in elite institutions. The development of these alternative pathways is also especially interesting because it constitutes new transfer roads within higher education and thus participates in the diversification of educational careers in higher education. The increased flexibility of students' trajectories and its relevance for social stratification have been highlighted in the U.S. (Goldrick-Rab, 2006; Milesi, 2010) but rarely studied in the European context.

Given the lack of empirical literature on alternative pathways to GE, this chapter aims to first assess descriptively the diversity of students' trajectories to attend GE. Building on the conceptual and methodological advances of sequence analysis, I estimate social disparities in these trajectories by comparing differences in trajectories' complexity and de-standardisation by social groups. My second research question deals with the political efficiency of these alternative admission policies. Data on trends in enrolment in GE, when alternative pathways were being progressively implemented, would be necessary to evaluate their efficiency in promoting equity and diversity in elite institutions. As a first step, I instead focus on students who have reached a GE in the latest cohort and evaluate whether students entering through alternative pathways differ in terms of social and academic characteristics than those entering through the traditional road. However, because this approach does not take into account the initial pool of students who were theoretically eligible for these policies, I further investigate the propensity to transfer to a GE among students graduating from tertiary short vocational degrees. These distinct, but complementary, approaches allow a fine-grained analysis of the social disparities in elite higher education attainment associated with transfer opportunities.

Results confirm the existence of social disparities in the trajectories of students attaining elite institutions as disadvantaged students follow trajectories which are, on average, more complex and further from the standard pathway. In addition, alternative pathways bring in GE students who are, on average from lower social origins than the traditional road and may thus contribute to diversifying the profile of students in GE. This is the case despite the fact that, among eligible students, advantaged students are more likely to transfer. This can be explained by the small proportion of advantaged students who become eligible to transfer by

graduating from a short vocational degree, ensuring that alternative pathways still bring about social diversity benefits.

Theoretical background

Educational transitions, trajectories, and pathways

Much of the empirical research in the sociology of education has conceptualised educational attainment as a sequence of discrete transitions where students either go to the next grade/level of education or leave school. Following Mare's seminal model which "disaggregates formal school attainment into a series of grade transitions" (Mare, 1980), further major theoretical and empirical contributions have focused on the mechanisms of inequality at specific branching points of educational careers (for example, the relative risk aversion model by Breen & Goldthorpe, 1997). However, this sequential model has been criticised for not accounting for several qualitatively different tracks and being blind to path dependency during educational careers (Breen & Jonsson, 2000; Karlson, 2011). Together with the development of the life course perspective, the general idea that "single events should not be isolated from each other but have to be understood in their continuity" (Aisenbrey & Fasang, 2010) has led to an increasing interest in more holistic approaches to characterising educational careers. Two concepts, trajectory and pathway, are most useful to describe the complete sequence of educational transitions, following the terminology introduced by Pallas (2003). *Trajectories* refer to the set of transitions that characterised educational careers followed by students. But individual educational trajectories unfold in a set of structural and institutional constraints, as best highlighted by Kerckhoff's work (1993a). The concept of *pathways* thus complements the idea of individual trajectories to refer to the channels which define the most common sequences of transitions. To sum up, "a trajectory is an attribute of an individual, whereas a pathway is an attribute of a social system. Pathways are of particular interest in their ability to illuminate structures—for example, constraints, incentives, and choice opportunities that link different social locations within a social system" (Pallas, 2003, p. 168). As noted by McMullin (2016), the concept of educational pathway refers to a route which is less strictly determined and more flexible than an educational track, so I argue that it is particularly well suited to the study of students' trajectories in higher education. In contrast with previous levels of education, students in higher education enter and navigate a vast range

of programmes with the possibility of changing institutions or programmes, interrupting their studies or going backward in their progression. Still, higher education programmes set more or less stringent requirements for enrolment and these requirements set the choice opportunities presented to students and frame typical and alternative pathways. In addition, since pathways reflect institutional constraints, they can change over time and "respond to pressure, such as demands for institutional change." (Mcmullin, 2016, p. 30). Public and political pressures calling for greater diversity in elite institutions undoubtedly played a crucial role in the development of alternative pathways to grandes écoles (as described for the case of business schools by Redon, 2016). Conceptualizing higher education attainment as the outcome of students' individual trajectories within predefined pathways also allows us to address major questions concerning the diversity of life course patterns in general, and of educational careers in particular.

The de-standardization and differentiation of life course patterns

Whether they focus on employment histories, family formation patterns or transitions into retirement, a great many studies in the life course approach are concerned with the increasing instability and diversity of life course patterns. This perceived characteristic of modern and globalised societies has been conceptualized with a variety of terms that have been used interchangeably (Brückner & Mayer, 2005). I focus on two core concepts, *differentiation* and *de-standardisation,* which have been most clearly defined and operationalised (Aisenbrey & Fasang, 2010; Brückner & Mayer, 2005). *Differentiation* refers to "the process where the number of distinct states or stages across the life time increases" (Brückner & Mayer, 2005). It is captured by the diversity of states *within* an individual trajectory, which is thus more or less complex (Van Winkle & Fasang, 2017), or following Elzinga & Liefbroer's terminology "turbulent" (2007). Applied to students' trajectories, it means that students are expected to go through a greater number of different programmes, or change institutions, with more moves in and out the education system. *De-standardization* refers to the increasing diversity *between* people' trajectories, implying that the typical sequence of events is experienced by a smaller share of the population (Aisenbrey & Fasang, 2010; Brückner & Mayer, 2005; Elzinga & Liefbroer, 2007). Two distinct aspects thus characterize de-standardisation: on the one hand, trajectories have become more dissimilar to each other and on the other hand, the typical trajectory is expected to be less prevalent (Elzinga & Liefbroer, 2007). These concepts

have been most often applied to identify change over time or cross-country differences. Nevertheless, this theoretical framework could also be especially relevant to social stratification studies: “social disparities in destandardization have rarely been analysed even though the increasing heterogeneity of life courses is closely related to issues of social stratification.” (Zimmermann & Konietzka, 2018). To my best knowledge, these concepts have never been applied to the study of social disparities in higher education, despite an increasing interest in non-traditional students’ trajectories and alternative pathways, as summarised below.

Literature review

Sociological research on higher education has traditionally focused on access or graduation patterns, with little attention paid to students’ detailed trajectories between these two outcomes. Until recently the diversity of students’ trajectories and its implication for social stratification was largely unknown. Although closely related, it is possible to distinguish two strands of research that have recently addressed this question: one that focuses on non-traditional educational trajectories and another which is primarily concerned with the efficiency of institutional alternative pathways or entrance requirements. I focus on the studies that address these topics in relation to social inequalities.

The diversification of students’ trajectories and its effects on social inequalities

In the U.S. context, non-traditional trajectories can be characterised by delayed, discontinuous or part-time enrolment, or multiple institutions attendance and there is evidence that these “deviations from traditional trajectories” (Milesi, 2010) have become increasingly common. Between the 1970s and the 1990s the proportion of high school graduates staying in a single institution in higher education have decreased by 10% (R. Andrews, Li, & Lovenheim, 2014). In this latest cohort, only half of the students starting in a four-year institution were found to follow a continuous trajectory without transfer (Goldrick-Rab, 2006). Similarly, Milesi (2010) estimated that among students who entered a four-year institution “a quarter waited eight months or more to enter college, a quarter had previously attended a two-year college, about a third interrupted their enrolment temporarily for at least eight months, a fifth transferred ’down’ to a two-year college after entering a four-year college, and on average four-year college enrolees spent a quarter of the overall duration of their enrolment as part-time

students." Results also converge in showing that economically disadvantaged students, minority students and those with lower academic preparation are more likely to follow these non-traditional trajectories (Goldrick-Rab, 2006; Milesi, 2010) and suggest that non-traditional trajectories are more detrimental on graduation for disadvantaged students (Milesi, 2010; Pfeffer & Goldrick-Rab, 2011). However, outside of the U.S. context, empirical results on this aspect are still very scarce but suggest that mobility across institutions may be less prevalent. In France, only a small proportion of university students from Paris area were found to have transferred across universities during their first four years in higher education (Frouillou, 2015). In Canada, Childs, Finnie, & Martinello (2017) note that "compared to American students,[…] Canadian students are also less likely to transfer across institutions. The difference is very large for students starting at community college; largely due to the relative lack of well-defined pathways from community colleges to universities leading to a bachelor's degree in Canada". Indeed, the diversification of students' trajectories has to be understood in light of the institutional settings which allow for more or less flexibility and make some moves more or less favourable for educational attainment. The second stream of research thus focuses on the existing or new alternative institutional pathways and their impact on social inequalities.

Admission policies to promote social diversity

Affirmative action is the most famous type of admission policy designed to promote racial, gender or social diversity. However, it goes beyond the scope of this paper to discuss the large literature which assessed its efficiency because affirmative action policies use ascribed characteristics as a selection criterion and thus differ fundamentally from the type of alternative pathway policy discussed here. A large range of other admission policies, not based on ascribed characteristics, have been implemented with the ambition to promote equity and diversity: alternative selection criteria, second-chance programmes, bridge programmes, new transfer routes, etc. The first challenge of these policies is to become a visible alternative which substantially modify students' opportunities and trajectories. For example, alternative entrance routes for adults to higher education in France, Germany and the U.K. were all found to be used by a small number of students and thus to have little effect on the system as a whole (P. Davies, 1996). The second challenge of these policies is to favour social diversity, and several empirical results question their efficiency in this regard. In the U.S., the test-

optional movement, allowing students not to submit their standardised test score such as SAT or ACT for their selective college application, has not increased the share of low-income or minority students in the universities that implemented it (Belasco, Rosinger, & Hearn, 2015). The opposite alternative was actually implemented in Sweden where the main entrance route to higher education is based on high school GPA only: an alternative road was created to allows applicants to use instead the results of a specific scholastic test - SweSAT - and Berggren (2007) found that this option is mainly used by upper class male applicants. Similarly, in Denmark the alternative entrance road based on more qualitative and extra-curricular activities than the high school GPA was found to have little impact of the social gradient of students accepted and to be most often used as an entrance route for low-performing upper class students (J.-P. Thomsen, 2016).

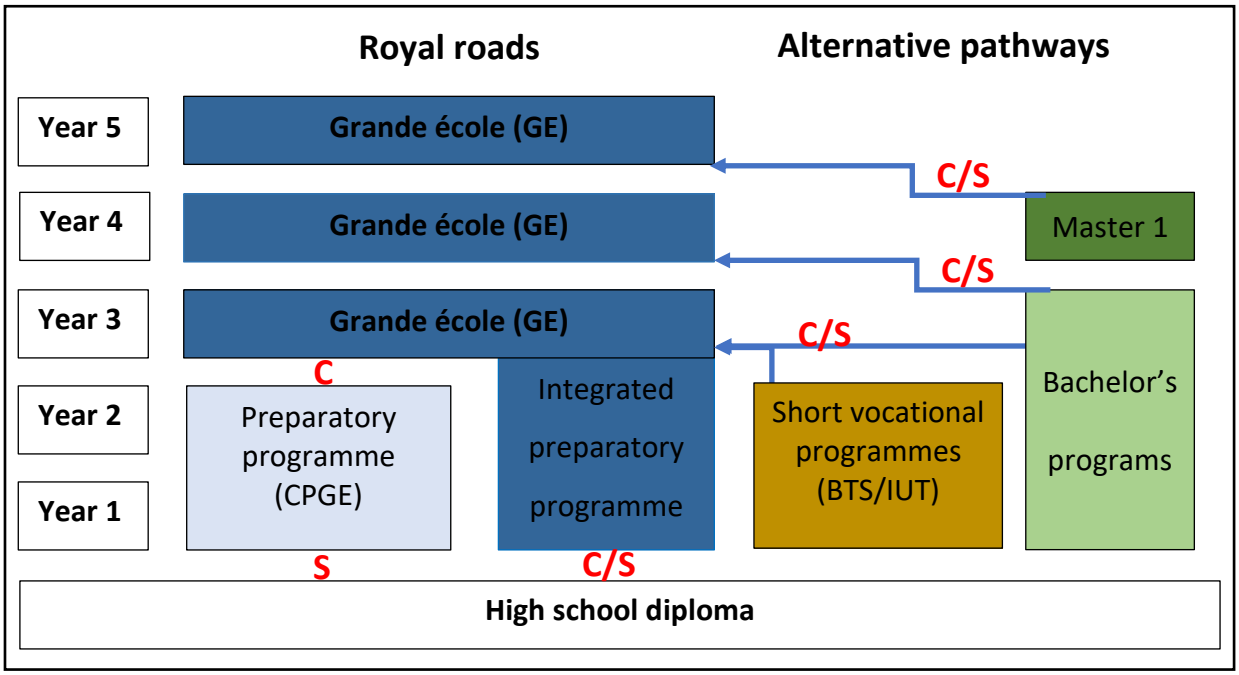
Regarding transfer behaviours, the American case of transition between 2-year to 4-year institutions has been the most studied. Following Brint & Karabel's work (1989) which claimed that U.S. community colleges contribute to diverting disadvantaged students from further educational opportunities, there has been a rich literature attempting to identify whether U.S. community colleges favour a democratization of bachelor's attainment or widen social inequalities. Results consistently showed that socially advantaged students are more likely to transfer from a community college to a university (see for example, Dougherty & Kienzl, 2006; Lee & Frank, 1990). In France, despite the increasing proportion of students entering a grande école after another degree, there has not been, to my best knowledge, any empirical estimation of the factors associated with these transfer behaviours.

Royal and alternative roads to French elite institutions

Historically grandes écoles are the result of the French revolution which lead to the selection of the national elite based on meritocracy, through a competitive process, rather than birth. Further developed during the 19th century, the general organisation of these small prestigious institutions has been maintained over time. Traditionally, they offer a three-year programme and select students based on high-level written and oral examinations: students are accepted based on their rankings in this "concours". In order to give students the necessary preparation, public preparatory programmes (CPGE) were created in high schools. Lasting two years after the high school diploma, these preparatory programmes are also selective and only take

students with the best high school academic records. This pathway of two years of CPGE and three years of GE, with two stringent selections, still remains the main, and most prestigious, way to enter grandes écoles. However, during the 20th century, as GE institutions diversified, new pathways have been created. Figure 5.1 summarizes the current main entrance roads to these institutions. Institutions were created offering integrated five-year programmes which include two years of preparatory programmes. These five-year GE programmes thus remove the second selection gate and select students directly after high school based on competitive examinations or on high school academic records and interviews. More recently, various alternative roads were implemented to allow students with another degree from higher education to transfer to a GE. These "admissions parallèles" are set at the institutional level, usually with a maximum quota of students who can be admitted through it.

Figure 5.1: Pathways to Grandes écoles



Selection criteria
C: Based on ranking in competitive written and oral examinations
S: Based on academic record, tests, interviews

Because these alternative pathways were always an institutional policy and not a nation-wide reform, it is difficult to trace back when they were first implemented and how quickly they developed. According to Blanchard (2014), in the case of business schools, these alternative admissions appeared as early as the end of the 60s but remained marginal until the 90s and

fully developed after 2000. Nowadays, these alternative pathways are undoubtedly widely implemented as even the most traditional and prestigious GE reserve some positions for it. Depending on the GE, these pathways are open to students who hold a two-year short vocational degree (BTS or IUT), have completed two years in a university programme, or are graduates of a bachelor's degree (three years in higher education), or students who have completed the first year of a master's degree (four years in higher education). Applicants for transfer to a GE always go through a selection process but it can take different forms: some institutions use the ranking in a competitive examination, which is specific to short vocational degree graduates, for example. Other GE use a mix of academic records, motivation, test scores and interviews. It is estimated that around 40% of all new entrants in GE now come from one of these alternative pathways (CGE, 2014) but little is known on how this has changed the profile of GE students.

It is important to note that students graduating from a GE after following an alternative pathway (instead of the most prestigious CPGE) seem to experience only a very modest wage penalty in the labour market. Contrary to what was found in selective institutions in the U.S. (R. Andrews et al., 2014), the wage differences between royal and alternative entrants of French engineering schools was estimated at around 3%, even when accounting for the selection bias in the different pathways (Adangnikou & Paul, 2004). Although this estimate is only based on engineering GE graduates, it is reassuring to see that alternative pathways to GE bring about similar benefits in the labour market to those of the main road.

The French case of alternative pathways to GE is especially interesting because it combines two of the main features of the alternative admission policies described in the international literature. On the one hand, it opens an official transfer road within higher education (similar to the community college to university transfer in the U.S.). On the other hand, it also relies on alternative selection criteria than the main pathway which select solely on academic excellence. These alternative pathways can thus be expected to change the trajectories followed by students in higher education before reaching GE and to modify the social and academic profile of the student body in these institutions. On the one hand, one can expect that alternative pathways to GE favour social diversity in elite institutions by providing new opportunities for disadvantaged students for three reasons. First, as shown in the previous chapter, the under-representation of disadvantaged students in elite education in France is

largely explained by lower academic preparation in high school. Thus, an alternative pathway which selects students with selection criteria other than an excellent GPA and very demanding academic competitions, should act as a lever for disadvantaged students. Second, following the relative risk aversion theory (Breen & Goldthorpe, 1997), students aim to secure a level of education to avoid downward mobility. Most of the alternative pathways allow students to go to a prestigious institution after gaining vocational/professional degrees, which also offer an immediate transition to the labour-market. In contrast, the traditional road requires two years of study in higher education but in specific programmes which only prepare students to enter GE and do not grant any degrees. For working and intermediate class students, the alternative pathways should thus appear as an attractive "safety net" option, before making more ambitious and risky educational choices. Finally, preparatory programmes for the traditional pathway are unevenly distributed geographically, mainly offered in large cities and high schools in wealthy neighbourhoods which become the typical feeder schools of elite institutions (Buisson-Fenet & Draelants, 2013; Lemaire, 2008). Since there are many more institutions offering short vocational programmes across the country, even in middle-sized towns, the cost of following an alternative pathway is expected to be lower than attending a CPGE, which often requires moving to a different city. Distance to higher education institutions has been shown to have a stronger negative effect on enrolment for socially disadvantaged students (Gibbons & Vignoles, 2012; Pigini & Staffolani, 2016), so alternative pathways should be a more attractive option for disadvantaged students. However, it is also possible to expect that alternative pathways will mainly benefit socially advantaged students. As summarized earlier, the international literature systematically found that socially advantaged students are the main beneficiaries of these types of policies and the compensatory advantage mechanism (Bernardi, 2014) would also posit that socially advantaged students with insufficient academic performance strategically use such alternative pathways to access elite institutions despite their low performance.

Data

This analysis draws upon the survey "Enquête sur le devenir des bacheliers - 2008-2012" (SIES, 2012) to identify students' attainment in GE. Since data was collected for five years only after high school graduation, I use enrolment in a grande école in the first semester of the fifth year as a proxy for attainment. Grandes écoles include engineering schools, business schools as

well as various prestigious social science institutions (ENS, Sciences Po and other IEP, etc.). Students with missing information in the fifth year but who were enrolled in the fourth year in an elite programme are also included in the analysis since dropout from these programmes is rare. Only 62 students, accounting for 6% of the analytical sample, had missing enrolment data in the fifth year. The analytical sample on the GE student body amounts to 964 students.

Social background is measured with parental education and parental class and I use the information on both parents. Because the proportion of students who have attained a grande école and whose parents are in the working class is marginal (less than 6%), this category is merged with the intermediate class. I further distinguish between students with one parent in the salariat and those with two parents in the salariat. Similarly, parental education differentiates first-generation students whose parents do not hold any higher education degree, students with one tertiary-educated parent, and students whose parents are both higher education graduates. Student academic profile is measured using detailed information on the track, distinction and age at graduation from high school.

In addition, it has been shown that the relatively small number of CPGE and GE institutions across the country has led to important geographical inequalities, which often overlap with social inequalities. Elite institutions are most notably over-represented in the Paris area (and to a lesser extent in other large cities) and only a minority of high schools (often located in wealthy neighbourhoods) offer preparatory programmes. I thus additionally control for the context of the high school attended with the size of the city (which also allows us to differentiate the Paris area), the public or private status of the high school and the presence of a preparatory programme to GE (CPGE) in the high school attended.

Students' trajectories are coded based on enrolment information for each semester in higher education (10 in total). I define 11 possible enrolment states, following the terminology of sequence analysis, which identify the type of programme the student is enrolled into. "Missing" is treated as an additional state so I do not make assumptions about the enrolment situation when it is not reported: only 17 students have missing information for two consecutive years and for each semester no more than 6% of the sample have missing information on enrolment. Table 5.1 summarizes the different states of enrolment and the codes that are used in the following figures.

It is important to keep in mind that this classification only differentiates between categories of HE programmes and thus does not take into account change of speciality or change of institution within the same category of programmes. The estimate of changes and transitions in students' trajectories is thus a lower bound and does not reflect the full complexity of students' experiences in higher education.

Table 5.1: States of enrolment used to code students' trajectories

Type of programme	Code
No enrolment	*NE*
Non-tertiary enrolment: Enrolled in programmes not classified at the HE level	*NT*
HE short vocational programmes in high school	*BTS*
HE short vocational programmes in university	*IUT*
Bachelor's programmes (university)	*BA*
Professional bachelor's programmes (university)	*Prof BA*
Master's programmes (university)	*MA*
Medicine programmes (university)	*Med*
Preparatory programme to grandes écoles	*CPGE*
Grandes écoles	*GE*
Study abroad	*SA*
Missing	*missing*

Methods

In order to describe and analyse students' trajectories, I rely on sequence analysis methods, which provides specific tools to describe, visualize and compare temporal categorical data. Imported in the 80s by Abbott (1983) from the field of genetics where it was used to analyse DNA, sequence analysis has become a standard method to study life-course patterns but also political and historical phenomena (P. Blanchard, Bühlmann, & Gauthier, 2014). In a nutshell, sequence analysis "compares chronological sequences of states within a holistic conceptual model instead of observing allegedly independent observations over time" (Gauthier, Bühlmann, & Blanchard, 2014). In this chapter, sequences refer to students' trajectories, *i.e.* the succession of their enrolment states in higher education, over five years (ten semesters).

To measure the *differentiation* of individual trajectories, I use the complexity index developed by Gabadinho et al. (2010). The complexity index is a composite measure which uses the number of transitions in each individual sequence and the longitudinal entropy which characterises the total time spent in each state. By construction, it ranges from 0, when an individual has experienced only one state for the whole sequence, and 1 when an individual has experienced all possible states with an equal duration. I test the robustness of my findings using the alternative measure of turbulence developed by Elzinga (Elzinga & Liefbroer, 2007).

I operationalise the *de-standardisation* of trajectories with the Hamming distance (Hamming, 1986) between each student's trajectory and the standard pathway to GE. Hamming's distance is a simple count of dissimilar states in a pairwise comparison of sequences. Since I am interested in the divergence of trajectories from the baseline historical pathway to GE, I apply the Hamming distance to measure the dissimilarity between any individual trajectory and the typical sequence: two years in a preparatory CPGE and three years in a GE. The Hamming distance is the simplest measure of dissimilarity and also the easiest to interpret (Zimmermann & Konietzka, 2018). I also test the robustness of the findings by using an alternative measure of dissimilarity: Elzinga's Longest Common Subsequences distance. The TraMineR package in R is used to calculate sequence complexity, dissimilarity and to visualize students' trajectories (Gabadinho, Ritschard, Mueller, & Studer, 2011). In order to assess whether the differences in mean complexity and distance between gender or social groups are statistically meaningful, and following Aisenbrey & Fasang's approach (2010), I compute 95% bootstrap confidence intervals drawing 1,000 samples with the bias corrected and accelerated (BCA) method (Efron & Tibshirani, 1993).

Since I am primarily interested in the effect on the student body of gaining access to GE through a traditional pathway or an alternative one, I choose a deductive method to assign trajectories to these two categories rather than an inductive classification. I proxy the pathways using the last type of programme in which the student was enrolled before entering GE: students entering directly to a GE or after a preparatory programme (CPGE) are classified "royal road" entrants. Students who were enrolled in other programmes (BTS, IUT, bachelor's, master's, etc.) before a GE are classified as having enter through an alternative pathway. In order to assess the diversity effect of alternative pathways on the GE student body, I compare social origins, academic and high school characteristics of students attaining GE through royal

roads to those who used alternative pathways. I use the index of dissimilarity, *D*, which can measure the (un)evenness of the distribution of students across institutions (Croxford & Raffe, 2013) or entrance pathways (Alon, 2011a). Since I am primarily interested in the extent of diversification of the student body in GE associated with alternative pathways, I compute the dissimilarity index to assess the proportion of alternative pathways entrants who would need to be from a different gender, social origin, track, etc. to make the two student bodies even. It is calculated as:

$$D = 0.5 * \sum_{i=1}^{n} \left| \frac{A_i}{A_T} - \frac{R_i}{R_T} \right|$$

Where n is the number of origin characteristic categories. A*i* is the number of alternative entrants from origin *i;* A*T* is the total number of alternative entrant students in grandes écoles; R*i* is the number of royal road entrants from origin *i* and R*T* their total number in GE. D is independent of the prevalence of the two entrance pathways in the composition of GE population and ranges from 0 to 1. In this case, 0 indicates that alternative pathway entrants do not differ from royal entrants and there are no diversity benefits associated with this policy. It is maximised and reaches 1 if all alternative pathways entrants differ entirely from royal road ones on a given characteristic meaning that the diversity observed in the whole student body of GE can entirely be attributed to alternative pathways.

Results

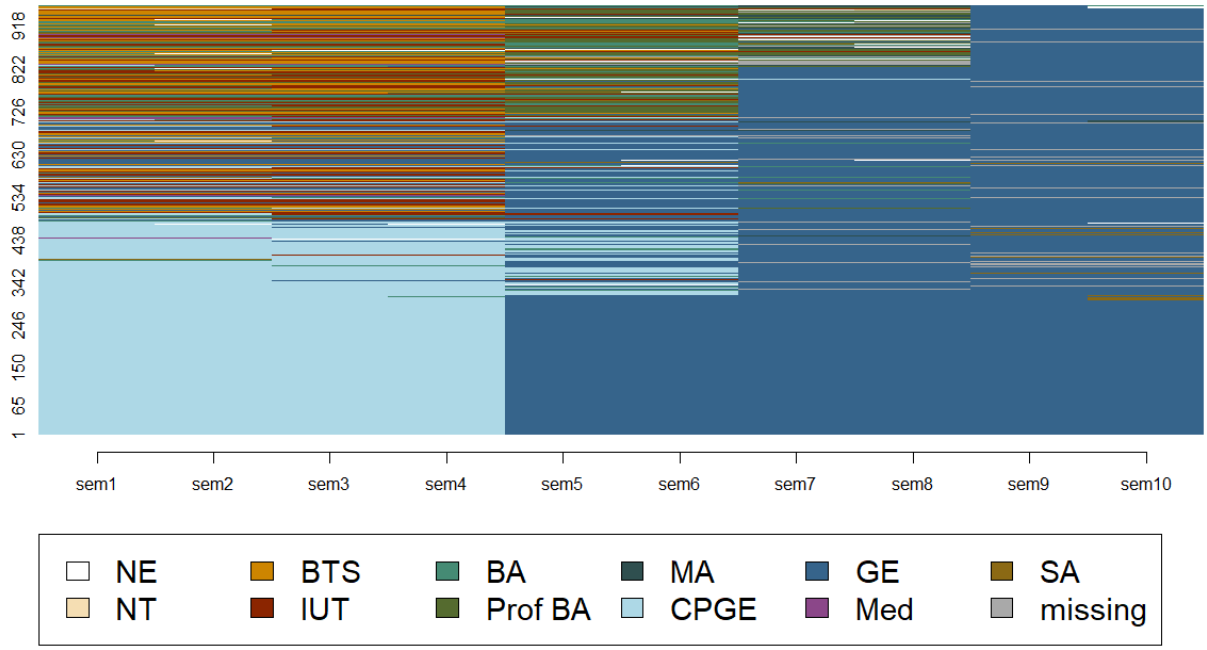
Description of students' trajectories to grandes écoles

Figure 5.2 plots the individual trajectories of the 964 students who reached a grande école in the fifth year in higher education. It clearly shows that going through a preparatory programme (CPGE, light blue) is still the most frequent path to reach a GE (dark blue). A third of all students have spent two years in a preparatory programme before entering GE and another 8.1% took an extra year in CPGE before making it to a GE (see the most common trajectories in Table 5.A in Appendix 5). However, the figure also illustrates the diversity in students' trajectories as a non-negligible number of students go through other types of programmes than CPGE before reaching a *grandes école*.

Outside of CPGE, it is more common to enter a GE after two years of a short vocational programme in university (IUT-6.4% of all students); to enter a GE directly after high school

graduation (5.3%); after three years in a professional bachelor's programme (2.7%) or after a short vocational programme in high school (BTS-2.6%). But there is overall a great diversity and individualisation of the observed trajectories: around 16% of the students follow a trajectory which is unique in the sample (159 sequences followed by one student only).

Figure 5.2: Trajectories in higher education of students reaching a grande école by the fifth year

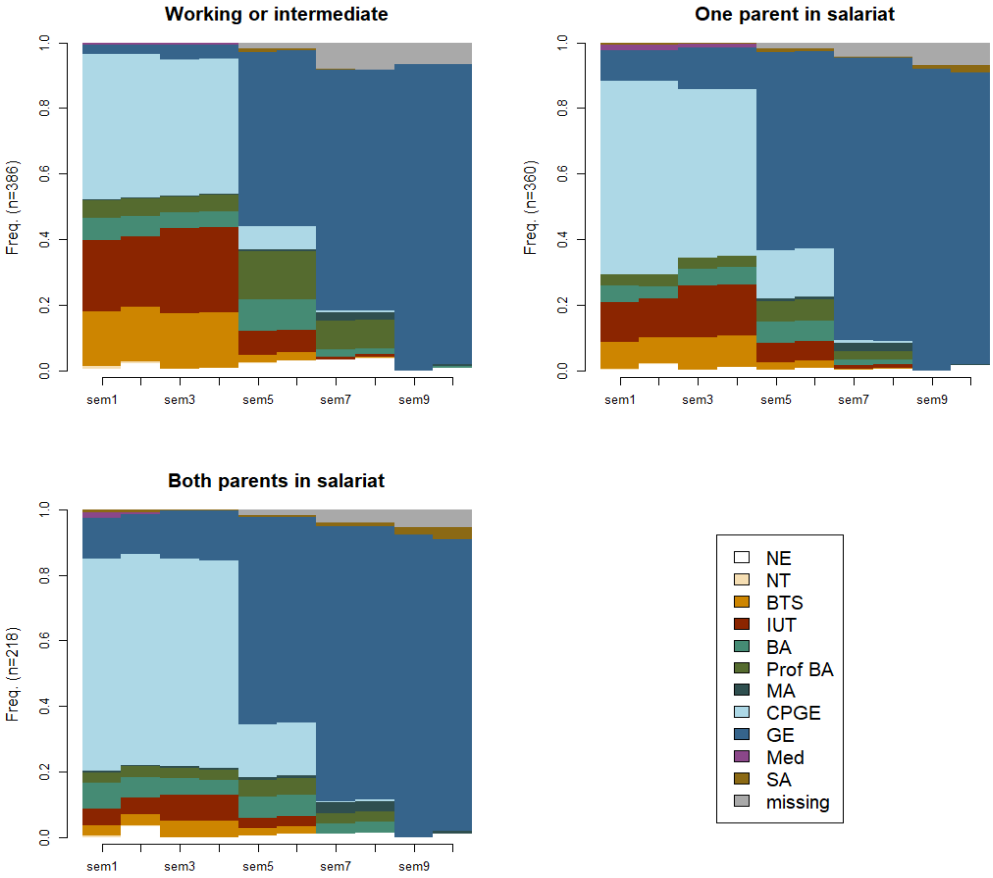


Source : « Enquête sur le devenir des bacheliers - 2008-2012. ».

Do students from different social backgrounds differ in the trajectories taken to reach GE? Figure 5.3 visually explores this question by showing the state distribution (i.e. the frequency of the different enrolment states at each semester), depending of students' social class of origin. It clearly shows that enrolment in vocational programmes (in orange and red), is much more common among students coming from the working or intermediate class, while preparatory programmes (light blue) are much more prevalent for students with two upper-class parents. Interestingly, enrolment in a grande école (dark blue) from the first semester in higher education is more common among students with at least one parent in the salariat and almost negligible among students from the working or intermediate class. This is somewhat surprising as grandes écoles in five years, which remove the second step of competitive selection after the two years of preparatory programme, and thus reduce the risk of failure, are often thought to be more favourable to social diversity. This does not appear to be the case in this sample. Actually, the exploration by gender shows that attending a five-year GE is

more common for women (8.3% of them follow this path) than for men (3.4%), and these institutions might mainly favour gender diversity. The state distribution by parental education shows very similar patterns than by social class and is presented in Appendix 5 (Figure 5.A).

Figure 5.3: State distribution by social class; students in a grande école in the fifth year



Source : « Enquête sur le devenir des bacheliers - 2008-2012. ».

In order to rigorously estimate gender and social disparities in students' trajectories to GE, I now turn to the measures of trajectories' complexity and distance from the typical pathway (Table 5.2). The average complexity index by group and their confidence intervals suggest that first-generation higher education students have trajectories which are 12% more complex than students with two tertiary-educated parents and that this difference is statistically significant. Similarly, when they reach a prestigious institution, students with no parent in the salariat follow trajectories which are 21% more complex than students with two upper-class parents. The difference in mean complexity thus appears to be larger based on social class of origin than for parental education and these results are robust to the use of the turbulence index instead of the complexity one (Table 5.B in Appendix 5). However, with the turbulence

index, the difference between gender becomes statistically significant as women's trajectories to GE appears to be less complex than those of men.

In terms of de-standardisation, i.e. distance from the typical pathways "two years in CPGE and three in GE", the same social disparities are observed but somewhat larger. First-generation HE students have trajectories which are, on average, further from this typical pathway than students with two tertiary-educated parents and the mean difference between the two groups represent almost one more dissimilar states (out of 10) for first-generation students in the pairwise comparison. This is also true for students from the working/intermediate class compared to students with two upper-class parents and again, social class is associated with a difference which is somewhat larger than parental education. The results are very similar if I measure de-standardization with the longest common subsequence instead of the hamming distance (Table 5.B in Appendix 5).

Table 5.2: Average complexity and distance from typical pathway, by gender, parental education and parental class; students in a grande école in the fifth year

		Complexity index			Hamming distance			
Variables		Mean	95% CI	% difference	Mean	95% CI	% difference	N
Gender	Male	0.216	0.209 - 0.223	Ref.	3.190	2.959 - 3.422	Ref.	589
	Female	0.205	0.194 - 0.215	-	3.512	3.200 - 3.824	-	375
Parental education	Below higher education	0.224	0.213 - 0.235	**12%**	3.893	3.542 - 4.244	**34%**	289
	One parent with higher education	0.219	0.206 - 0.232	-	3.368	3.002 - 3.735	-	239
	Both parents with higher education	0.200	0.191 - 0.209	Ref.	2.904	2.646 - 3.162	Ref.	436
Parental social class	Working class & intermediate	0.233	0.223 - 0.243	**21%**	3.904	3.602 - 4.207	**45%**	386
	One parent in salariat	0.201	0.191 - 0.210	-	3.058	2.785 - 3.331	-	360
	Both parents in salariat	0.192	0.179 - 0.206	Ref.	2.697	2.332 - 3.062	Ref.	218
	All students	**0.212**	**0.205 - 0.218**	**-**	**3.315**	**3.133 - 3.497**	**-**	**964**

Note: bias corrected and accelerated bootstrap confidence intervals reported. Percentage differences calculated with reference category when confidence intervals do not overlap.
Source : « Enquête sur le devenir des bacheliers - 2008-2012. ».

To summarize, these results show that students from disadvantaged backgrounds who attain entry to elite institutions tend to attend a greater number of programmes in higher education (with more variation in the time attended) and follow more non-traditional pathways. This suggests that social groups differ in their use of existing alternative pathways to enter elite institutions.

Alternative pathways and diversity in the student body

Among the 964 students who have attended a grande école in the fifth year, around 42% have followed an alternative pathway, which is an estimation very similar to the one done by the grandes écoles association with a different dataset (40%; CGE, 2014). Table 5.3 summarises the characteristics of the student body in grandes écoles, depending on the pathway they

followed. Following Alon's study (2011a), I interpret the diversity in the "royal" student body as a proxy of the counterfactual diversity level in GE if alternative pathways did not exist. The dissimilarity index D provides an estimate of the (un)evenness of the distribution in the two groups and can be interpreted as the percentage of students in alternative pathways who would need to have a different origin, academic performance, etc. to make the two student bodies identical. Thus, the higher the dissimilarity index, the larger the diversity in student characteristic brought by alternative pathways.

Table 5.3: Characteristics of students who have reached an elite institution in fifth year, by entrance pathway

Frequency distribution in % and dissimilarity index

		Royal roads	Alternative pathways	Dissimilarity index D	All
Gender and social characteristics					
Gender	*Male*	60.2	62.3	***0,02***	61.1
	Female	39.8	37.7		38.9
Parental education	*Below higher education*	24.1	38.2	***0,19***	30.0
	One parent with higher education	22.6	27.8		24.8
	Both parents with higher education	53.3	34.0		45.2
Parental social class	*Working class or intermediate*	31.0	52.6	***0,22***	40.0
	One parent in salariat	39.8	34.0		37.3
	Both parents in salariat	29.2	13.4		22.6
Academic performance characteristics					
Track of high school degree	*Academic Scientific*	74.7	45.4	***0,29***	62.4
	Academic humanities	2.0	2.2		2.1
	Academic economics	15.7	22.1		18.4
	Technological	7.7	26.6		15.6
	Vocational	0.0	3.7		1.6
Age at high school degree	*On time or in advance*	91.1	71.2	***0,20***	82.8
	One year or more late	8.9	28.8		17.2
Distinction in high school degree	*Without distinction*	9.4	38.7	***0,44***	21.7
	Quite good	24.1	39.2		30.4
	Good	37.6	17.6		29.3
	Very good	28.9	4.5		18.7
High school characteristics					
Size of the city in high school	*Village or small town*	16.6	19.1	***0,03***	17.6
	Medium-sized city	29.2	28.0		28.7
	Large city, other than Paris	29.9	28.0		29.1
	Paris area	24.2	24.8		24.5
Type of high school	*Public*	73.3	77.9	***0,05***	75.2
	Private	26.7	22.1		24.8
Offered preparatory programme to GE	*No*	77.2	87.3	***0,10***	81.4
(CPGE)	*Yes*	22.8	12.7		18.6
Number of observations		**561**	**403**		**964**

Source : « Enquête sur le devenir des bacheliers - 2008-2012. ».

The effect of alternative pathways on the composition of the student body in elite institutions appears to be largest in terms of diversity of academic profile in high school diplomas. Students attaining attendance at a GE through the royal roads show extremely homogenous profiles in terms of high school academic performance: almost 75% of them graduated from the scientific track, 90% graduated on time and two-thirds have a distinction "good" or "very

good". As a comparison point, it is useful to look back at the proportion of students with these characteristics among all high school graduates: 30% graduate from the scientific track, less than 60% graduate on time and 16% reach a distinction "good" or "very good" (as shown in Table 4.1 in the previous chapter). The royal road to GE is undoubtedly very efficient in selecting only the top students from high school, but it comes at the price of a strong homogeneity in students' academic profiles.

In contrast, alternative pathways appear to be efficient in bringing about more diverse academic profiles. I find the largest index of dissimilarity (0.44) for the distinction obtained in the high school diploma, with around 78% of the students who have the distinction "quite good" at most. In addition, alternative pathways allow more students from the technological track to attain elite education (26.6% of alternative entrants come from this track compared to only 7.7% of royal road entrants) and the proportion of students graduating from high school one year late rises to around 29% with alternative pathways compared to only ~9% through the royal roads.

The diversification in the academic profile of GE students from alternative pathways is associated with a diversification in terms of social origin. The dissimilarity index for parental social class amounts to 0.22 and is mainly driven by the larger share of students without any upper-class parent in the alternative pathway (38.2% versus 24.1% in the royal road group). Similarly, alternative pathways entrants are more often first-generation college students (38.2%) than students coming from the royal roads (24.1% only). However, the dissimilarity indexes suggest that the diversity effect is somewhat smaller for social origin than it is for academic profile.

Interestingly, I find that alternative pathways have only a small impact on the diversity of students in terms of the high school attended as the dissimilarity index for graduating from a high school offering a prestigious preparatory programme is 0.10 and amounts to only 0.05 for the type of high school (public or private). Furthermore, alternative pathways seem to have no effect on the geographical profile of students (as measured by the size of the city in high school) and on gender diversity in grandes écoles. If anything, men are slightly more represented in students entering through alternative pathways than through royal roads.

These results thus confirm that alternative pathways to GE seem to be associated with a change in the composition of the student body in elite institutions. These pathways provide a non-negligible number of students who differ from students following the royal pathways on various characteristics. Alternative pathways allow students with lower than excellent academic preparation and from lower social backgrounds to attend GE, although they do not have any positive impact on the gender nor geographical diversity of these institutions. But the diversity benefits of alternative pathways depend on both the characteristics of students eligible for it and the differential propensity of these students to use it. Looking only at the students who have entered GE says nothing about the use of these pathways in the pool of eligible students, so I now turn to the analysis of transfer behaviours to GE among students who are theoretically eligible for it.

Transfer to grandes écoles after a short vocational degree

Alternative pathways to GE were first developed for students with a short tertiary vocational degree (BTS or IUT) and these graduates still account for the largest group of students who gain access to elite institutions through alternative pathways: among the students who have attained entry to GE, around 30% had first graduated from a short vocational degree, which accounts for almost 70% of students who have entered through an alternative pathway. I thus estimate transfer behaviours[1], using the same database, among the 2,252 students who reported graduating from a short vocational degree as a first degree in higher education. In this group, 12.5% of the students have transferred to a grande école by the fifth year.

Table 5.4 shows the characteristics of graduates from these programmes and the proportion of them who have transferred. Undoubtedly, vocational degree graduates differ on many characteristics from the typical GE students described earlier. A bit less than two out of three of BTS or IUT holders are first-generation college students and a bit less than three out of four come from the working or intermediate class. Only one out of five graduated from the most prestigious academic-scientific track while 41.7% hold a technological high school diploma. More than half obtained their high school diploma without any distinction. The majority of short vocational degree graduates came from a small or medium-sized city (61.1%) and

[1] The analysis is not limited to students who transferred immediately after their short vocational degree, as a large share first obtained another degree (for example a professional bachelor's degree) before to enter a GE.

studied in a public high school (81%) which did not offer a preparatory programme to GE (CPGE-94.6%).

Table 5.4: Characteristics of students holding a short vocational degree (first HE degree)
Frequency distribution in %

		Distribution in analytical sample	Proportion who transfer
Transfer to a grande école	***No***	**87.5**	
	Yes	**12.5**	
Applied to transfer to a grande école	*No*	78.0	
	Yes	22.0	
Gender and social characteristics			
Gender	*Male*	51.1	16.8
	Female	48.9	8.0
Parental education	*Below higher education*	62.7	8.3
	One parent with higher education	21.8	17.9
	Both parents with higher education	15.4	21.9
Parental social class	*Working class or intermediate*	72.1	10.0
	One parent in salariat	22.6	18.0
	Both parents in salariat	5.3	21.8
Academic performance characteristics			
Track of high school degree	*Academic Scientific*	21.1	25.8
	Academic humanities	4.3	4.2
	Academic economics	15.9	13.2
	Technological	41.7	9.9
	Vocational	17.0	3.7
Age at high school degree	*On time or in advance*	56.5	15.0
	One year or more late	43.5	9.2
Distinction in high school degree	*Without distinction*	53.0	9.5
	Quite good	34.5	14.0
	Good	11.1	21.6
	Very good	1.4	15.6
High school characteristics			
Size of the city in high school	*Village or small town*	25.3	11.1
	Medium-sized city	35.8	9.9
	Large city, other than Paris	26.2	12.9
	Paris area	12.6	21.8
Type of high school	*Public*	81.0	12.4
	Private	19.0	12.6
Offered preparatory programme to GE (CPGE)	*No*	94.6	12.1
	Yes	5.4	19.8
HE vocational degree characteristics			
Type of vocational degree	*In high school-BTS*	68.4	6.7
	In university-IUT	31.6	24.9
On-time graduation; 2 years after high school	*No*	27.8	12.0
	Yes	72.2	12.7
Number of observations		***2 252***	

Source : « Enquête sur le devenir des bacheliers - 2008-2012. ».

Finally, more students graduate from the somewhat less prestigious BTS degree (often offered in high school) than from the IUT programmes which are offered in universities (68.4% versus 31.6%). Fewer than three-quarters of these students graduated two years after entering higher education. The proportion of students who have transferred to a GE varies largely for each of these categories and I estimate the independent effects of these different variables on the probability of transferring to a GE with nested logit models, presented in Table 5.5.

Table 5.5: Estimation results for the probability of transfer to an elite institution; graduates of short vocational degrees

Odds ratios and average marginal effects from logit models

Variables		Model 1				Model 2				Model 3				Model 4			
		Odds ratio		AME		Odds ratio		AME		Odds ratio		AME		Odds ratio		AME	
Gender	Male (reference category)																
	Female	0.451***	(0.06)	-0.081***	(0.01)	0.422***	(0.06)	-0.082***	(0.01)	0.408***	(0.06)	-0.084***	(0.01)	0.473***	(0.07)	-0.068***	(0.01)
Parental education	Below higher education	0.399***	(0.08)	-0.104***	(0.03)	0.551***	(0.11)	-0.059***	(0.02)	0.582**	(0.12)	-0.052**	(0.02)	0.587**	(0.13)	-0.050**	(0.02)
	One parent with higher education	0.886	(0.17)	-0.018	(0.03)	1.013	(0.20)	0.002	(0.02)	1.050	(0.21)	0.006	(0.02)	1.061	(0.22)	0.007	(0.02)
	Both parents with higher education (reference category)																
Parental social class	Working or Intermediate	0.779	(0.21)	-0.027	(0.03)	0.910	(0.26)	-0.009	(0.03)	1.098	(0.32)	0.008	(0.03)	1.137	(0.34)	0.011	(0.03)
	One parent in salariat	0.978	(0.26)	-0.003	(0.03)	1.082	(0.30)	0.008	(0.03)	1.204	(0.34)	0.017	(0.03)	1.275	(0.36)	0.022	(0.02)
	Both parents in salariat (reference category)																
Track of high school degree	Academic Scientific (reference category)																
	Academic humanities					0.185***	(0.10)	-0.170***	(0.03)	0.171***	(0.09)	-0.179***	(0.03)	0.215***	(0.12)	-0.138***	(0.03)
	Academic economics					0.556***	(0.11)	-0.081***	(0.03)	0.519***	(0.10)	-0.090***	(0.03)	0.527***	(0.11)	-0.074***	(0.02)
	Technological					0.382***	(0.06)	-0.120***	(0.02)	0.345***	(0.06)	-0.131***	(0.02)	0.498***	(0.09)	-0.079***	(0.02)
	Vocational					0.103***	(0.03)	-0.194***	(0.02)	0.084***	(0.03)	-0.206***	(0.02)	0.154***	(0.05)	-0.152***	(0.02)
Age at high school degree	On time or in advance (reference category)																
	One year or more late					0.826	(0.13)	-0.018	(0.01)	0.788	(0.12)	-0.022	(0.01)	0.780	(0.12)	-0.023	(0.01)
Distinction in high school degree	No distinction (reference category)																
	Quite good					1.752***	(0.27)	0.053***	(0.01)	1.988***	(0.31)	0.063***	(0.01)	1.683***	(0.27)	0.047***	(0.01)
	Good or Very good					3.061***	(0.60)	0.125***	(0.03)	3.370***	(0.67)	0.131***	(0.03)	2.647***	(0.54)	0.100***	(0.02)
Size of the city in high school	Village or small town (reference category)																
	Medium-sized city									0.906	(0.17)	-0.008	(0.02)	0.925	(0.18)	-0.006	(0.02)
	Large city, other than Paris									1.227	(0.24)	0.019	(0.02)	1.211	(0.24)	0.017	(0.02)
	Paris area									3.114***	(0.69)	0.134***	(0.03)	3.330***	(0.75)	0.139***	(0.03)
Type of high school	Public (reference category)																
	Private									1.186	(0.21)	0.017	(0.02)	1.292	(0.23)	0.025	(0.02)
High school offered CPGE	No (reference category)																
	Yes									1.006	(0.27)	0.001	(0.03)	0.971	(0.26)	-0.003	(0.02)
Type of HE vocational degree	In high school-BTS (reference category)																
	In university-IUT													2.637***	(0.42)	0.096***	(0.02)
On-time graduation; 2 years after high school	No (reference category)																
	Yes													1.295	(0.21)	0.023*	(0.01)
Constant		0.398***	(0.09)			0.462***	(0.12)			0.314***	(0.10)			0.131***	(0.05)		
Log likelihood		-798.2				-736.5				-717.9				-698			
Pseudo R2		0.0582				0.131				0.153				0.176			
Number of individuals		2,252		2,252		2,252		2,252		2,252		2,252		2,252		2,252	

Source: Enquête sur le devenir des bacheliers - 2008-2012.

Standard errors in parentheses

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

Model 1 shows that among students graduating from a vocational degree, there are large differences in the transfer behaviours to elite institutions: women are less than half as likely to transfer than men (which represents a difference of marginal effects of 8 p.p.) and first-generation college students are 10 p.p. less likely to transfer than students with two tertiary-educated parents. In contrast, controlling for parental education, there is only a small non-significant difference between students from the working or intermediate social class and those with two upper-class parents. Students with a stronger academic background in high school are more likely to transfer after their vocational degree, especially those from the academic-scientific track and those who graduated with at least a distinction "good"[2]. Importantly, academic preparation does not mediate the lower propensity of women to transfer but it explains part of the difference based on parental education. Although high school characteristics do not further mediate gender or parental education inequalities, it is striking to see that students who attended high school in the Paris area are much more likely to transfer to a grande école (+13.4 p.p.; Model 3). Finally, it could be that women and first-generation college students make the less ambitious choice of vocational programmes in higher education, which then hinders their opportunities to transfer. Model 4 shows some support for this hypothesis but in the case of gender only. The type of vocational degree does have a large independent effect on transfer behaviours (an increase of almost 10 p.p. for IUT graduates) and its inclusion in the model reduces slightly the coefficient for women but only marginally for first-generation students.

Overall, advantaged students, whether it is in terms of parental education, academic background or geographical origin, are more likely to transfer to a grande école. The only exception to this pattern is social class, which does not have an independent effect on transfer behaviours. These results complement the conclusions drawn previously regarding the diversity benefits of alternative pathways to GE and allows us to discuss the conditions under which alternative entrance pathways can contribute to reducing social inequalities in higher education.

Discussion

This chapter has implemented different approaches to describe and analyse the trajectories of students attaining grandes écoles and has estimated the effect of social origin on trajectories to elite higher education. I complemented the traditional analysis of single transitions in educational careers by building on concepts and methods from sequence analysis to further investigate students' trajectories in a holistic approach. These distinct but complementary approaches made it possible to address three crucial questions: first, what are the trajectories of students attaining entry to GE and do they differ by students' social origin? Second, do students entering through alternative pathways differ in terms of social and academic characteristics than those entering through the traditional road? Finally, who are the students taking advantage of the transfer opportunities offered by these alternative pathways?

Results on the characteristics of students' trajectories confirm a finding established in the U.S. context: students from lower social backgrounds have trajectories in higher education which are less linear and further from the traditional pathway than socially advantaged students (Goldrick-Rab, 2006; Milesi, 2010). Not only has it been the opportunity to test the relevance of non-traditional trajectories for social stratification in HE outside of the American context, but this chapter also attempted to go beyond the analysis of the probability to experience specific deviations from traditional pathways (such as delayed enrolment or change of institutions) by implementing a theoretically-driven framework to assess social disparities in students' trajectories. I used the concepts and measures of complexity and de-standardisation recently developed as part of sequence analysis methods. Often used to study school-to-work transitions or employment trajectories, sequence analysis has rarely been applied to educational careers. In France, only two recent theses have used sequence analysis methods to develop typologies of students' trajectories across specific HE institutions (Frouillou, 2015; Moulin, 2014). The present chapter has instead focused on the question of de-standardisation of students' trajectories and it would be extremely interesting to expand this analytical approach to analyse the diversification of students' trajectories over time. Similarly, the comparisons of complexity and de-standardisation levels could be a promising approach to comparatively evaluate the flexibilization of educational careers in higher education across countries.

The second focus of this chapter deals with the efficiency of alternative pathways to diversify and reduce inequalities in elite French higher education institutions. The analyses combine, and this has rarely been done in other studies on alternative pathways, a retrospective approach which investigates who are the students in GE who have followed an alternative pathway, and a prospective one which identifies the probability of using this road among eligible students. On the one hand, I find evidence that less advantaged and lower performing students are over-represented among alternative pathways entrants suggesting that these pathways allow a diversification of the student body of elite institutions. On the other hand, among students eligible to transfer to a GE after graduation from a short vocational tertiary degree, students with better academic backgrounds and from highly-educated families are more likely to make use of these alternative pathways. These results provide an opportunity to discuss the conditions under which alternative pathways can increase the opportunities of disadvantaged students in elite institutions.

First, the fact that alternative pathways appear to serve disadvantaged students in reaching elite institutions but do not address the under-representation of women allows us to discuss the hypotheses formulated earlier, on the mechanisms which drive the efficiency of such policy. Results on the composition of the student body in GE have shown that the largest dissimilarity between royal and alternative entrants lies in their academic performance in high school, as the royal road only let in excellent high school students. The previous chapter has shown that social inequalities in GE attainment are largely driven by the lower academic preparation of disadvantaged students in high school, while gender inequalities exist despite the fact that women do as well or better than men. It is thus not surprising that the increasing opportunities for students with an average or good, but not excellent, academic profile should lead to increasing opportunities for students from lower social backgrounds, while this policy has no effect on the lack of gender diversity. As expected, alternative pathways seem to be efficient in increasing social diversity because they rely on alternative selection criteria which are less narrowly related to academic preparation than competitive examinations and, *de facto*, are more favourable to disadvantaged students.

The analysis of the propensity to transfer up from short vocational programmes to elite institutions hints at the fact that alternative pathways to enter GE can be used differently by different social groups. A closer look at the trajectories of students attaining elite institutions

through alternative pathways indeed shows that among those with at least one tertiary-educated parent, around one out of five was first enrolled in a prestigious preparatory programme (CPGE) for one or more years before going to a short vocational or bachelor's programme and then transferring back to a GE. In contrast, the proportion of these "compensating" trajectories among first-generation college students attaining entry to a GE through alternative pathways is much smaller (around 7%). These results would need to be confirmed with a larger database but suggest that alternative pathways can serve compensatory strategies for socially advantaged students who want to reach a GE but face difficulties in the very demanding CPGE and fail to enter through the royal roads.

Alternative pathways allow for compensatory trajectories for advantaged students and, among vocational graduates, students with better academic backgrounds and with higher educational family backgrounds are more likely to seize the opportunity to transfer to a prestigious institution. However, results still suggest that alternative pathways participate in diversifying the profile of students in GE. This is only possible because socially advantaged students and very good students still account for a minority in the programmes that are targeted by alternative pathways opportunities. Given the social segregation seen in access patterns in French higher education (as discussed in Chapter 2), students who first obtain a short vocational degree, or to a lesser extent a university degree, and thus become eligible for alternative pathways to GE, are more likely to be from lower social backgrounds with a lower academic preparation than students in prestigious CPGE programmes. This ensures that, even if in relative terms advantaged students are more likely to transfer, alternative pathways allow quantitatively more students from disadvantaged backgrounds and with lower academic preparation to enter GE and maintain the diversity benefits of this policy. This finding has important implications for the efficiency of alternative pathways.

The previous literature on alternative admission criteria had concluded that these policies fail to address social inequalities in higher education, as most advantaged students maintain or increase their advantage in entrance through alternative pathways (Belasco et al., 2015; Berggren, 2007; J.-P. Thomsen, 2016). Although these studies evaluated policies that differ in which criteria were used for the main entrance road and the alternative ones, they shared the characteristic that any high school student could decide to apply through the alternative selection process. In the case of alternative pathways to French elite institutions, only

graduates of specific tertiary programmes get this opportunity. Because these tertiary programmes are characteristic of disadvantaged students in higher education, this selection criteria may be a crucial element to guarantee that alternative pathways contribute to reducing social inequalities. Choosing to apply with the GPA score instead of a standardised test score (or vice-versa) is relatively easy and this type of alternative lets the door open to compensatory or "safety net" strategies from better-informed, socially-advantaged students. In contrast, it is more demanding to graduate from a programme that last at least two years and, although some strategic behaviours from upper class students are still found, disadvantaged students still constitute the bulk of beneficiaries from these alternative pathways. In this perspective, the case of alternative pathways to elite institutions, especially the ones for short vocational degree holders, may be interpreted as a need-blind colour-blind affirmative action policy, following Alon's terminology (2011a). Such policy gives an advantage in the selection process based on an eligibility criterion which is not a personal characteristic of social disadvantage (such as ethnic origin or financial familial need) but a criterion which is associated with structural disadvantages. In the case of some selective Israeli universities, students coming from disadvantaged neighbourhoods have an edge in the selection process and it was found to be efficient to diversify the student body of these top institutions (Alon, 2011a). The case of French elite institutions is thus interesting because it suggests that offering opportunities to students who have earned a degree which is largely characteristic of disadvantaged students can work in a similar way. As social stratification across different higher education institutions is becoming an increasing concern (Gerber & Cheung, 2008; Shavit, Arum, et al., 2007), these types of alternative pathways can participate in increasing opportunities for disadvantaged students along their educational careers in higher education. But it also implies that diversity benefits in elite French institutions will only hold if disadvantaged students remain over-represented in short vocational programmes. As upper class families increasingly avoid general university programmes (Ichou & Vallet, 2013) and may increasingly turn to short vocational programmes, it is important to further examine whether the shifting lines of social stratification in higher education may hinder the diversity benefits of alternative pathways in the near future.

Two important limits of this chapter should be highlighted. First, this chapter does not take into account the variation in the share of alternative pathway entrants across elite institutions.

I mentioned earlier that the share of new entrants from alternative pathways varies largely by institution and data on engineering grandes écoles shows that the share of alternative entrants is much smaller in the most prestigious institutions than in the second-tier ones: for example, in the most prestigious public engineering school "École polytechnique", the proportion of alternative pathways entrants is only 6% (L'Etudiant, 2018). There is little doubt that graduating from a GE, even a second-tier one, should bring about benefits on the job market compared to holding a short vocational degree or a general bachelor's degree. But this observation also implies that alternative pathways do not address the problem of the renewal of the economic and political elite in France, who overwhelmingly come from a handful of top institutions, if these institutions offer so few seats to alternative entrants.

Second, I interpreted the diversity in the "royal" student body as a proxy of the counterfactual diversity level in GE if alternative pathways did not exist. Since students entering through alternative pathways come more often from disadvantaged backgrounds, I concluded that alternative pathways seem to be efficient in diversifying the student body of elite institutions. However, such analyses based on one cohort of students do not allow me to estimate the causal effect of this policy. Actually, the same result can be interpreted either as social opening of elite institutions or as the "diversion" of disadvantaged students. It is possible that disadvantaged students who entered through alternative pathways would have reached prestigious institutions anyway and were just "diverted" from the most prestigious road by alternative pathways. However, I also found that alternative pathway entrants also differ largely in terms of academic background, with lower performance in high school. I would thus argue that it is less likely that these students would have reached prestigious institutions anyway and favour an interpretation in terms of social opening of elite institutions, rather than diversion. Still a quasi-experimental design based on trends data, such as difference-in-differences, would be necessary to be able to conclude that the implementation of alternative pathways increases the proportion of disadvantaged students in elite institutions. Although the quasi-experimental evidence on the effect of alternative pathways is still limited, other policies are increasingly evaluated through experimental or quasi-experimental designs. I thus now turn to the systematic overview of this literature to gain insights on the efficiency of these policies in addressing inequalities in higher education.

Chapter 6
What works to reduce inequalities in higher education? A systematic review of the (quasi-)experimental literature on outreach and financial aid[1]

Introduction

The growing concern about social inequalities in higher education goes well beyond academic research and, in recent years, equity in higher education has emerged as a central political issue in many countries. Faced with public debates on inequality in higher education, policymakers and university administrators are thus increasingly seeking policy instruments to address equity issues in higher education. This systematic review aims to provide an overview of the effects of various interventions on higher education inequalities. We make use of recent research in economics, psychology and sociology that has identified the causal effects of policy interventions on disadvantaged students. We hope that a broad overview of this literature will help policy-making efforts to improve the odds of disadvantaged students accessing and completing higher education.

This review has three distinctive features. First, we are exclusively concerned with outcomes for disadvantaged students. Earlier reviews in this field typically assessed the effects of interventions on getting any young person into higher education (Heller, 1997; Leslie & Brinkman, 1987). In contrast, we only include studies that estimate an effect on disadvantaged groups. We use the term 'disadvantaged students' to refer to a broad class of lower socio-economic status groups. The literature alternatively defines these groups as low-income, non-white, working-class children, or first-generation college students. While there are differences between these groups, there is substantial overlap as well and a broad definition allows us to capture the relevant literature on equity in higher education, including the different dimensions of social disadvantage.

Secondly, we focus on both enrolment in and completion of higher education. In recent years, the literature has increasingly recognized that getting more youth into higher education is insufficient and that interventions should also ensure that they ultimately graduate (Bettinger,

[1] This chapter was co-authored with Koen Geven. An earlier version of this chapter was published in Geven, K. (2018). Public policy and inequality in higher education. European University Institute.

2004; Castleman & Long, 2013). We take stock of this conclusion, and present effects on both access and graduation in higher education.

Thirdly, we aim for a systematic overview of the (quasi-)experimental literature on this topic. While a number of research syntheses have summarised empirical evidence on interventions in higher education, the large majority relies on cross-sectional evidence. Only a few reviews have specifically summarised the (quasi-)experimental literature and their scope was narrower. For instance, Page & Scott Clayton (2016) focus only on college access in the United States, while Deming & Dynarski (2009) only discuss financial aid. In addition, these reviews discuss the conclusions of the literature in a narrative form without systemically providing the estimates on which they are based. The present overview conveys the results in a narrative form but also rigorously gathers, provides, and compares the causal effects on both access and completion. Finally, a recent meta-analysis (Sneyers & Witte, 2018) discusses the experimental evidence on the effect of three types of policies on access and graduation in higher education but it does not focus on disadvantaged students. As a result, among the possible interventions relevant to inequalities in higher education, only need-based grants are discussed while we summarize and compare the effects from a much broader range of interventions.

The present review discusses 75 studies that provide causal estimates of the impact of outreach and financial aid interventions on access or completion rates of disadvantaged students in higher education. Outreach interventions are defined as policies that target youth in secondary education (usually high school) and aim to raise participants' aspirations and readiness for higher education. These include interventions that provide information, counselling, and/or focused academic tutoring in order to increase and facilitate transition to higher education. Financial aid includes monetary help provided to students to meet, at least partially, their financial need for higher education. In this category, we discuss universal, need-based, merit-based, and performance-based grants, loans and tax incentives. In addition to outreach interventions and financial aid policies, a number of other interventions may help reduce inequalities in higher education but the available (quasi-)experimental evidence on their efficiency is currently insufficient for a literature review and these results are not discussed here.

The paper is organised as follows. In the next section, we will discuss the barriers that may prevent disadvantaged students from accessing and completing higher education. We then describe the methods used in our search and coding of intervention studies, followed by the presentation of results according to the type of interventions: outreach, financial aid, and mixed interventions which combine financial aid and outreach.

Barriers faced by disadvantaged students in higher education

Outreach and financial aid may help disadvantaged students to access and complete higher education if these interventions efficiently address some of the barriers met by disadvantaged students in higher education. We summarise the most common hypotheses discussed in the current literature on education inequality mechanisms. These include (1) financial barriers, (2) lack of academic preparation, (3) lack of information and, (4) behavioural barriers. While there may be additional mechanisms that prevent disadvantaged students from succeeding in higher education (e.g. negative self-identities or discrimination), these mechanisms are not specifically addressed by financial aid or outreach programs and are not discussed here.

Unmet financial need

Financial barriers are often at the core of the concerns about higher education opportunities for disadvantaged students who are eligible for it. The total financial cost of higher education studies includes both direct costs such as tuition fees and living costs, study materials, and health coverage, and indirect costs such as foregone earnings. In some countries, the direct costs of higher education attendance have risen dramatically over the last years and have raised public concern about affordability. In the U.S., between 1985 and 2015, average tuition and fees in public four-year institutions increased more than threefold in real terms (Ma, Baum, Pender, & Bell, 2015). And this trend is not restricted to the United States. Between 1995 and 2010, in 14 out of 25 industrialized countries, governments have reformed the structure of tuition fees (OECD, 2012). With some exceptions (e.g. Germany), this meant that tuition fees went up.

As a result, low-income students and their families may struggle to meet the costs of higher education. For example, in the U.S., the unmet financial need of students, i.e. the total educational cost minus the expected family contribution and all grants received, is greater for

students with lower family incomes than for their wealthier counterparts, and in 2003-04 was estimated to range between $9,031 and $10,259 for full-time full-year students from a family in the lowest income quartile (Long & Riley, 2007).

Low-income students seem to be particularly sensitive to the price of higher education for both enrolment decisions (Heller, 1997; Kane, 1994) and year-to-year persistence (Paulsen & St. John, 2002). Large unmet financial need makes students more likely to work and for a substantially higher number of hours (Scott-Clayton, 2012). In turn, investing many hours in paid work reduces the time students can devote to study and has been shown to be associated with longer time to graduate and with a higher probability of dropout before graduation (Choitz & Reimherr, 2013; King, 2002).

Unsuitable academic preparation

A *lack of academic preparation* may be a major barrier for disadvantaged students' educational attainment (Carneiro & Heckman, 2002). A large share of these students may drop out from school due to inequalities that affect the early life course. But even among students eligible for higher education, lower levels of academic preparation and performance can constitute a major hurdle. For example, Greene and Forster (2003) estimate that in the public high school class of 2001 in the U.S., half of all black and Hispanic students graduated from high school but only 20% and 16% of them, respectively, had the minimum qualifications for applying to four-year colleges. This lack of academic preparation clearly limits students' options in terms of accessing selective forms of higher education (i.e. highly ranked universities).

This lower level of initial academic credentials can also hinder graduation from higher education. For example, in the U.S., a larger proportion of students coming from disadvantaged backgrounds need to take remediation courses during their higher education studies (Sparks & Malkus, 2013). Since there is a lack of evidence about the effectiveness of remediation, this may reduce these students' chances of completing their degrees (Attewell, Lavin, Domina, & Levey, 2006; Scott-Clayton & Rodriguez, 2014).

Lack of Information

The *lack of accurate information* about higher education among disadvantaged students is another plausible mechanism highlighted in the literature. First, students from disadvantaged

backgrounds may underestimate the returns to higher education and overestimate the costs of enrolment, leading them to underestimate the net returns of a higher education degree. Focusing on the literature which evaluates expectations about earnings before students decide to enter higher education (usually high school seniors), results on the accuracy of earning benefits associated with a tertiary degree and on the influence of social background is mixed (for a detailed summary of the available empirical evidence, see Abbiati & Barone, 2017). For example, in the U.K., high school students were found to make accurate estimations of the returns of a university degree, independently of their social background (Williams & Gordon, 1981) and, similarly in Switzerland, no clear patterns of the effect of father's level of education could be identified (Wolter, 2000). In contrast, other studies find that estimated earnings after a university degree are overestimated by high school students, independently of social origin (Avery & Kane, 2004), or that overestimation of returns is stronger among students coming from advantaged social backgrounds (Abbiati & Barone, 2017).

Regarding the estimated cost of higher education, the empirical literature has consistently shown that high school students tend to overestimate higher education costs (Abbiati & Barone, 2017; Avery & Kane, 2004; Loyalka, Song, Wei, Zhong, & Rozelle, 2013) and suggests that incertitude or overestimation of the costs are more common among disadvantaged families. In the U.S. for example, parents with lower education backgrounds, or from minority groups, were half as likely to provide estimates of tuition fees compared to white or highly educated parents (Grodsky & Jones, 2007), which confirmed earlier results showing that low-income parents were more likely not to know about the costs of higher education (Olson & Rosenfeld, 1985). In Canada, the upward bias in cost estimation was found to be larger among low-income parents who largely underestimated the financial returns to a higher education degree (Usher, 2005).

A related problem is the lack of information on how to access financial aid. Financial aid and its application process is often complex, particularly in the US-context. Students need to fill out the Free Application for Federal Student Aid (FAFSA), which, with over 100 questions, has been criticized for being "long and cumbersome" and deterring disadvantaged students from applying for financial aid (Long, 2008). In 2000, around 850,000 students who did not file the FAFSA were actually eligible for financial aid (King, 2004) and lower middle income, white and male candidates were found to be less likely to complete the FASFA even when they were

eligible for it (Kofoed, 2017). Although the complexity of the aid application process has been mainly highlighted in the United States, the non-take-up of financial aid may be a problem relevant to other national contexts. In Germany, for example, a recent simulation estimates that around 40% of the eligible low-income students do not take up their entitlements (Herber & Kalinowski, 2016).

Behavioural deficits

Recently, the field of behavioural economics, building on findings from cognitive sciences, neurobiology and psychology, has brought attention to *behavioural barriers* as an explanation for suboptimal choices and behaviours in education (Lavecchia, Liu, & Oreopoulos, 2015). These barriers include *present bias, cognitive overload,* and *routine* or *status quo bias.*

The *present bias* may explain why some students or families do not invest in education in the most optimal way. Education is a domain where costs are salient in the present, while benefits are more uncertain and time distant. If some students give more priority to immediate rewards, this may negatively impact enrolment decisions, time devoted to study and dropout behaviour (Lavecchia et al., 2015). In sociology, the relatively short time horizon of working class students has been put forward to explain why these students are diverted away from academic tracks in postsecondary education and choose lower-status tracks which are typically shorter in duration and offer more concrete rewards on the job market, e.g. entering a specific occupation, (Hillmert & Jacob, 2003).

In addition, students may make suboptimal choices regarding their educational career due to c*ognitive overload. The paradox of choice* highlights that a large set of options is not always better as people may be overwhelmed by the number of alternatives which are cognitively costly to compare (Jabbar, 2011). This may be especially relevant in the case of higher education where the lack of structure makes it especially difficult to navigate for students (Scott-Clayton, 2011).

Thirdly, the s*tatus quo bias* suggests that people rely heavily on routine and on the default option, not engaging in the optimal behaviours despite appropriate information. In higher education, one powerful example of the importance of the default option in shaping behaviours is provided by a small change in the cost of sending test scores in college applications in the United States in 1997. When the ACT increased the number of reports that

could be send for free from three to four, the proportion of test-takers sending four reports rose from 3% to 74%, although the price to send a fourth report before the change was only US$6. This change in the default option for applications mainly benefited low-income students who were able to enrol in more selective colleges (Pallais, 2013).

There is currently little evidence confirming that these behavioural barriers particularly affect disadvantaged students. It may be that disadvantaged students are more bounded in their decision-making processes (by the lack of resources, information sources, lower reference points, etc.) or that they are more affected by the consequences of suboptimal choices (Scott-Clayton, 2011). However, the emerging literature suggest that these mechanisms are helpful to design interventions which efficiently trigger behavioural changes among disadvantaged students (Ross, White, Wright, & Knapp, 2013).

Methods

Research syntheses, such as systematic reviews and meta-reviews, are becoming increasingly common in studies of education (Ahn, Ames, & Myers, 2012; Sneyers & Witte, 2018; Valentine et al., 2011). Although they differ in their analysis methods, systematic and meta-reviews are both characterised by rigorous and transparent search and coding protocols.

Inclusion criteria

Three main criteria have been used to select relevant articles and reports. First, based on our research question, we only selected studies that look specifically at the impact of an intervention on disadvantaged students (particularly low-income, first-generation, non-white students). We only included studies evaluating interventions that were either targeted specifically at these groups or were broader in scope but investigated the heterogeneity in the effect of the interventions and provided estimates on these groups. Second, we only included studies with a (quasi-)experimental design. As mentioned earlier, a "naïve" comparison between educational outcomes of students participating in an intervention, and those who do not, is likely to lead to biased estimates, especially in the case of interventions targeted at disadvantaged students who differ from other students in many observed and unobserved characteristics. Thus, selected studies build either on randomised controlled trials (i.e. formal experiments), or quasi-experiments that analysed a counterfactual using appropriate

matching techniques, instrumental variables, difference-in-differences or regression discontinuity methods. Finally, we only selected evaluations of interventions which provided estimates on students' behaviours in higher education (enrolment or graduation). We excluded all studies which only evaluated an intervention in light of changes in students' aspirations or other attitudes.

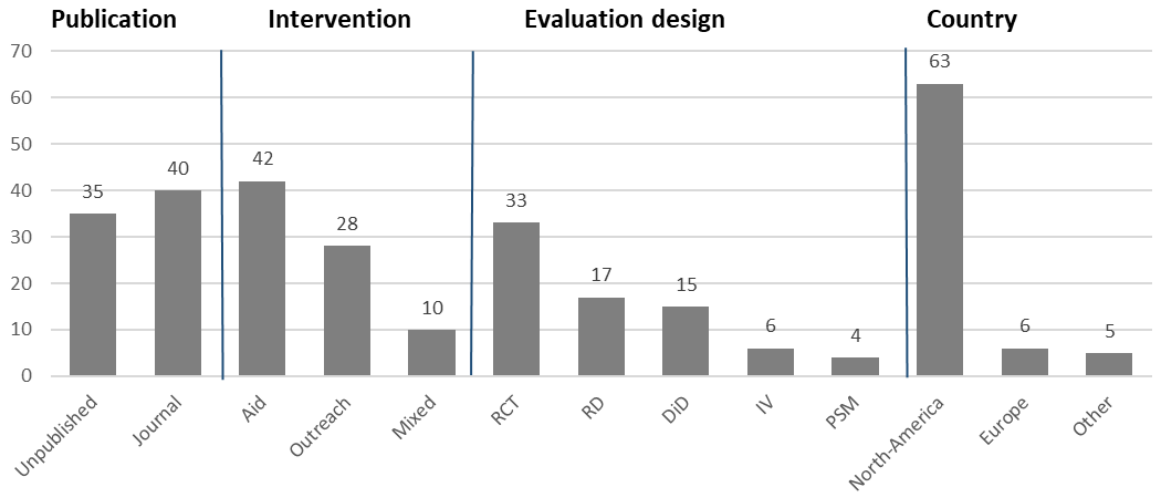
Literature search

Several strategies were used to find relevant studies. We first reviewed all titles and abstracts of search results in the following electronic databases: JSTOR, ERIC, WEB OF SCIENCE and the Pathways to College Online Library[2]. We also searched the websites of organisations working on higher education policies, most notably the Institute of Education Sciences (IES), the policy research organisation MDRC, the National Center for Postsecondary Research (NCPR), the non-profit organisation ACT and The National Bureau of Economic Research (NBER). We also systematically reviewed the bibliographies of literature reviews or meta-analyses on equity in higher education. Once we had reached a starting set of papers matching all our inclusions criteria, we systematically reviewed all their references and we identified and checked all the studies citing them (sometimes referred to as backward and forward snowballing search methods). We limited the search to articles or reports in English and published by May 2018. Overall, we reviewed titles and abstracts of thousands of academic articles, working papers and policy reports. This yielded an initial set of 296 studies which we carefully read and systematically reviewed on our inclusion criteria, leaving us with 105 studies which met all the inclusion criteria. However, twelve studies which evaluate interventions for which the (quasi-)experimental evidence is currently too scarce to be discussed in a literature review are not presented here. Eighteen additional studies were further excluded as they did not provide estimated impact effects on access nor graduation but only on other, less comparable, outcomes (persistence, dropout or credits earned, for example). We thus further focus on the findings of 75 studies which specifically evaluate outreach programs, financial aid policies or a combination of the two. The list of the selected studies is presented in Table 6.A in Appendix 6.

[2] The following search terms were used: (College OR "Higher Education" OR "Tertiary Education" OR University) AND (Inequality OR Stratification OR Access OR Drop-out OR Retention OR Persistence) AND (Experiment OR RCT OR Policy OR Intervention OR Reform OR Effect OR Impact).

Figure 6.1 shows the distribution of the type of publications, the interventions evaluated, the (quasi-)experimental designs, and the countries where the interventions were evaluated among these 75 studies. Slightly more publications appeared in academic journals and more evaluations are available for financial aid programs than for outreach interventions. Randomised experiments are the most common methodology implemented, followed by regression discontinuity and difference-in-differences design. Finally, it is clear from Figure 6.1 that the (quasi-)experimental literature on outreach and financial aid comes overwhelmingly from North America and no less than 60 studies evaluate an intervention from the United States. The lack of diversity in the educational contexts where interventions or policies are tested is already an important result from this review and should be kept in mind when interpreting the results of these studies.

Figure 6.1: Characteristics of studies included



Note: *For the interventions, articles evaluating more than one type of intervention are counted more than once.*

Coding

For each of these articles, we coded the experimental design, the characteristics of the intervention (place, duration, content), the nature of the sample (eligibility criteria for participation, assignment to control and treated group, age, gender and minority status when applicable), and the outcomes selected (effect size, standard errors, timing of measurement, model used and baseline in control group). The selection and coding of the studies was first carried by one coder (allocated at random) and a second coder then reviewed the initial codes.

In cases of conflict, we discussed the disagreement. In all cases, we managed to resolve our differences after deliberation.

Estimate selection

Most studies reported more than one estimate of the effect of an intervention on access or graduation rates. In order to report only the most comparable estimates, we defined four main rules to select them. First, we reported the effect on enrolment rates which are measured immediately after high school graduation or after participation in the program. Although the impact on access to higher education in a longer-term perspective could be relevant as well, most studies only provided immediate enrolment rates, and, for better comparability, we focused on these estimates. In the few cases where estimates on immediate enrolment were not available, the timing of measurement is specified with the estimates. Conversely, we selected the longest time-frame available regarding graduation rates. Since this review focuses on how to improve graduation rates of disadvantaged students, we compare estimates that evaluate whether students ultimately earned a degree in higher education. The results on the timing of graduation (on-time or delayed) are only discussed for the individual studies for which it is most relevant, but the timing of measurement is always reported. In addition, we only reported the estimates referring to the most disadvantaged participants. For example, when the effect of an intervention was provided for participants with different income levels, we selected the lowest level. Finally, we only reported estimates related to enrolment or graduation in public institutions, if a distinction between public and private was made.

Analysis

For various reasons, we decided against a formal meta-analysis that can estimate an average effect size of the interventions. First, there is a large diversity of studies involved, with different interventions and different estimation strategies, with their own assumptions, which are important for the interpretation of the estimated effect. As a result, there are too few studies in each category to do a meaningful formal meta-analysis. Instead, we opt for a systematic review that presents the selected findings and implications in a narrative form. We clustered the studies based on the characteristics of the interventions and we provide all selected estimates and the details of the different interventions in Appendix 6.

We also compare the raw unstandardized estimated effects and decided not to calculate standardised effect sizes. While acknowledging that standardised effect sizes would facilitate the comparison of our estimates with external benchmarks, we argue that standardised effect sizes are not absolutely necessary given the characteristics of our review and their calculation would have some important limits in this case. We only included studies which provide the effect of an intervention on the exact same outcomes, enrolment and graduation rates. Even for a meta-analysis, it is recognized that raw mean differences can be used directly when all studies use the same outcome and report the effect a meaningful scale (Borenstein, 2009). Second, among the 75 selected studies, only three (Bos, Berman, Kane, & Tseng, 2012; Goldrick-Rab, Kelchen, Harris, & Benson, 2016; C. Hoxby & Turner, 2013) reported standardised effect sizes and they were already calculated with two different methods. For all the other studies, we would need to use different methods to calculate them based on the information available in each study and at the price of many assumptions[3]. We would also need to exclude some of the studies since, as noted by Sneyers & Witte (2018) who carried a meta-analysis on some of the same studies which we use, some articles need to be excluded because they do not report information that would allow us to calculate a standardised effect size. Given that all the selected studies focus on the same meaningful outcomes and that we do not aim to obtain an average effect of the interventions, we thus report and mainly discuss the estimated marginal effect of the intervention in percentage points. Still, we systematically report in Appendix 6 the baseline means, whenever available. In addition, for the few types of interventions where many studies are available, we provide a graphical overview of the available evidence by plotting the selected estimated effects and the calculated relative risks to make the comparisons across studies easier.

To graphically summarise the results, we only compared estimated effects of interventions on enrolment and completion from *any* higher education institution. If estimates were only provided for separate types of programmes, we focus on the estimates for the longer or more academic type of program (for example four-year college or university). The reason is that an increase in enrolment in shorter programmes may come at the expense of enrolment in longer

[3] For example, the baseline mean specific to the disadvantaged group is not always reported. The baseline reported is usually not adjusted for covariates (contrary to the estimated effect). And, especially for studies not based on RCT but difference-in-differences or instrumental variables, only the whole sample size is reported, and we would need to make assumptions about the split between control and treated groups.

programmes, as suggested by the diversion theory (Brint & Karabel, 1989) . While the opposite may also happen (increase in long programme outcomes as a result of diversion from short programmes), we consider this to be beneficial to the students.

Outreach programmes

Outreach programmes are one of the most common types of interventions implemented to widen access to higher education by increasing aspirations, knowledge, ability to apply and/or readiness for higher education of high school students or recent graduates.

We grouped outreach interventions in three types that may affect students differently. The first group consists of low-intensity interventions that address information barriers faced by high school students. These interventions mainly deliver general information on financial aid, college costs and returns to higher education or college application, sometimes through automated procedures. Information sessions are generally of short duration, such as one hour or a single day. A second group of interventions is designed to complement information with personalised assistance and aims to guide students during the steps of the enrolment procedures (accessing financial aid, applying to a university, registration, etc.). These interventions are more often spread over a longer period, provided by tutors who engage in a personalised exchange with participants and often include proactive strategies to ensure that participants engage in the program. Recently though, some low-cost nudging interventions have been designed to provide guidance to students through automated procedures. The third group of outreach programmes offer academic tutoring during upper secondary education, in addition to information and counselling. Lasting several years, these interventions include extensive after-school activities and aim to increase students' academic readiness for higher education.

Table 6.1 first summarises the number and characteristics of the selected studies regarding the impact of outreach interventions and allows us to identify gaps in the available literature. Most notably, we found 28 studies which provide causal effects of the effect of outreach interventions on access to higher education for disadvantaged students but only 4 which provide estimates on graduation rates. The lack of evidence on graduation may be consistent with the aim of outreach interventions, which primarily aim to facilitate access to higher education. Nevertheless, it is crucial to know whether disadvantaged students who entered

higher education after participating in an outreach programme were able to eventually graduate and this should clearly be addressed more often in the future. We could also identify a number of studies evaluating interventions providing information only (8) and interventions providing information & support (18) but we have insufficient evidence on the effect of intensive interventions combining information, support and academic tutoring (three studies only). Finally, outreach interventions are usually evaluated through experimental designs and have been tested in six different countries. However, we also note that the diversity of educational contexts is only found for interventions providing additional information only. The large evidence on the interventions classified as "information & support" comes exclusively from the United States and Canada, and testing such interventions in other contexts would also be necessary in the future.

Table 6.1: Available evidence on the impact of outreach interventions

	Access	Graduation
Number of studies by type of interventions		
Not specified (Any outreach programme)	1	0
Information	8	0
Information & support	18	3
Information, support & tutoring	3	1
Total number of studies	**28**	**4**
Studies' characteristics		
RCT design (in % of total studies)	82%	50%
Diversity of national contexts (nb of country)	6	2
National-scale interventions (in % of total studies)	25%	25%
Single-institution interventions (in % of total studies)	11%	0%

Source: Tables 6.B1, 6.B2, 6.B3, 6.B4,6.B5 in annex.

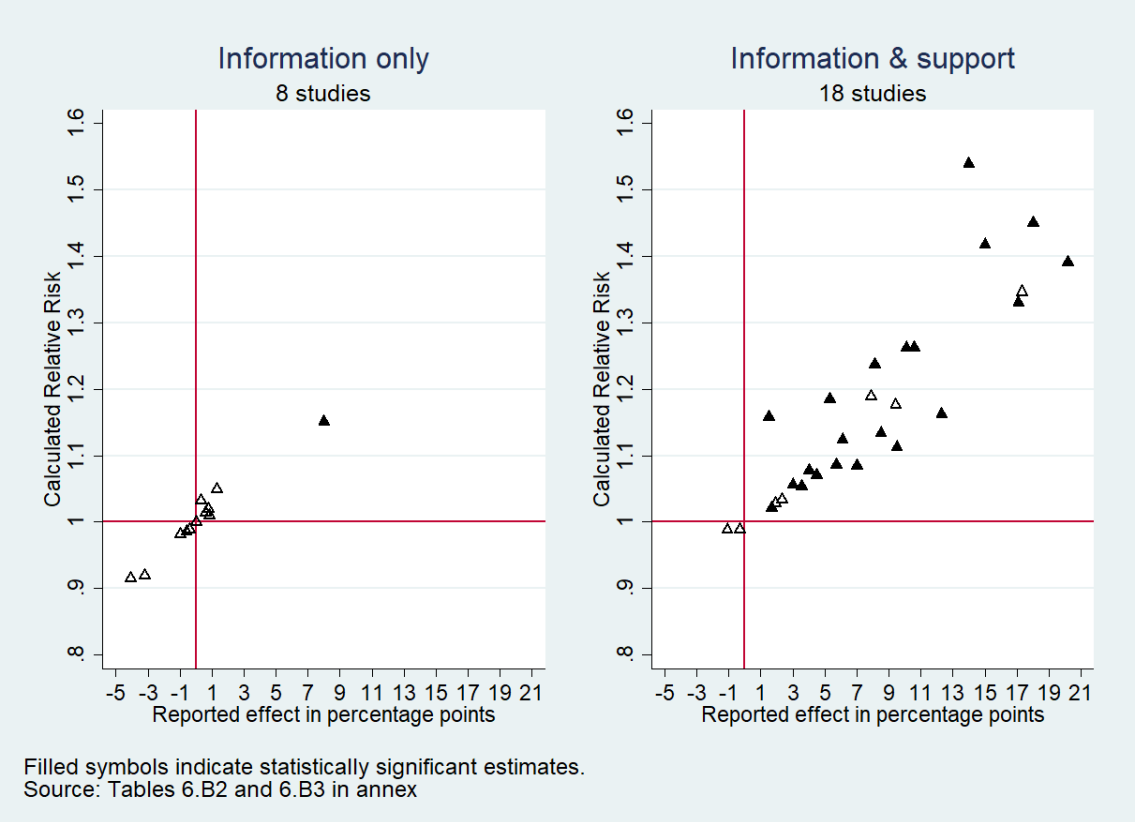
Impact on access to higher education

Only one study provides a quasi-experimental evaluation of outreach programmes in general, not limited to one specific intervention. Domina (2009) uses longitudinal data and propensity score matching to compare the efficiency of outreach programmes, whether services are offered to a relatively small number of selected students (targeted programmes), or to the whole cohort in a given school (school-wide programmes). Only the former (targeted programs) specifically focus on disadvantaged students. Estimates suggest an increase in enrolment (+5.5 p.p.) in any higher education institution, but this was not statistically significant (Table 6.B1 in Appendix 6). Since no information was available on the type of

services offered, it is possible that different programme designs have very different impacts on college enrolment.

The evaluations of specific outreach interventions indeed suggest a great variety of effects on enrolment, depending on the characteristics of interventions. Figure 6.2 displays the graphical overview of all estimated effects for interventions providing disadvantaged students with additional information, and those providing information and personalised support. It clearly shows that interventions providing disadvantaged students with *additional information* only on higher education seem to have very little impact on access patterns, while interventions which complemented information with *assistance or individualised guidance* on college or financial aid applications seem to be more efficient. Among the 18 studies included, the range of the estimated effects is wide, but most found a statistically positive effect on the enrolment rates of disadvantaged students and more than half found an increase in enrolment rates by at least 10%.

Figure 6.2: Selected estimates for the impact of outreach on access to higher education



Note: Refer to estimates on access to any type of higher institution, whenever available. If not provided, estimates on access to four-year institutions or to university are used instead. See Appendix 6 for further details.

Whether they focus on financial aid information or costs and returns to higher education, most of the interventions providing disadvantaged students with ***additional information*** had a very small or null impact on enrolment rates of disadvantaged students (Table 6.B2 in Appendix 6).

Interestingly, such interventions have been tested in very different contexts and consistently brought little improvement in widening access to higher education for disadvantaged students. In the U.S., providing information on aid eligibility and application in tax preparation offices did not increase enrolment of disadvantaged students (Bettinger, Long, Oreopoulos, & Sanbonmatsu, 2012). Similarly, sending high school seniors text messages on the financial benefits of financial aid and highlighting the monetary gains which could be obtained by completing the FASFA had no impact on students' enrolment (Bird, Castleman, Goodman, & Lamberton, 2017). In Finland, an information session on returns to higher education did not have any impact on transition rates of disadvantaged students (Kerr, Pekkarinen, Sarvimäki, & Uusitalo, 2014). In Colombia, a similar intervention also did not find significant results (Bonilla, Bottan, & Ham, 2017). In Chile, where students consulted web pages on returns to higher education, there was also no impact on enrolment rates (Hastings, Neilson, & Zimmerman, 2015). In the U.S., the inclusion of an online shopping sheet in the financial aid award notifications, to provide personalised information about costs and loan options, had a negative effect on the enrolment behaviours of low-income admitted students, although this effect was not statistically significant (Rosinger, 2016). Even a more intensive intervention which provided personalised information on the costs, benefits and chances of success in higher education through three meetings did not improve access of disadvantaged students in Italy (Abbiati, Argentin, Barone, & Schizzerotto, 2017).

Among the eight studies reviewed, only one found a large positive impact on enrolment rates. Despite a design very similar to interventions previously mentioned, Loyalka, Song, Wei, Zhong, & Rozelle (2013) found that a one-time presentation on cost and financial aid in poor counties in China increased enrolment by 8 percentage points. Nevertheless, the authors note that the information intervention did not have an impact on enrolment for lower SES students (estimates were unfortunately not provided).

How should we interpret these findings? We formulate different hypotheses building on the literature which has investigated information biases about higher education. First, it could be that beliefs about the costs or returns to higher education are "sufficiently" biased to

represent a barrier for disadvantaged students only in specific national or educational contexts. If so, information campaigns do have an impact on beliefs, college-going intentions, application behaviours and eventually access rates, but only if access to information on financial aid and costs of higher education is extremely limited. The only study which found a large positive impact for such intervention took place in China where students learn about financial aid packages only *after* being accepted to a higher education institution. This lack of early information on financial aid may deter disadvantaged students to even apply (Liu et al., 2011; Loyalka et al., 2013). In other contexts, information about costs, returns or financial aid may be more widely accessible and there would be no need to address this issue. It is interesting to see, for example, that, a recent intervention in the U.S. that provided semi-personalised information about returns to higher education to high school students (through a web platform) reported major difficulties in mobilising schools and students to participate. In three years, only 25 schools out of 300 agreed to join the experiment despite active outreach, and in the participating schools, students made very little use of the developed tool. As noted by the authors, this is a useful finding in itself which suggests that there may be little demand for additional information, at least in this specific context (Blagg, Chingos, Graves, & Nicotera, 2017).

Another hypothesis would be that students' beliefs about higher education do not automatically impact their intention to attend higher education and/or their behaviours to apply. If so, information interventions may be efficient in changing students' beliefs but that would not necessarily translate to intentions and/or behaviours. For example, in the U.S., Avery and Kane (2004) found that there was only a weak connection between students' estimations of net returns from higher education and plans to attend college. However, there is also evidence that information interventions are efficient in changing beliefs about cost or returns from higher education and intentions to attend (Bleemer & Zafar, 2018; Oreopoulos & Dunn, 2012; Peter & Zambre, 2017). One study found that providing additional information about grants did not change college intentions but did increase college applications behaviours (Ehlert, Finger, Rusconi, & Solga, 2017). Finally, providing general information about a prestigious grant changed disadvantaged students' knowledge but did not affect their propensity to apply to it, unless general information was combined with a meaningful role model who could show that someone with a similar background had been successful in

obtaining such grants (Herber, 2018). These results call for further research on the relationship between beliefs, intentions and behaviours regarding higher education. In addition, it is important to recall that, in many educational systems, enrolment in higher education goes beyond the student's own decision. Not only do students need to apply but they also need to be selected by the tertiary institution to be able to enrol. Even when additional information increases college intentions and application behaviours, it may be that the lack of support during the application process hinders the chances of disadvantaged students making successful applications.

Finally, further research would be needed to disentangle the effect of information interventions, depending on the type of information provided. Providing additional information on returns from higher education in the labour market, on available financial aid, or on chances of success may impact disadvantaged students very differently. And the connection between beliefs, intentions and behaviours may vary depending on the nature of the information biases and updates. It is very interesting to see, for example, that providing students with a personalised message about their chances of graduating in a chosen programme did not increase their actual enrolment if the message was positive, but led to a large decrease (by 14 p.p.) in enrolment in this specific programme if the assessment of the chances of success was negative (Pistolesi, 2017). This result suggests that providing additional information on the odds of success may be more efficient in changing behaviours when it is negative (thus leading to a decrease in enrolment) but has little impact when it is positive. It would be interesting to investigate whether this would also be the case for the other types of information relevant for higher education decision-making.

In contrast, the effect of the interventions which complemented information with ***assistance or individualized guidance*** on college or financial aid application were found to increase enrolment rates of disadvantaged students in most cases (Figure 6.1 and Table 6.B3 in Appendix 6). Typically, the "information & guidance" outreach interventions provide personalised advice and support on higher education applications through counsellors. In some cases, the counselling program can run over a few years in high school: An early example of such a program is the Talent Search program, a large-scale program in the U.S. This nation-wide program provides information and support to disadvantaged students from ninth grade onwards. It focuses on high school courses that students should take to prepare for college,

to apply for financial aid, and on orienting students through the college application process. Although the intensity of the program varies, it is estimated that around half of the participants receive less than 10 hours of services per year. Using propensity score matching, Constantine, Seftor, Martin, Silva, & Myers (2006) estimate that initial enrolment of Talent Search participants in a postsecondary institution was higher by 18, 4, and 15 percentage points, respectively, in Texas, Indiana, and Florida. Gains in access were larger for two-year institutions than for four-year college. Similarly, In Canada, the "Explore your Horizons project" provided 40 hours of after-school activities over three years in high school (Ford et al., 2012). This included guidance for disadvantaged students and their parents. The intervention was successful in increasing participation of disadvantaged students in higher education, by around 10 percentage points.

Six interventions were designed to provide counselling to disadvantaged students during the senior year in high school only. In the US, Avery (2010) analysed an individualised counselling intervention of ten hours over the school year for high-achieving disadvantaged high school seniors. The intervention led to an increase of 8 p.p. in access to most selective higher education institutions, although this large increase was not significant due to the small sample size of this pilot study (Avery, 2010). Similarly, counselling in senior year of high school was found to increase the probability of enrolling in higher education for disadvantaged students (Stephan & Rosenbaum, 2013), and up to 7 p.p. (Barr & Castleman, 2017). It also showed to be efficient in diverting disadvantaged students from short programs and encourage them to enrol in four-year institutions (Bos, Berman, Kane, & Tseng, 2012; Castleman & Goodman, 2014). Finally, being enrolled in a school which offered a "GO center" i.e. a dedicated classroom for the college application process with a full-time counsellor and active outreach run by selected student peers, already increased enrolment of low-income students by 3.5 p.p. which should be taken as a lower bound estimate as it does not focus on students who actually took part in the programme (Cunha, Miller, & Weisburst, 2018).

There are several ways in which these – moderately intense – interventions may have influenced disadvantaged students' enrolment behaviours. While a longer exposition to information on higher education may be beneficial, these interventions also help students to navigate among college choices. Moreover, they reduce the complexity of application tasks which seems to be a crucial step to induce changes in application behaviours as suggested by

the behavioural theories described earlier. Additionally, it seems that early familiarisation with higher education options may be a powerful way to raise students' educational aspirations which in turn can raise students' performance in high school. Indeed both the Talent Search and Explore Your Horizons, which were spread over four and three years respectively, have raised high school completion among disadvantaged students although they did not include academic tutoring (Constantine et al., 2006; Ford et al., 2012). These results thus draw our attention to the role of anticipatory decisions (Erikson, Goldthorpe, Jackson, Yaish, & Cox, 2005) on academic performance.

Although they are not likely to increase educational aspirations, short-term targeted counselling interventions to support students in the application and enrolment period also appear to be efficient in raising access rates of disadvantaged students. Four interventions specifically focused on students after upper-secondary graduation and provided proactive counselling during the summer months to low-income students. The results highlight the importance of engaging students in available counselling activities as a key factor to improve students' outcomes. Three of these interventions had very consistent and substantial impact (between 8 and 14 p.p.) on immediate enrolment and enrolment in four-year institutions (Castleman, Arnold, & Wartman, 2012; Castleman, Owen & Page, 2015, Castleman, Page, & Schooley, 2014). In these cases, counselling was available for students in the control group but without any proactive outreach, while counsellors used many means to contact students in the treatment group. The large gap in enrolment between the two groups thus indicates that availability of information or counselling is not sufficient and that counsellors actively need to reach out to potential students. This is achieved using small financial incentives for participation in another one-month counselling intervention which also brought about large increases (17 to 20 p.p.) in enrolment rates of non-white and low-income students (Carrell & Sacerdote, 2013). Only one summer counselling intervention did not significantly increase enrolment rates of disadvantaged students in higher education (Castleman & Page, 2015). But even this intervention led to an increase of almost 5 p.p. in enrolment in four-year institutions. It is difficult to identify precisely what explains the lower impact of this study compared to the ones previously discussed but it should be noted that the intervention still led to an increase in enrolment rates of 12 p.p. for students with less-developed college plans. Thus, it may also

be that the efficiency of such interventions depends largely on their ability to target students who are the most at risk to fail to carry their matriculation after their high school graduation.

But is it possible to efficiently guide students through the application process with little or no contact with counsellors? Five interventions tested low-cost interventions offering guidance through automated or semi-automated procedures and results are promising that these interventions can, to some extent, improve access outcomes of disadvantaged students. In the U.S., Bettinger et al. (2012) experimented with streamlined personal assistance for the FAFSA application. They found that college enrolment of low-income high school students increased by 8 percentage points. This is a substantial increase, especially in light of the low intensity of this intervention which lasted around ten minutes (Bettinger et al., 2012). In addition, Hoxby & Turner (2013) sent high-achieving low-income students semi-customised college advising and college application fee waivers, by regular mail. The goal was to improve access rates of high-performing disadvantaged students into selective institutions. This randomized controlled trial combined information and a simplification of the paperwork tasks usually required to obtain application fee waivers for low-income students. They concluded that treated students enrolled significantly more in institutions matching their ability: an increase of 5 p.p., which amounted to a 20% increase compared to the mean of the control group. With intervention costs amounting only to $6 per student, this type of intervention is extremely promising. The outcomes of interventions that provide personalised information on the steps that need to be taken to enrol (without the simplification component) are somewhat smaller but still lead to improvement in enrolment behaviours with minimal intervention costs. For example, sending text messages to remind high school graduates of the tasks required for enrolment during the summer had a small impact on two-year institution enrolment (+3 p.p.) of disadvantaged college-intending students but the increase was not significant and less than 2 percentage points regarding overall access to higher education (Castleman & Page, 2015). However, it seems that this type of intervention is more efficient for the most disadvantaged students as text messaging increased enrolment of low-income students by almost 6 p.p. and of first-generation students by almost 5 p.p. (Castleman & Page, 2017). Interestingly, sending the same text messages to both students and their parents did not improve the efficiency of the intervention, or in some cases, even reduces it. Finally, a large-scale nudging experiment which sent only a few emails and text messages to

disadvantaged college-intending high school seniors to guide them step-by-step through the completion of the FASFA application was associated with a small but statistically significant increase in enrolment (+1.7 p.p.) (Bird et al., 2017). In this study, the control group was receiving the same number of messages but with general information about financial aid, so the positive impact of the texts which included "planning prompts" confirms the importance of complementing information with concrete logistics guidance to efficiently increase access to higher education.

These results are encouraging but, as mentioned earlier, the evidence on "information & guidance" outreach interventions come exclusively from North-America and this limits the possibility of generalising them: similar interventions should be tested in other contexts in order to confirm the efficiency of counselling or nudging outreach interventions.

Finally, there are fewer evaluations of intensive outreach programs that offer ***intensive academic tutoring*** during upper secondary education. These interventions not only try to address information gaps but also the lack of academic preparation of disadvantaged students. Although limited, the current evidence suggests that these intensive interventions may have little impact on overall access to higher education (Table 6.B4 in Appendix 6). Randomised experiments to evaluate the "Upward Bound" program and the "College Possible" program, which both offer academic support in upper secondary school, did not find a significant impact on access to higher education (Avery, 2013; Myers, Olsen, Seftor, Young, & Tuttle, 2004; Seftor, Mamun, & Schirm, 2009). However, in the case of the "College Possible" program, Avery (2013) estimated that initial enrolment at four-year colleges increased by 15 percentage points for program participants. Regarding "Upward Bound", it is unclear why the two evaluations of the program brought diverging results regarding the impact on enrolment in four-year institutions. Increase in initial enrolment was estimated to amount to 6 p.p. when measured three years after high school graduation but to only 1 p.p. based on the last follow-up survey (seven to nine years after high school graduation). Overall, these results do not indicate that intensive outreach interventions are more efficient than shorter ones which focus only on simplifying the matriculation process. One possible explanation is put forward by Myers et al. (2004) who suggest that the absence of impact on postsecondary enrolment is the consequence of the large number of students who do not complete "Upward Bound". Since these interventions last over many years and include many hours of out-of-school

activities, many pupils usually drop out before completing them. Thus, these interventions may be efficient only for a minority of highly motivated and committed disadvantaged students.

Impact on graduation

Table 6.B5 in Appendix 6 presents the estimates of outreach programs on graduation rates but, as mentioned earlier, we found very few (quasi-)experimental studies, only four studies, which have evaluated the impact of outreach programs on graduation rates of participants

So far, only one study has been able to identify a positive impact of an outreach program on graduation rates. Constantine et al. (2006) identified, using propensity score models, a substantial increase of 5 p.p. in completion rates at 2-year institutions for participants of the "Talent Search" program in Florida. This increase is smaller than the corresponding increase in initial enrolment (+10 p.p.) but is still positive and statistically significant. Conversely, the "Upward Bound" program did not have any impact on graduation rates, which is consistent with the almost negligible impact found for enrolment, and can again be interpreted in light of the high number of participants dropping out before the completion of the intervention (Seftor et al., 2009). Similarly, and despite leading to a large increase in enrolment rates, the "Explore Your Horizons" intervention in Canada failed to find an effect on graduation rates. Since the increase in enrolment rates was exclusively driven by enrolment in university programs and graduation rates measured only four years after expected high school graduation, later data may be necessary to identify an increase in graduation rates (Ford, Grekou, Kwakye, & Nicholson, 2014). However, with a long-term evaluation, Cunha et al. (2018) did not find that the increase in enrolment for low-income students translated in an increase in graduation by eight years: being enrolled in a school offering outreach (GO center) seems to induce enrolling students who are also more at risk of dropping out once in college. These results suggest that the long-term benefits of outreach interventions may be limited if students are not further supported once in college (Cunha et al., 2018) and that more attention should be given to graduation outcomes in evaluations of outreach programmes.

Financial support

The influence of price on college enrolment has been a long-standing concern in the literature (Leslie & Brinkman, 1987). As described in the section on barriers faced by disadvantaged students in higher education, the unmet financial need of students refers to the difference between their costs and resources to attend higher education and represents a barrier for those who cannot rely on resources such as family resources or loans. Financial aid can fill this gap and may thus reduce the cost barrier to higher education. But financial aid may also address other barriers: for example, aid payments can be made contingent on minimum academic performance in order to incentivise and increase the academic preparation of students.

As financial aid has diversified over the last two decades, we may expect some heterogeneity in the effects of interventions. Therefore, we separately discuss the impact of universal grants (available for all students), need-based aid (which uses parental financial conditions as the main eligibility criteria), merit-based aid (which requires high academic performance, usually at high school graduation), performance-based aid (which is contingent on staying enrolled and making passing grades in higher education), loans, and tax incentives (tax credits which are provided to families for education expenses).

Table 6.2: Available evidence on the impact of financial aid

	Access	Graduation
Number of studies by type of interventions		
Universal grants	1	1
Need-based grants	14	12
Merit-based grants	6	4
Performance-based grants	4	2
Loans	2	3
Tax-credit	2	1
Total number of studies	**28**	**22**
Studies' characteristics		
RCT design (in % of total studies)	18%	23%
Diversity of national contexts (nb of country)	8	3
National-scale interventions (in % of total studies)	43%	45%
Single-institution interventions (in % of total studies)	7%	9%

Source: Tables 6.C1-C6 and 6.D1-D6 in annex.

Table 6.2 shows that most of the available evidence deals with need-based grants, which is not surprising given that, until recently, this was the main model of financial aid in higher education. Contrary to outreach interventions, we could find many studies (often the most

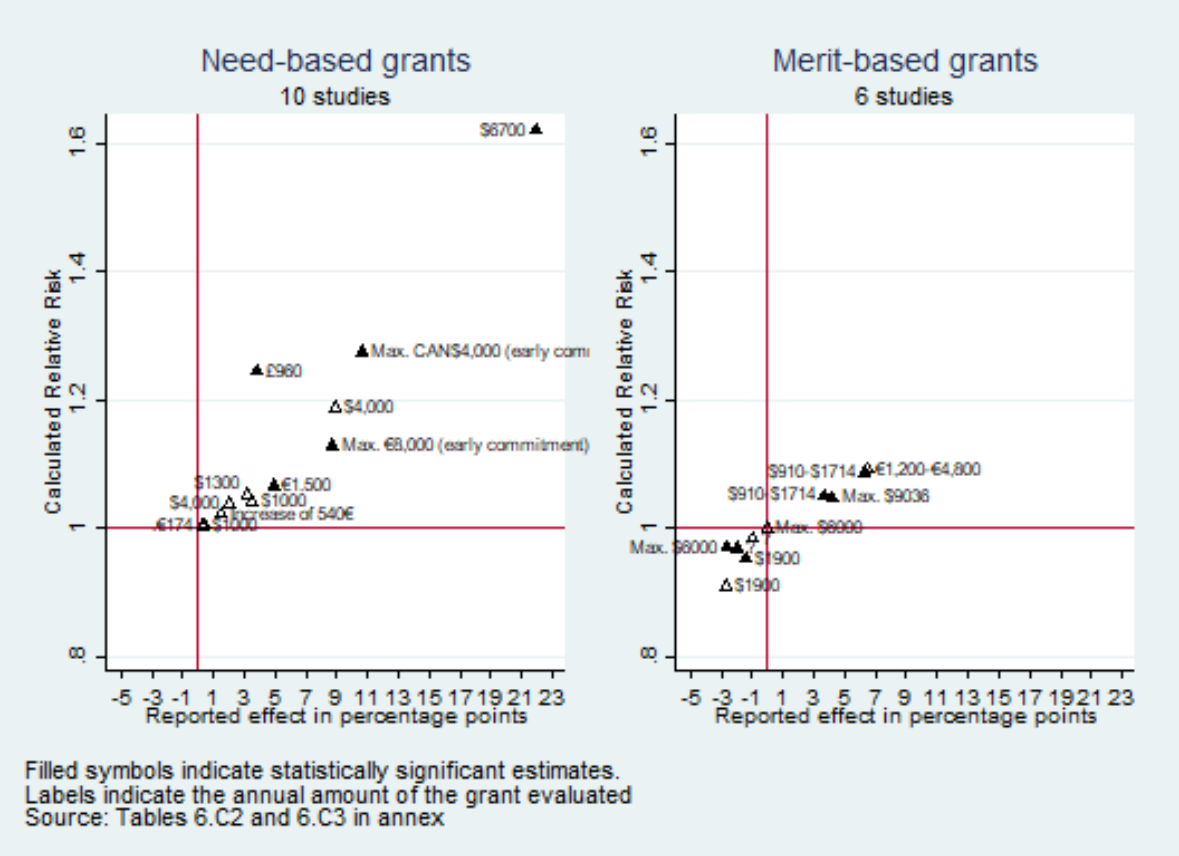
recent ones) providing estimates of the impact of aid on graduation outcomes. Around half of the studies evaluated a national aid scheme, and there is some diversity in the educational contexts where the effect of financial aid was evaluated. However, the available causal evidence on the effect of some aid schemes for disadvantaged students remains extremely limited, most notably for universal grants, loans and tax-credits.

Effects on enrolment

One study provided causal estimates of the effect of universal grants or price reduction on the access rates of disadvantaged students, using a difference-in-differences design (Table 6.C1 in Appendix 6). Large price reductions in community colleges, which amount to at least 60% reduction of the tuition fees, based on residency was found to successfully increase disadvantaged students' enrolment in these institutions but to divert students from four-year institutions (Denning, 2017). More quasi-(experimental) evidence is obviously needed to conclude whether universal grants or price reductions efficiently increase access to higher education for disadvantaged students, and whether these policies participate in reducing inequalities in higher education. It may be that universal financial grants, which normally only include a basic application process, are more efficient in reaching all disadvantaged students than specifically targeted programs which require complex application forms. Conversely, it may be that socially advantaged students react more to such opportunity and remain the primary beneficiaries of these policies.

More studies are available regarding the effect of grants which defined more stringent eligibility rules. Figure 6.3 displays the collected estimates for need-based and merit-based grants for which it was possible to calculate risk ratios. Results on the effect of need-based grants are mixed. Many studies find a small substantive effect, but which fails to reach statistical significance. A few studies, however, found that need-based grants had a large effect on access rates of disadvantaged students. Results on merit-based grants are also mixed but with a different pattern: some concluded that merit-based grants actually decreased enrolment rates of disadvantaged students and only a third of the available studies found that such grants had a positive statistically significant effect on access to higher education for disadvantaged students. Since there is such diversity in these findings, it is necessary to discuss the studies and the design of the aid schemes in more detail.

Figure 6.3: Selected estimates for the impact of financial aid on access to higher education



Note: Refers to estimates on access to any type of higher institution, whenever available. If not provided, estimates on access to four-year institutions or to university are used instead. See Appendix 6 for further details.

The evidence on ***need-based aid*** is mixed. While most studies find a small substantive effect on access to higher education (Table 6.C2 in Appendix 6), only a third of the selected estimates are statistically significant. Among the fourteen studies reviewed, only four interventions found a statistically significant effect larger than 5 percentage points. However, the grant programs evaluated differ greatly from one another and it is possible to identify some of the features that seem to be associated with larger impacts on access rates to higher education. Most notably the amount and the timing of the grant seem to be central features in the efficiency of need-based financial aid.

For example, in the U.S., the Pell grant, which can be quite small, was not associated with any increase in enrolment (Denning, Marx, & Turner, 2017; Kane, 1995; Rubin, 2011) while grants supplementing the Pell grant or more generous interventions were associated with positive and sometimes large effects on enrolment. Early (quasi-) experimental evidence on the effect of the implementation of the Pell grant did not show any positive effects on enrolment rates

of blacks nor of students from the lowest income quartile (W. L. Hansen, 1983; Kane, 1995). Rubin's (2011) evaluation of the Pell grant, using a regression discontinuity design, also failed to identify an effect of being eligible for the Pell grant around the cut-off point of the expected family contribution (Rubin, 2011). She argues that the size of the grant at the eligibility cut-off point ($400 per year) may be too small to lead to a sizeable effect on students' enrolment patterns. However, even a $1000 grant, for the most disadvantaged students eligible for the maximum Pell grants, failed to have any impact on enrolment in university (Denning et al., 2017).

Conversely, studies analysing grants that supplement the Pell grant are more likely to find positive effects of aid, supporting the hypothesis that the size of aid matters. In a randomized controlled trial in the United States (California), Richburg-Hayes et al (2015) provided a one-time $1,000 additional subsidy for enrolling in higher education which increased enrolment at any college by 3.5 percentage points (although it was not statistically significant), and by 5 percentage points for two-year colleges. Using a regression discontinuity design, Castleman and Long (2013) found that an additional yearly renewable grant of $1,300 (in 2000$) had a positive (+3 p.p.), but statistically non-significant effect on higher education enrolment which was mainly driven by an increase in enrolment in four-year institutions (statistically significant at 10%). Bettinger (2015) also found a small but statistically significant response to the Ohio College Opportunity Grant: those who received around $750 more grant aid because of a reform of the aid scheme were 1.5 percentage points more likely to enrol at public, four-year colleges. Linsenmeier et al (2006) found that one university grant, that replaced a loan (increasing total grant aid by an average of just over $3,000), had a small impact on attendance among admitted students (yield rate) for low-income students (2 p.p.) but was able to raise attendance by close to 9 p.p. for low-income minority students, an estimate almost significant at the 10% level.

Finally, interventions that offer very generous subsidies were found to have large effects on enrolment. Dynarski (2003) found that the elimination of the Social Security Benefits program that targeted children of deceased, disabled or retired parents decreased enrolment by 22 percentage points. Under this program, students received an average subsidy of $6,700 per year (in 2000$), at a time when tuition averaged around $1,900 per year at public universities. Similarly, the temporary ban on all types of federal financial aid, for students with drug

convictions, decreased immediate college attendance by 22 p.p. although this effect was mainly the consequence of delayed enrolment during the time of the ban (Lovenheim & Owens, 2014).

Evidence from Europe seems to confirm that the effect of need-based aid is only identifiable when the amount of aid is large enough. In France, the main need-based grant scheme, the "Bourses sur Critères Sociaux", contains different levels of aid. While a fee-waiver (which amounted to 174 euros for undergraduate students) had small positive (statistically non-significant) effects, an additional €1,500 per year increased enrolments by almost 3 percentage points, and by almost 5 p.p. for enrolment in the first year of undergraduate programs (Fack & Grenet, 2015). In the United Kingdom, the implementation of need-based grants of £960 (2006 prices), on average, was associated with an increase in access to higher education of almost 4 p.p. among low-income youths (Dearden, Fitzsimons, & Wyness, 2014). In contrast, in Germany, a 10% increase in the federal students' financial assistance scheme led to a small but not significant increase in enrolment rates of low-income students (Baumgartner & Steiner, 2006). The authors argue that this may have to do with the small sample size but it is also possible that the increase in aid, which went from 326 to 371 Euro on average per month, was too small to lead to any sizable increase in enrolment rates, in line with the findings from the studies discussed above.

Together with the amount, the timing of the grants may also be important for efficiently supporting disadvantaged students. In New Brunswick in Canada, Ford et al. (2014) deposited a maximum of CAN$8,000 in high school students' saving accounts. The amount was deposited in tenth grade, giving students enough time to prepare their college applications. Importantly, students were only able to access the grants for two years while in college. Enrolment in postsecondary education increased dramatically, by almost 11 percentage points, although this was driven exclusively by an increase in short program enrolment. Another example of financial aid with early commitment was tested in Italy (Azzolini, Martini, Romano, & Vergolini, 2018). Interestingly, disadvantaged students were invited to save money for their education during their last two years of high school and their deposits on this dedicated saving account were matched at a rate of 4 to 1. The money could then only be used for educational expenses and this led to a large increase in enrolment of almost 9 p.p. Not only were students aware of the amount of money they had for higher education studies before the end of secondary

school, but students and families were directly involved in anticipating and saving for educational expenses, which may be another promising way to increase educational aspirations for higher education (Azzolini et al., 2018).

The causal evidence on ***merit-based aid*** suggest that these types of grants can have negative effects for disadvantaged students, and only have a positive effect when they are designed to guarantee that disadvantaged students have access to them (Table 6.C3 in Appendix 6). Eligibility for merit-based aid is defined in reference to the academic ability of the students, with criteria setting minimum high school grades or performance in specific standardised tests. The rationale for this form of aid is that it may incentivise student performance in high school (thus increasing academic preparation for higher education), while encouraging good performers to enrol in higher education. In theory, it also allows for the targeting of public money on the students who are sufficiently prepared for higher education and who will be able to complete a degree. However, since high performers are typically from privileged backgrounds, it is possible that these kinds of programs are not accessible to students from disadvantaged backgrounds. If this is so, this form of aid may reward those who would anyway enrol in college, or even increase inequality across social groups. On the other hand, some of the merit-based grants are made accessible only to disadvantaged students by including a need-based eligibility criterion and may be able to improve access to higher education for this group.

With one exception, merit-based grants that did not have a need-based eligibility criterion often seemed to have either increased inequalities or failed to trigger any improvement for disadvantaged students. For example, Dynarski (2000) used a difference-in-differences approach to estimate the effect of Georgia's HOPE scholarship, a merit-based aid programme without any income eligibility criteria, on different income groups and minorities. While she found that HOPE increased the enrolment for whites and middle-income groups, enrolment among blacks and low-income students decreased by 3 and 1 percentage points respectively (not statistically significant). In other words, Georgia HOPE seemed to have increased inequality. Using a broader sample of states with strong merit-funding, Sjoquist & Winters (2015) found a small negative effect of merit-based aid on college attendance among non-White or Hispanic men. Bruce and Carruthers (2014) also estimated a negative significant effect of the Tennessee HOPE programme on college enrolment of minority students. On the

positive side, they found that Tennessee HOPE may have redirected some low-income students from two-year colleges into more selective four-year colleges.

Only Cohodes and Goodman (2014) found a positive effect of a merit-based grant without a need-based eligibility criterion. The Adams scholarship in Massachusetts added between $900 and $1700 in annual aid to reduce tuition costs for those who score highly on the state-wide examinations in tenth grade and without any need-based eligibility component. Enrolment in four-year institutions increased by more than 6 percentage points among non-White students, while it went up by almost 4 percentage points among low-income groups. The difference with the negative effects identified by the previous studies may be interpreted in light of the specific design of the Adam scholarship: the initial idea was to provide a grant to students whose score would place them in the top 25 percent of students state-wide. However, "Concerned that […] statewide standard would assign scholarships largely to students in wealthy, high-performing school districts", the state decided that a student's total score would need to fall in the top 25 percent of scores in *his or her school district* (Cohodes & Goodman, 2014). Thus, although there was no need-based criterion for eligibility, the grant scheme was designed to guarantee that disadvantaged students would benefit from it.

Regarding merit-based grants which are targeted to lower-income students, Kane (2003) found that a merit-aid programme in California with a need-based component increased enrolment by 4 percentage points immediately below the income eligibility threshold. The Cal Grant A offered a maximum of $9,420 annually to reduce tuition fees, for those with GPAs above a specific limit. Similarly, Vergolini, Zanini and Bazoli (2014) found that an Italian merit grant, available only for high performers from low-income families increased enrolments by 6.5 percentage points, although this finding was not statistically significant.

While there is limited evidence on the effect of ***performance-based scholarships,*** which make grant payment conditional on minimum academic achievement in higher education, the few available studies find promising effects. Nevertheless, it should be noted that these types of grants often focus on students who have already carried the first enrolment steps in a specific institution and provide them incentives to register for a minimum number of courses**.**

Out of the four available studies, three identified a positive significant effect on enrolment (Table 6.C4 in Appendix 6) and the only study that did not show any increase was targeting

freshmen students who already had a registration rate of almost 100% in the control group (Binder, Krause, Miller, & Cerna, 2015). In contrast, Barrow et al (2014) found that a performance-based grant of $1,000 per semester increased enrolment by 5 percentage points. Students received $250 for enrolling, another $250 at mid-terms, and another $500 for completing the semester. Richburg-Hayes et al. (2015) were also able to detect a close to 5 percentage point increase in two-year college enrolment of high school seniors participating in the Performance-Based-Scholarship-demonstration (California-PBS), but without any impact on four-year college enrolment. The California-PBS offered students between $1,000 per term for a maximum of two years, in return for enrolling and completing six or more credits with at least a C-average in that period.

With a different aid scheme, Jackson (2010) finds that the Texas Advanced Placement Incentive Program (APIP) raised enrolment by 5 percentage points. This program provided financial incentives to students and teachers in high schools for passing grades on advanced placement exams. Students receive between $100 and $500 for a score of 3 or higher on the AP-exam. He finds that the intervention raised enrolment rates by 5 percentage points. Teachers also receive cash awards, depending on their level of involvement in the program and their performance. Nevertheless, further research that targets students in high school or out of college would be useful to further identify the potential impact of performance-based scholarships on access to higher education.

Finally, we discuss a few additional findings on the effects of loans and tax credits, although we could only find a few (quasi-)experimental studies which estimated the impact of these types of aid specifically on disadvantaged students.

The evidence on ***loans*** suggest that these forms of aid may be efficient in improving access rates of disadvantaged students (Table 6.C5 in Appendix 6). In Chile, the national loan program was found to increase enrolment by 20 percentage points for college-intending students in the lowest-income quintile, and "access to the loan programs appears to eliminate the relatively large income gradient in college enrollment" (Solis, 2013). Similarly, short-term loans covering tuition fees in South African public universities were estimated to double enrolment rates of admitted disadvantaged students (Gurgand, Lorenceau, & Mélonio, 2011). In contrast, the available evidence on ***tax incentives*** do not suggest any large positive impact for disadvantaged groups' access to higher education (Table 6.C6 in Appendix 6). In the U.S.,

Lalumia (2012) estimates the joint effect of different tax credit programs on adults eligible for tax incentives and fails to identify an effect on enrolment for non-whites and adults whose parents did not go to college. Finally, Bulman & Hoxby (2015) analyse the introduction of the American Opportunity Tax Credit (AOTC) in 2008 and do not find an effect on college attendance for any income group. As these tax incentives only provide income relief about 10.5 months after enrolment, these may not be very effective in addressing unmet financial need. Moreover, these tax incentives tend to benefit middle and upper income families, as lowest-income families do not pay taxes and are thus not eligible for tax credits.

Effects on graduation

The literature on the effects of financial aid on higher education outcomes, beyond mere enrolment, is still quite recent but has lately received a growing attention (Binder et al., 2015; Castleman & Long, 2013).

Regarding an example of "universal" grant, price reduction in community colleges, based on residency, led to a small increase in associate degree graduation for black students but not for low-income students, for whom the increase in enrolment did not translate into more graduates (Denning, 2017).

The available evidence further suggest that ***need-based grants*** are often efficient in supporting the graduation of disadvantaged students (Table 6.D2). Alon (2011b) found that each additional $100 of Pell grant received in the first year by students coming from the poorest families (bottom income quartile) increases degree completion by 0.6 percentage points, which is statistically significant. Interestingly, the effect was larger for students in the lower-middle income (almost 1 percentage point for each additional $100) but there was no effect for students in the top two quartiles. Similarly an additional $1,000 in annual grant aid was found to significantly increase graduation rates of minority students enrolled in private and most selective universities (Alon, 2007) and to increase graduation from bachelor's degrees for the lowest-income students by more than 5 p.p. (Denning et al., 2017). Using a difference-in-differences strategy, Lovenheim and Owens (2014) also found that convicted drug offenders were 7 percentage points less likely to earn a bachelor's degree when they became ineligible for federal aid, although this was not significant. Only Denning (2018) found an effect of less than 1 p.p. on completion of a bachelor's degree following an increase in the

Pell grant but this was estimated on students already in their last year of a bachelor's programme and the larger financial aid did increase on-time graduation by almost 3 p.p. (Denning, 2018).

Regarding the grants supplementing federal aid in the U.S., Castleman and Long (2013) found that Florida FSAG increased graduation from four-year colleges by 5 percentage points. This is a substantial effect, as it represents an increase of 21% over the sample mean probability to graduate. The Wisconsin Scholars Grant was also found to largely increase on-time bachelor's graduation (Goldrick-Rab et al., 2016) but not completion of associate degrees (Anderson & Goldrick-Rab, 2016). An institutional grant meant to cover 100% of unmet need had a small but non-significant effect on on-time graduation (+2.2 p.p.; Clotfelter, Hemelt, & Ladd, 2018). Finally, Turner and Bound (2003) estimated that the GI-Bill, which provided up to $500 in tuition expenses and up to $120 per month in living costs to returning veterans from WWII, increased college degree completion of black students by almost 3 percentage points, although this effect was not statistically significant. The authors argue that the absence of a large effect is due to higher education supply problems in the South of the United States, where school segregation was still a major issue. Indeed, they identified a larger, statistically significant, effect of almost 6 percentage points for Blacks in the northern states.

In Canada, Ford et al (2014) found that the two-year grant provided with early commitment during high school increased any degree completion by 9 percentage points, which represents a 70% increase from the baseline. While, this effect is not reported separately for short programs and university completion, we should expect it to be mainly driven by completion of short programs, as this two-year grant had not increase university enrolments. In France, Fack & Grenet (2015) found that receiving a €1,500 grant, on top of a fee-waiver increases undergraduate degree completion by almost 3 percentage points, for those on the threshold of grant eligibility in their final year. They also find that those who are eligible for this grant from their first year were 2.1 percentage points more likely to graduate, although this effect was not statistically significant. While these effects are slightly smaller than the enrolment effect cited above, they are still sizeable, as this aid allowed around half the students who it incentivised to enrol to complete their undergraduate degrees.

The evidence of ***merit-based financial aid*** on degree completion is limited but current findings are not encouraging (Table 6.D3 in Appendix 6). Among the four reviewed studies, none was

able to identify an improvement in graduation rates for disadvantaged students (Carruthers & Özek, 2016; Cohodes & Goodman, 2014; Sjoquist & Winters, 2015; Welch, 2014). All the selected estimates on graduation from any degree or bachelor's degree range from -4 to +0.2 percentage points and none are significant.

We would expect the effects of ***performance-based financial aid*** on degree completion to be larger on completion as these forms of grants are specifically designed to increase persistence and graduation. Performance-based aid provides short-term monetary incentives to maintain a minimum GPA allowing students to graduate within a reasonable period of time. The evidence on disadvantaged students' graduation or completion rates is however still very limited (Table 6.D4 in Appendix 6). Binder et al. (2015) find that the VISTA program for disadvantaged students at the University of New Mexico increased degree completion within five years by 4.5 percentage points, which was statistically significant at the 11% level. The effect was stronger (+6.4 p.p.) among those in the bottom 50% of the income distribution, although not statistically significant. Mayer, Patel and Gutierrez (2015) found that a performance-based grant in three community colleges, raised degree attainment within two and within three years, by 3 to 4 percentage points. Nevertheless, within four years, the program had increased completion by less than 2 percentage points and was no longer statistically significant. In other words, the program accelerated degree completion, thus increasing efficiency, but did not increase overall graduation in the long term.

Finally, none of the three studies which provides causal estimates of the effect of ***loans*** on graduation identified a statistically significant impact. Alon (2007) and Dunlop (2013) estimated close to nil effects of additional $1,000 and $100, respectively, in annual loans. Only (Wiederspan, 2016) identified a large effect (+ 20) of receiving federal loans on graduation from associate degrees but this was not statistically significant. We could identify only one study assessing the effects of ***tax incentives*** on degree completion for disadvantaged students. Elsayed (2016) finds, using propensity score matching, a substantial and statistically significant effect of tax incentives on degree completion for black students (almost 10 p.p.). It would be necessary to replicate and confirm these results with other research designs in order to see if tax credits may be more efficient in supporting persistence and graduation than enrolment.

Mixed interventions combining financial aid and outreach

This section presents the results from studies evaluating mixed interventions that combine outreach with financial aid. While these studies make it difficult to assess the causal effect of a specific component, they do allow us to assess the effectiveness of a package of interventions. We would generally expect such mixed interventions to be more effective than single interventions discussed above. However, combining different elements in one intervention may also be ineffective if a single component is sufficient to allow students to enrol or graduate, or if the effects of the different components are not additive. In such a case, we would not observe a larger effect of mixed interventions than outreach interventions or financial aid separately.

Table 6.3: Available evidence on the impact of interventions combining outreach and financial aid

	Access	Graduation
Total number of studies	**7**	**6**
Studies' characteristics		
RCT design (in % of total studies)	43%	50%
Diversity of national contexts (nb of country)	2	2
National-scale interventions (in % of total studies)	0%	0%
Single-institution interventions (in % of total studies)	14%	33%

Source: Tables 6.E1-E2 in annex.

Table 6.3 provides the overview of the available evidence on these interventions. The causal evidence is still limited but covers equally access and graduation outcomes. Around half of the available evidence comes from randomized experiments. However, we could only find evidence from the United-States and Canada for these types of interventions and this is clearly one of the main limits of this literature.

Effects on enrolment

The evidence is still limited but mixed interventions seem efficient in raising enrolment. Six out of the seven available studies found a statistically significant positive impact for at least one disadvantaged group. And when a positive impact was identified, effect sizes are generally large compared to outreach or aid estimates.

The Quantum Opportunities Program (QOP) was one of the earlier experiments from the 1990s and included education (tutoring, computer-based instruction), development activities

and community service to improve the living conditions in the community. It targeted inner-city low-income youth from ninth grade through to high school. Program staff and students received a small cash incentive to engage actively in these activities, as well as bonuses when major segments were completed. Students received over $1,000 on average, and all funding was deposited in a fund that they could access while in postsecondary education. An initial evaluation found that QOP had a dramatic effect and increased postsecondary enrolment by 26 percentage points (Hahn, Leavitt, & Aaron, 1994) but it should be noted that the sample of this experiment was small (N=158 students). A more recent evaluation with a larger sample found smaller but still sizeable effects: By the time that youth were in their mid-twenties, participants were around 7 percentage points more likely to have ever attended postsecondary education (which included colleges, vocational or technical schools, and the armed forces) than those in the control group. Participants were also 4 percentage points more likely to have attended a two- or four-year college, although this effect was not statistically significant (Rodríguez-Planas, 2012).

The other randomised experiment tested in Canada a combination of outreach and need-based aid (Ford et al., 2014). Students were eligible to receive 40 hours of counselling during high school, and a maximum of CAN$8,000 in need-based aid, deposited during high school and payed while in college, over two years. The impact was both substantial and statistically significant as it increased enrolment in higher education by more than 10 p.p. Interestingly, this study also tested the effect of each component of the intervention individually allowing us to compare the effect sizes of the mixed intervention with its single components: the estimated impact on access to higher education for the mixed intervention is not larger than the impacts of the individual components of the intervention (see earlier in outreach and need-based grants). However, the combination of the interventions also increased attendance at university by almost 7 p.p. while financial aid alone only had an impact on enrolment in short programs (Ford et al., 2014).

The Pathways to Education programme (Oreopoulos, Brown, & Lavecchia, 2014) provided an intensive multifaceted support to pupils from ninth grade through high school in urban settings in Canada. Participants received counselling, free daily evening tutoring and group mentoring activities. Students also received financial support throughout the programme, including transportation, school supplies, and a financial award of CAN$1,000 at the end of

each year of programme participation. Financial support could reach a maximum of CAN$4,000 and could be used only to pay for postsecondary education expenses. At the first site where the program was tested, the program had dramatic effects on postsecondary attendance as program youths were 19 percentage points more likely to enrol in any postsecondary education. At the second site where the program was tested, however, the results were much more modest as the increase in postsecondary enrolment was 4 percentage points, which was not statistically significant, although there was an increase in application rates. (Oreopoulos et al., 2014).

All these interventions reached disadvantaged students early, in ninth or tenth grade of high school but one intervention starting only in the senior year of high school was also efficient in raising access rates of disadvantaged students. The Knox Achieves programme which provided outreach and financial aid for making an immediate transition to community colleges increased enrolment by more than 25 p.p. in these institutions without diverting students from universities (Carruthers & Fox, 2016).

Only two studies (R. J. Andrews, Imberman, & Lovenheim, 2016; L. C. Page, Castleman, & Sahadewo, 2016) did not identify large increase in enrolment of disadvantaged students with interventions combining outreach and generous financial aid. Interestingly, both were focusing on high-achieving disadvantaged students only. As already mentioned when discussing merit-based aid, high-performing and motivated disadvantaged students can be expected to enrol in higher education in any case. Thus, it is less likely that such interventions bring large improvements for this specific population.

Effects on graduation

The available findings regarding interventions that combine outreach and financial aid on graduation rates of disadvantaged students is still insufficient but suggest that these interventions can have positive effects on graduation rates but that their efficiency is not systematic. Out of the six studies selected, three found a large positive effect on graduation rates. Two found smaller effects (less than 5 percentage points) and one did not find any positive effect on graduation rates of disadvantaged students.

The Quantum Opportunities Program did not affect graduation rates for bachelor's degrees or associate degrees. Nevertheless, youths in the programme were 7 percentage points more

likely to complete two years of college or training (Rodríguez-Planas, 2012). This is perhaps surprising, since QOP invested substantial resources in raising the academic preparation of the program participants. On the other hand, QOP did not provide support beyond the high school years, and the effects may have worn off over time. The mixed interventions implemented by two flagship public universities in Texas also brought very limited improvements in degree outcomes of the treated students (+1.5 p.p. increase in one case and a nil effect in the other) but these interventions already had only a limited impact in enrolment rates in these specific universities (R. J. Andrews et al., 2016).

Conversely, Ford et al (2014) found an increase in completion by 8 p.p. in their evaluation of learning accounts and explore your horizons. This is broadly in line with the effect of the financial aid alone discussed above. The Dell programme, focusing on high-performing disadvantaged students, was also able to support bachelor's graduation which was raised by 19 p.p., despite its very small impact on enrolment (L. C. Page et al., 2016). Comprehensive intervention implemented after enrolment in higher education may also be successful. The ASAP programme targeted disadvantaged students at three community colleges in New York. In return for full-time enrolment, the programme provided students with free tuition and free public transport. Students also received a dedicated advisor and academic tutoring. The participants were estimated to be 18 percentage points more likely to graduate by three years, effectively doubling graduation rates (Scrivener et al., 2015). Similarly, combining a need-based grant with mentoring and career guidance in one university raised completion rates by almost 5 percentage points, although this was not significant through the (preferred) regression discontinuity estimating strategy (Clotfelter et al., 2018).

Conclusion

The results of the experimental or quasi-experimental literature discussed in this paper provide an overview of the causal effects of the most common interventions or policies implemented to raise higher education outcomes of disadvantaged students. We were able to identify some promising ways to reduce inequalities in higher education, even though many interventions failed to find an effect.

Outreach interventions targeted at students in high school or recent graduates seem to be a relatively cost-effective tool to address inequalities in access to higher education, as long as

the interventions go beyond providing general information about higher education. Substantial improvements have been identified when disadvantaged students were offered personalised counselling activities or simplification of application tasks, especially when counsellors actively reach out to targeted students to ensure their participation. However, neither interventions which only provide additional information nor those including intensive academic tutoring seem to efficiently raise higher education outcomes of disadvantaged students

Financial aid is more expensive, and the evidence on its effectiveness for disadvantaged students varies largely depending of the type of aid. The evidence on need-based grants suggests that most grant schemes only lead to limited improvements in enrolment rates, unless they provide substantial amounts of money. It is possible that enrolment as a response to aid follows a threshold effect and that need-based aid is only effective when it covers a significant part of unmet financial need and determining such a threshold should be an interesting question for future research. It also seems that an early commitment of aid, while students are still in high school, leads to much larger impact on higher education access and this type of grant could be further tested. Merit-based aid is rarely effective in tackling inequalities in higher education, except when it includes a need-based component to specifically support disadvantaged students. Conversely, merit-based aid based only on academic results, without any assessment of students' financial needs, seems to have no effect, and was even found to raise inequality. Regarding attainment, only need-based grants were found to increase graduation rates of disadvantaged students quite consistently. Finally, the (quasi-)experimental literature on the effect of universal grants on disadvantaged students, performance-based grants, loans or tax credits for disadvantaged students is still scarce and further research is necessary to draw general conclusions.

Interventions that combine early financial aid and outreach activities are even more demanding for the public purse. Nevertheless, the experimental literature shows promising results on enrolment and completion of disadvantaged students. Since they support students through different mechanisms, these interventions seem to lead to large increases in enrolment rates, more consistently than either outreach or financial aid alone. It should also be noted that effect sizes of these interventions are in the same ballpark as some of the more

effective outreach or financial aid interventions. More needs to be known, therefore, about the cost effectiveness of these interventions as compared to other types of interventions.

Our systematic review of the literature also allows us to identify areas for which additional experimental evidence is needed. Overall, there is still a lack of available evidence on the impact of the outreach interventions on graduation rates. As the problem of dropout in higher education has received increasing attention, it is crucial to provide causal evidence on the capacity of interventions or reforms to translate a higher number of under-represented students in higher education into a higher number of graduates. Another shortcoming of the existing literature is that there is little variation in institutional settings. Most studies discussed here are from the United States, and further research, in other national and institutional contexts, is needed to shed light on the pertinence of the interventions. To make this literature comparable and to be able to draw more precise conclusion on the effect of financial aid, we also consider that studies should systematically report the amount of the aid evaluated relative to higher education costs (tuition and living expenses) in their specific context. For the time being, it is very difficult to compare or standardise the amount of aid evaluated as the costs of higher education vary so widely across countries and institutions, and this information would be crucial to identify a threshold that financial aid needs to cover to increase access and graduation rates of disadvantaged students.

Nevertheless, most of the evidence discussed here is quite recent and this literature is growing quickly. We therefore hope that more precise conclusions and policy recommendations could be drawn in the coming years. Overall, the available evidence from the (quasi-)experimental literature is encouraging for the institutional and political leverage to reduce inequality in higher education. Although some of the inequalities discussed here may arise very early in the life course, our results highlight the possibility, and perhaps the necessity, to also tackle education inequalities later. Well-designed interventions in high school and higher education can thus bring about substantial improvements in the difficult educational career of disadvantaged students.

Chapter 7
Conclusions

To what extent and how does social background influence students' attainment in higher education? Can social inequalities at this stage of the educational career be reduced by political reforms or interventions? This dissertation has focused on the patterns of inequality formation in the last stage of the education system, in the French context, and on the evaluation of educational policies to reduce them. Undoubtedly a precise identification of inequality patterns is highly relevant for policy actions as a "better knowledge of the stage students with different schooling and family backgrounds suffer most could help targeting interventions for the reduction of inequalities in higher education." (Contini et al., 2018). Acknowledging the longitudinal nature of higher education careers and building on the life course perspective on educational inequalities, I have assessed the effect of social origin on pivotal outcomes of higher education careers in both the vertical dimension of stratification (access to higher education, dropout) and horizontal dimension (access, transfer and attainment in prestigious institutions). In order to contribute to the understanding of the development of social inequalities in French higher education, each chapter has further tested different mechanisms which can contribute to social inequalities in the last stage of the educational system. In Chapter 2, I have focused on the processes of cumulative (dis)advantage during secondary education and in the transition to higher education. In Chapter 3, I asked whether students failing to meet the academic requirements in their first year in higher education are more likely to dropout when they are from disadvantaged backgrounds than socially advantaged students experiencing the same negative outcome, as predicted by the compensatory advantage hypothesis. I further estimated, in Chapter 4, the independent effects of different dimensions of social origin (parental education, social class and social status) on higher education attainment, to disentangle the effects of different familial resources, and I evaluated the mediation role played by academic preparation at the end of high school for these different dimensions of social origin. Focusing on policy solutions, I have further explored the effect of alternative pathways on the composition of the student body in prestigious institutions in Chapter 5. Finally, I provided a systematic review of the (quasi-)experimental literature evaluating outreach interventions and financial aid on the outcomes of disadvantaged students in higher education in Chapter 6.

Summary and implication of the main findings

Results first confirm the cumulative nature of performance in educational careers and the crucial role of previous education in shaping social inequalities in higher education outcomes. In Chapter 2, I found that the gap by social origin in high school graduation explains the majority of the gap in access to higher education. In addition, the effect of social origin on high school graduation is largely mediated by differences in performance already at the entrance of secondary education (around age 11). Comparatively to findings in the U.S. context (Bailey & Dynarski, 2011), the role of social inequalities in secondary education seems to be even more determinant in France. Indeed, I consistently find that the gross association between social origin and the transition to higher education (Chapter 2), dropout patterns (Chapter 3) or attainment (Chapter 4) is largely reduced once controlling for differences in academic preparation by the end of high school. Supporting the "dissipating effects" hypothesis (S. Davies & Guppy, 1997), I more specifically find that the net effect of social origin is close to zero once controlling for academic performance at the end of high school for access to any higher education programme among eligible students (Chapter 2). Even going beyond access, I find that the effect of social origin on the situation of students, five years after becoming eligible for higher education, is largely explained by their performance in high school graduation, at least for some attainment outcomes (Chapter 4). For example, the large gross effect of parental education, social class and social status on the probability not to have a higher education degree is fully explained by lower academic performance at the end of high school. The gross association between social origin and master's programme attainment is also largely mediated by performance in high school graduation. For attainment in elite institutions, I find that the effect of parental education and parental social status is largely mediated by academic performance at the end of high school, with mediation percentages ranging between 65% and 80% (Chapter 4). Overall these results highlight that the under-representation of disadvantaged students in French higher education can only be addressed through a reduction of inequalities of performance across social groups in earlier stages of the educational system. In Chapter 6, we further find that interventions which try to increase higher education opportunities of disadvantaged students by providing intensive outreach activities with academic tutoring do not consistently increase access rates of disadvantaged students. It is probable that intense interventions with many hours of after-school activities,

over many years, are too demanding for most students and many of them drop out before completing them (Myers et al., 2004) . This additional evidence thus calls for reforms of the school system itself, rather than out-of-school interventions, to address the lack of academic preparation of disadvantaged students and reduce inequalities in higher education.

But this dissertation has also provided evidence of a "lingering" effect of social origin in the French higher education system for specific, but crucial, outcomes. Most notably, social origin is especially relevant when considering the horizontal stratification in higher education (Chapter 2 and 4). Confirming the relevance of the effectively maintained inequality's theory in higher education (Lucas, 2001, 2009) and previous empirical evidence on the French system (Duru-Bellat et al., 2008), social origin has a direct effect, beyond differences in academic readiness at the end of high school, on access and final attainment from prestigious institutions. After high school graduation, I estimate that students with low-educated parents are 9 percentage points less likely to initially access a prestigious institution, holding performance in high school diploma constant (Chapter 2). In addition, I find that the negative association between being from the working or intermediate class and elite attainment is mediated by academic performance in high school graduation by no more than 40% (Chapter 4). Thus, more than half of the effect of economic resources on elite programme attainment is a direct effect. Parental education also has a direct effect on the probability of transferring, after a short vocational degree, to a prestigious institution (Chapter 5). I further find that the situation of each parent is relevant to understand the transmission of social advantage through attainment in elite institutions: students with two, rather than one, highly-educated parent(s) or from the upper class are more likely to attain entry to a prestigious institution (Chapter 4). These results thus suggest that students' trajectories in higher education further diverge by social origin, after high school graduation, in the horizontal dimension of social stratification, and that the inequalities observed at the end of high school are further amplified. Given that elite institutions remain the gatekeepers of the top political and economic positions in French society, the effect of social origin on elite programme attainment should be an important concern for the equity of the higher education system.

Beyond the estimation of the effect of social origin on higher education outcomes, this dissertation has focused on the processes of accumulation of (dis)advantage during educational careers. I tested the relevance of the compensatory advantage hypothesis

(Bernardi, 2014) in the formation of social inequalities in higher education outcomes. My results suggest that, in the French context, socially advantaged students with poor performance benefit from a "compensatory advantage" to secure a high school diploma, and thus gain eligibility to higher education (Chapter 2). I further find that socially advantaged students are more likely to overcome failure in the first year of higher education, compared to socially disadvantaged students who are much more likely to drop out after such events (Chapter 3). I further identify a "reinforcement advantage" for high-achievers from socially advantaged backgrounds who are able to better capitalize on their good performance in high school to enter prestigious tertiary programmes than disadvantaged high-achievers (Chapter 2). These results thus suggest that social origin is more or less salient for different academic profiles. This is a significant result which stresses the importance of considering the interaction between performance and social origin in the formation of social inequalities, which is rarely done for outcomes in higher education and I see three main contributions of this approach.

Theoretically, the evidence of the heterogeneous effect of social origin for different academic profiles further supports and refines the "lingering effect" hypothesis in higher education by identifying precisely when social origin still has a large effect on educational outcomes. In the French higher education system with relatively modest financial and selection barriers, the estimated net effect of social origin on higher education outcomes, controlling for academic readiness, often appears to be moderate, if not small, especially comparing with the much larger effect of social origin observed on earlier outcomes such as high school graduation. Rather than concluding that social origin is much less relevant in higher education than in previous stages of the educational system, the results presented in this dissertation suggest that the moderate average effect of social origin can mask important heterogeneity by level of performance. It is, for example, striking to find that, in the case of academically well-prepared students, there is no effect of social origin on dropout patterns in higher education for those who validate their first year. However, for students, with similarly good academic preparation, who fail in their first year, social origin has a large effect on annual dropout patterns (Chapter 3). This dissertation thus contributes to the emerging literature that have assessed social inequalities on higher education outcomes at different levels of performance, in the Italian context (Bernardi & Triventi, 2018; Contini et al., 2018) or in the U.S. (Andrew, 2017).

In addition, the fact that students' trajectories diverge most by social origin after some academic outcomes but not after others, points to the relevance of the notion of "triggering events" in understanding the effect of social origin in education in general and higher education in particular. For example, I find evidence of a compensatory advantage in high school graduation for socially advantaged students assigned to the vocational tracks but not for grade repetition in secondary education, nor for graduation in the lower secondary degree (Chapter 2). It is also striking that failing in the first year of higher education has such a large effect on dropout patterns, even when controlling for academic readiness one year earlier (Chapter 3). Being a central concept of the life course perspective, triggering events and path-dependency have framed important research on educational careers or labour-market trajectories (for example, the effect of track assignment in Kerckhoff's work, 1993; 2001). It is interesting to see that events occurring late on the educational road (such as failure in the first year of higher education) can still be critical junctures for future outcomes, and that social origin becomes salient with such events.

The evidence that social origin has a much larger impact among low-performing students for some outcomes or among high-performing students for others is also a valuable contribution from a policy perspective, as it could contribute to better targeting of beneficiaries of interventions. It is clear from Chapter 6 that some outreach and financial aid policies can improve outcomes of disadvantaged students in higher education but that they need to target the students who are on the margin of enrolling or graduating and who would not have done it without an intervention. For example, we have seen in Chapter 6 that some merit-based grants with very stringent performance requirements, have a negligible effect on outcomes of disadvantaged students because "the policy targets students whose academic ability are so high that they would have enrolled at the university even in the absence of the policy" (Vergolini et al., 2014). In addition, with a few exceptions, the most efficient policies and interventions identified in Chapter 6 are quite costly to implement. It is undoubtedly necessary to identify students who are most at-risk of not entering or dropping out from higher education to justify the feasibility of implementing such policies at scale.

Finally, this dissertation has addressed the question of policy solutions to reduce inequalities in higher education. Undoubtedly, the large social gap in performance already at age 11 (Chapter 2) should be a major concern for political actions and supports the call for early

interventions to reduce social inequalities in later outcomes (Carneiro & Heckman, 2002; Heckman, 2006). However, the results on social inequalities in elite institution attainment (Chapter 4), and on the trajectories of students from different social origin to reach these institutions (Chapter 5), suggest that even when they manage to reach a good or very good level of academic performance, disadvantaged students are much less likely to enter prestigious programmes through the main historical pathway. So even if differences in academic preparation by social origin were dramatically reduced through early interventions, it would still be necessary to address the under representation of disadvantaged students in top higher education institutions with late interventions. Indeed, the systematic review of the (quasi-)experimental literature on the effect of outreach and financial aid provided in Chapter 6 shows that some late interventions can make a difference and successfully bring a greater number of disadvantaged students to enrol and graduate from higher education. Most notably, we find that outreach interventions which go beyond providing information and include personalised support through counselling and simplification of application tasks are usually efficient in increasing access rates of disadvantaged students. Although the results on the effect of need-based grants on access are more mixed, we could identify some characteristics, such as the amount of the grant or its timing, which appear to be associated with large positive effects. And overall, need-based grants appear to be efficient in raising graduation rates of disadvantaged students. Combining different types of interventions also seem to be a promising way to improve higher education outcomes of disadvantaged students although more research is needed to draw sound conclusions. There is little doubt that the literature implementing (quasi-)experimental designs to evaluate policy interventions in higher education is currently developing very quickly. Growing evidence should soon allow us to draw more precise conclusions regarding the effects of higher education reforms or interventions to improve equity in higher education. However, the systematic review of this emerging literature already allows us to conclude that some late interventions, when well-designed, are efficient in increasing opportunities for disadvantaged students and reduce inequalities in higher education outcomes.

Limitations and ideas for further research

There are a number of questions which have not been addressed by this dissertation and would demand further research. I am focusing here on three limitations which I consider to be the most necessary or promising avenues for future research.

From a theoretical perspective, a precise model of the mechanisms generating inequalities in higher education should be developed. As summarized in the introduction of this dissertation, two theories have been most influential in describing the mechanisms bringing about social inequalities in education, the cultural capital theory and the relative risk aversion model. There is empirical evidence which support, at least partially, the relevance of each model in explaining inequalities in higher education. However, an integrated theoretical framework which would build on these two models to account for the development of inequalities over time is still lacking. The study of social inequalities in higher education is undoubtedly challenging. A rich literature on social stratification in education has built on the distinction between primary and secondary effects of social origin (Boudon, 1974; Girard & Bastide, 1963) to study social inequalities in educational outcomes (for example, Jackson, 2013). However, such a distinction has limitations and is especially difficult to apply to the study of inequalities in higher education. Most notably, it relies on the assumption that the primary and secondary effects of social background act independently of each other and rely on separate mechanisms. However, anticipatory decisions (Erikson et al., 2005) ,aspirations (Barone, 2006) or unobserved variables in general (Morgan, 2012) may affect both performance and choice. In higher education, there is little doubt that course attendance is a crucial dimension of students' performance and the importance of anticipatory decisions at this level of education can hardly be ignored. On the other hand, the choice of programme and institution in higher education is largely shaped by institutional constraints such as selection which uses performance to validate students' choices. Assuming the independence and additive effects of performance and choice in the making of social inequalities in higher education is thus especially problematic. This dissertation has focused instead on mechanisms of accumulation of (dis)advantage along higher educational careers to shed light on social inequalities. Chapters 2 and 3 have highlighted the relevance of the compensatory and reinforcement advantage hypotheses during secondary and tertiary educational careers and have provided evidence on the differential accumulation of educational (dis)advantage by social origin.

However, much remains unknowns about the detailed mechanisms driving the patterns identified in these chapters. Why are low-achievers from socially-advantaged backgrounds better able to gain a high school diploma or to persist in higher education after failure in the first year? And how do high-achievers from socially advantaged background capitalise on their good performance to integrate into the most prestigious higher education programmes? The compensatory advantage hypothesis (Bernardi, 2014) builds on the relative risk aversion model (Breen & Goldthorpe, 1997) to posit that, even in the case of bad performance, upper class students always have the incentive to stay in education to avoid downward mobility (Bernardi & Triventi, 2018; Lucas, 2009). Several hypotheses have been formulated regarding the specific behaviours which could allow socially advantaged families to efficiently compensate for the consequences of negative life outcomes or educational outcomes. For example, upper class families have more economic and cultural resources which they can mobilize to support their child in case of problems, through private lessons, parental help with homework or school choice (Bernardi & Grätz, 2015). But the behaviours driving the compensatory advantage may be different for different stages of the education system or different types of outcomes. To guarantee higher education access, especially to elite institutions, there is evidence that socio-economically advantaged students in the U.S. invest in "shadow education" (i.e. preparation courses, tutoring…) to boost their SAT test scores (Buchmann, Condron, & Roscigno, 2010). But other hypotheses could be made, especially building on the large specialised literature on higher education. In Chapter 6, we summarised the literature on the barriers faced by disadvantaged students in higher education. Important findings shed light on the prevalence and consequences of unmet financial needs, lack of information, of academic preparation and more recently on behavioural deficits faced by disadvantaged students in higher education. Undoubtedly, some of these barriers echo the factors identified in the broader relative risk aversion (RRA) model (Breen & Goldthorpe, 1997). For example, recent evidence suggests that incorporating information biases in the RRA model improves its explanatory power (Barone et al., 2017) and this is a promising way of incorporating informational barriers in the broader decision-making model to account for educational inequalities. However, there have been few attempts to connect general models of social stratification in education and the specialised literature on disadvantaged or minority students in higher education. Similarly, the large literature on dropout in higher education, in the wake of Tinto's work (1975), has pointed to crucial factors for dropout behaviours, such

as integration in the tertiary institution, which are largely overlooked by the social stratification literature in higher education. It would be interesting to see whether such processes of social and academic (des)integration mediate the effect of social origin on dropout behaviours, especially after academic failure. Research on inequalities in higher education would undoubtedly benefit from a theoretical model which could build on these different strands of research and integrate some factors which are specific to higher education in order to highlight the micro-mechanisms which allow high SES students to compensate for a negative outcome or capitalize on a positive one, in their tertiary trajectories.

Another limitation of this dissertation lies in the methodological approaches implemented to grasp the development of inequalities in higher education. In Chapter 3, I rely on event-history analysis to rigorously estimate dropout patterns, taking in to account the time dimension and the right-censored nature of longitudinal data. In Chapter 5, I employ recent developments of sequence analyse in order to capture differences in students' trajectories, beyond single transitions, in a holistic approach. But a full account of the development of inequalities in higher education over time is still missing. Generally speaking, capturing the dynamic nature of inequality-generating processes such as cumulative (dis)advantage or the compensatory advantage is far from obvious (DiPrete & Eirich, 2006). In addition, It has been noted that, in higher education, "the complexity of students' pathways makes sound and informative research very difficult to execute" (Bahr, 2013). The traditional approach to model educational attainment as a sequence of discrete transitions (Mare, 1980) relies on a simplification of real trajectories (Hillmert & Jacob, 2010). But the deviations from linear trajectories, such as delay in enrolment, transfer across institutions, stop-out behaviours, are increasingly common in higher education and have been found to be relevant for social stratification (Milesi, 2010). How to integrate these deviations from typical trajectories and the qualitative differences between types of programmes without forgoing efficiency and clarity of the models? In Chapter 3, I have, for example, only distinguished between dropout and graduation as competing events in the course of higher educational careers. However, it would be interesting to distinguish further between stop-out (temporarily leaving higher education) and institutional dropout (leaving one specific institution, with the possibility of re-enrolling in another). In Chapter 5, I have implemented measures of trajectories' complexity and de-standardisation which, I believe, constitute a promising way to capture deviations from the

ideal linear pathway in an efficient way. A fruitful extension of these analyses would be to test the hypotheses of increasing flexibility and diversity of students' trajectories over time and its impact on social stratification. Overall, a careful account of students' progression in higher education would be necessary to improve our understanding of social inequalities in higher education and methodological developments would be beneficial to the study of higher education trajectories and the evolution of inequalities over educational careers.

Finally, I do not address in this dissertation the role of system and institutional characteristics on social inequalities in higher education outcomes. In order to account precisely for the patterns of inequality formation at different points in higher education careers, I have focused on one education system only. I used some results from the U.S. as a meaningful benchmark to interpret some of the results on the French situation, but a comparative approach would be an essential development of this research on social inequalities in higher education. Several aspects of the educational system or institutional characteristics are expected to shape and frame social inequalities in higher education, their size or the mechanisms at play. One crucial aspect is the organisation of secondary education and its performance in terms of differences in academic preparation by social origin. As highlighted by Triventi (2014), "schools contribute to the instruction and previous selection of pupils, whose motivations, aspirations and level of skills partially depend on the way in which secondary education is organised and structured." The social selectivity of higher education is thus likely to vary with the form and level of social selectivity at the previous stages of the educational system. This dimension should undoubtedly be integrated more often in comparisons of higher educational systems. Admission criteria, funding systems, and autonomy of institutions are other characteristics of higher education systems which are expected to play a crucial role on equity in higher education. But cross-national comparisons of higher education systems remain challenging as these policies often vary across higher education institutions within each country. In France, for example, the higher education system combines programmes with modest entrance requirements with programmes with stringent selection based on specific competitive examinations. Similarly, tuition fees and expenditure per student vary dramatically from one public institution to the other (Berné & Métivier, 2015), and an increasing share of students are now attending private institutions. The variation in the effect of parental education and social class on attainment for different types of programmes, highlighted in Chapter 4,

suggests that institutional arrangements may be essential in mediating the effect of social origin on higher education outcomes. Similarly, results on the trajectories of students attaining entry to elite institutions suggest that alternative pathways bring students with a different academic and social profile than the traditional road into these institutions (Chapter 5). Further research on how institutional settings and entrance requirements may moderate or reinforce the effect of social origin on higher education outcomes would thus be necessary.

A greater attention to institutional arrangements would also be needed to improve our conclusions on policy solutions to tackle inequalities in higher education. The systematic review of the (quasi-)experimental literature on outreach and financial aid interventions, in Chapter 6, has highlighted that most of this literature still comes from the United States. New evidence in different educational contexts is undoubtedly needed to draw sound conclusions on the efficiency of these interventions or policies. In the case of outreach interventions, for example, the American higher education system is characterized by long and complicated application processes for both universities and financial aid. It is thus legitimate to wonder whether the large effects found for most of the outreach interventions which rely on counselling and personalised support would be confirmed in countries with different, and simpler, application systems. In addition, a major limit of the literature on financial aid is that the aid amounts are not directly comparable. Beyond problems of currency conversions, the amount of financial aid can only be interpreted in the light of the cost of higher education in the specific country and institutional context. Although some general information on the cost of higher education is usually provided, studies should systematically report the proportion of financial need that is covered by the evaluated grant. I believe that, only with such estimates of the costs covered by financial aid, would a meaningful meta-analysis of the estimated effects of financial aid on higher education outcomes be possible.

Overall, the study of social inequalities in higher education raises many challenges for social stratification research. The diversity of tertiary education programmes and their different organisations, the flexibility offered by existing pathways and the complexity of students' trajectories make it more difficult to precisely account for, and explain, the role of social origin on educational outcomes. There is little doubt, however, that the always growing proportion of individuals reaching this level of education will motivate further research on inequalities

and policy solutions to reduce them. And the complexity of higher education systems and trajectories calls for innovative theoretical and methodological approaches which make its study even more promising and interesting.

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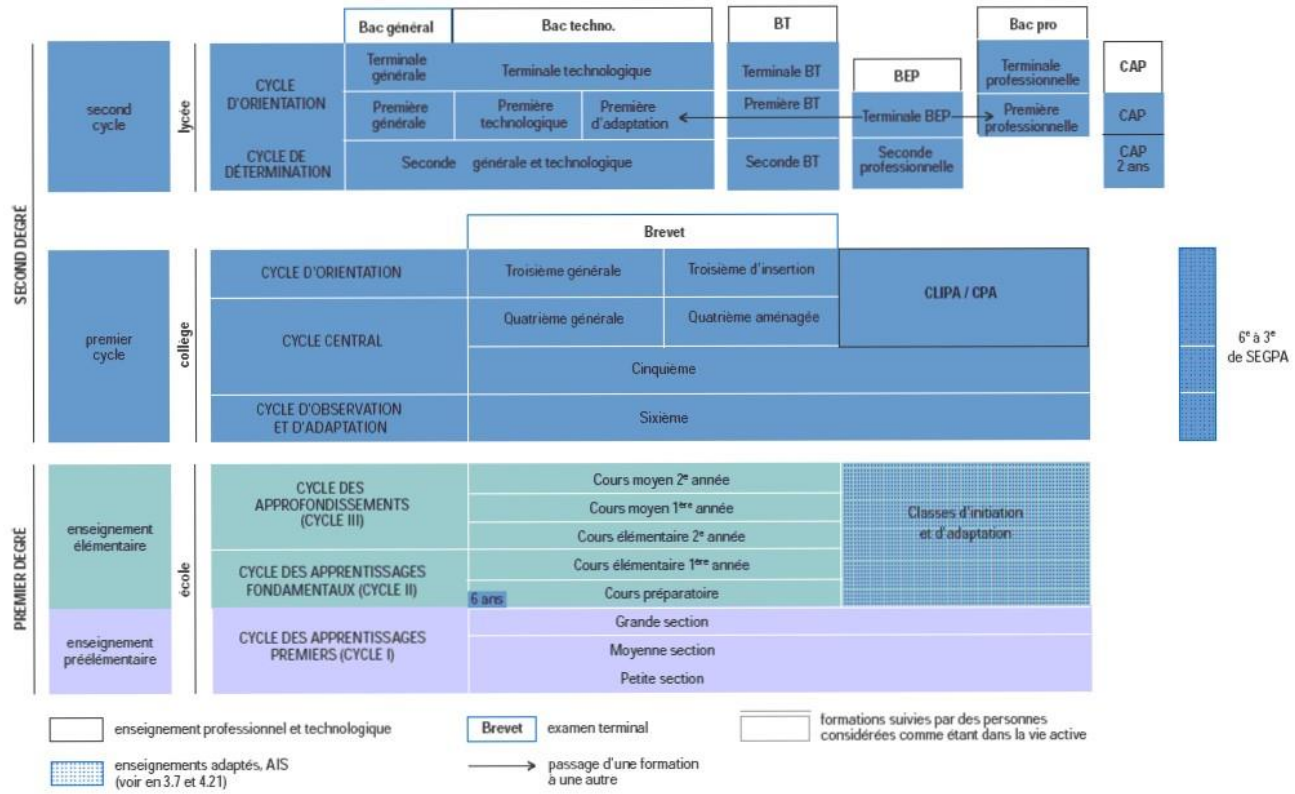
Appendix 2: Additional material for chapter 2

Figure 2.A: Diagram of the French primary and secondary education (prior to 2009 reforms)



Source: International Bureau of Education (2007), world data on education sixth education.

http://www.ibe.unesco.org/sites/default/files/France.pdf

Table 2.A: Association between social origin and access to higher education (logit models)

Average marginal effects

		Access to higher education (unconditional)				High school graduation (eligibility)				Access to higher education conditional on eligibility			
Gender	Male (reference category)												
	Female	0.147***	(0.01)	0.147***	(0.01)	0.136***	(0.01)	0.135***	(0.01)	0.055***	(0.01)	0.054***	(0.01)
Parental education	Lower secondary or less	-0.366***	(0.01)			-0.350***	(0.01)			-0.089***	(0.01)		
	Vocational (CAP/BEP)	-0.296***	(0.01)			-0.259***	(0.01)			-0.098***	(0.01)		
	High school	-0.122***	(0.01)			-0.098***	(0.01)			-0.041***	(0.01)		
	Tertiary (reference category)												
Parental social class	Working class or inactive	-0.278***	(0.02)			-0.220***	(0.02)			-0.124***	(0.01)		
	Intermediate	-0.146***	(0.01)			-0.098***	(0.01)			-0.078***	(0.01)		
	Salariat (reference category)												
Summary of social origin	Less than high school & working class			-0.587***	(0.01)			-0.509***	(0.01)			-0.212***	(0.01)
	Less than high shool & intermediate/salariat			-0.426***	(0.01)			-0.343***	(0.01)			-0.154***	(0.01)
	High school & working class/intermediate			-0.225***	(0.01)			-0.156***	(0.01)			-0.092***	(0.01)
	High school & salariat			-0.162***	(0.02)			-0.112***	(0.02)			-0.063***	(0.02)
	Tertiary & working class/intermediate			-0.137***	(0.01)			-0.082***	(0.01)			-0.065***	(0.01)
	Tertiary & salariat (reference category)												
Constant													
Observations		12,332		12,332		12,332		12,332		8,227		8,227	
Pseudo R2													
Log likelihood													

Source: Panel d'élèves du second degré, recrutement 1995

Robust standard errors in parentheses

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

Table 2.B: Eligibility to higher education by initial performance, robustness with social class

linear probability models

Variables		Model 1: With interaction by parental education & interaction by social class		Model 2 (Main model): With parental education only		Model 3: With interaction of parental education & control of social class	
Gender	Male (reference category)						
	Female	0.080***	(0.01)	0.080***	(0.01)	0.080***	(0.01)
Parental education	Lower secondary or less	-0.192***	(0.02)	-0.251***	(0.02)	-0.201***	(0.02)
	Vocational (CAP/BEP)	-0.170***	(0.02)	-0.215***	(0.02)	-0.182***	(0.02)
	Upper secondary (Bac)	-0.063***	(0.02)	-0.087***	(0.02)	-0.074***	(0.02)
	Tertiary (reference category)						
Parental social class	Working class or inactive	-0.117***	(0.03)			-0.100***	(0.01)
	Intermediate	-0.061***	(0.02)			-0.029***	(0.01)
	Salariat (reference category)						
Position in standardized test in 95	1st tertile	-0.172***	(0.04)	-0.191***	(0.03)	-0.188***	(0.03)
	2nd tertile (reference category)						
	3rd tertile	0.061***	(0.01)	0.090***	(0.01)	0.086***	(0.01)
Interaction: Position in standardized test in 95*parental education	1st tertile*Lower secondary	-0.116**	(0.05)	-0.148***	(0.04)	-0.140***	(0.04)
	1st tertile*Vocational	-0.122***	(0.04)	-0.146***	(0.04)	-0.139***	(0.04)
	1st tertile*Upper secondary	-0.108**	(0.05)	-0.120***	(0.05)	-0.118***	(0.05)
	3rd tertile*Lower secondary	0.095***	(0.03)	0.127***	(0.03)	0.122***	(0.03)
	3rd tertile*Vocational	0.098***	(0.02)	0.128***	(0.02)	0.128***	(0.02)
	3rd tertile*Upper secondary	0.024	(0.02)	0.047**	(0.02)	0.048**	(0.02)
Interaction: Position in standardized test in 95*social class	1st tertile*Working class	-0.051	(0.05)				
	1st tertile*Intermediate	-0.026	(0.04)				
	3rd tertile*Working class	0.044	(0.03)				
	3rd tertile*Intermediate	0.064***	(0.02)				
Constant		0.864***	(0.01)	0.836***	(0.01)	0.850***	(0.01)
Observations		11,176		11,176		11,176	
R-squared		0.293		0.289		0.293	
AIC		10064		10128		10069	
BIC		10203		10223		10179	

Source: Panel d'élèves du second degré, recrutement 1995

Robust standard errors in parentheses

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

Figure 2.B: performance at entrance in secondary education by parental education

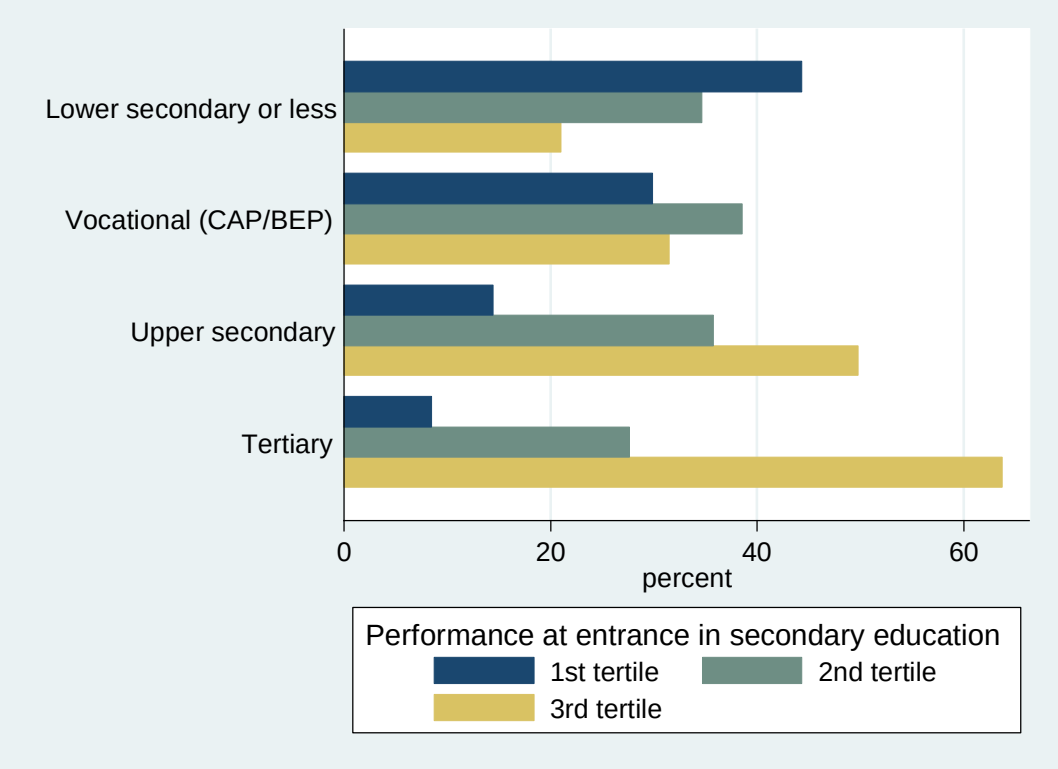


Table 2.C: Predicted probabilities of initial access after high school graduation, conditional on eligibility

From multinomial logit model with interaction between tertile of performance and parental education

Track of high school degree	Performance in high school degree	Parental education	No HE		Vocational		University		Prestigious	
Academic track	First tertile	Lower secondary or less	0.063	[0.046-0.081]	0.215	[0.178-0.252]	0.689	[0.643-0.735]	0.033	[0.011-0.056]
		Vocational (CAP/BEP)	0.123	[0.100-0.146]	0.291	[0.256-0.326]	0.557	[0.516-0.599]	0.028	[0.012-0.045]
		Upper secondary (Bac)	0.107	[0.082-0.132]	0.299	[0.258-0.340]	0.560	[0.513-0.608]	0.034	[0.015-0.052]
		Tertiary (reference category)	0.078	[0.060-0.096]	0.267	[0.235-0.299]	0.595	[0.558-0.632]	0.060	[0.042-0.077]
	Second tertile	Lower secondary or less	0.066	[0.047-0.085]	0.291	[0.240-0.341]	0.600	[0.539-0.660]	0.044	[0.012-0.075]
		Vocational (CAP/BEP)	0.084	[0.066-0.102]	0.322	[0.284-0.360]	0.542	[0.497-0.587]	0.052	[0.028-0.076]
		Upper secondary (Bac)	0.072	[0.052-0.091]	0.287	[0.245-0.329]	0.562	[0.512-0.612]	0.080	[0.049-0.110]
		Tertiary (reference category)	0.052	[0.038-0.066]	0.259	[0.228-0.289]	0.545	[0.508-0.581]	0.145	[0.119-0.170]
	Thrid tertile	Lower secondary or less	0.033	[0.022-0.045]	0.258	[0.205-0.312]	0.553	[0.484-0.621]	0.156	[0.094-0.218]
		Vocational (CAP/BEP)	0.036	[0.026-0.046]	0.267	[0.226-0.307]	0.460	[0.409-0.511]	0.238	[0.188-0.288]
		Upper secondary (Bac)	0.037	[0.025-0.050]	0.218	[0.180-0.256]	0.426	[0.377-0.475]	0.319	[0.270-0.368]
		Tertiary (reference category)	0.027	[0.019-0.035]	0.136	[0.116-0.156]	0.379	[0.349-0.409]	0.458	[0.427-0.488]
Technological track	First tertile	Lower secondary or less	0.156	[0.120-0.192]	0.615	[0.567-0.663]	0.225	[0.186-0.264]	0.004	[0.001-0.007]
		Vocational (CAP/BEP)	0.229	[0.193-0.265]	0.631	[0.592-0.670]	0.137	[0.114-0.160]	0.003	[0.001-0.005]
		Upper secondary (Bac)	0.201	[0.157-0.245]	0.656	[0.608-0.704]	0.140	[0.112-0.167]	0.003	[0.001-0.005]
		Tertiary (reference category)	0.165	[0.128-0.203]	0.661	[0.617-0.705]	0.167	[0.140-0.195]	0.007	[0.004-0.010]
	Second tertile	Lower secondary or less	0.138	[0.105-0.171]	0.700	[0.655-0.745]	0.157	[0.122-0.192]	0.004	[0.001-0.008]
		Vocational (CAP/BEP)	0.160	[0.132-0.188]	0.706	[0.672-0.741]	0.129	[0.106-0.152]	0.005	[0.002-0.008]
		Upper secondary (Bac)	0.151	[0.115-0.187]	0.693	[0.649-0.737]	0.147	[0.118-0.176]	0.008	[0.004-0.013]
		Tertiary (reference category)	0.122	[0.090-0.153]	0.702	[0.662-0.742]	0.160	[0.133-0.186]	0.017	[0.010-0.024]
	Thrid tertile	Lower secondary or less	0.083	[0.059-0.107]	0.735	[0.688-0.781]	0.163	[0.123-0.202]	0.019	[0.008-0.030]
		Vocational (CAP/BEP)	0.088	[0.068-0.108]	0.750	[0.715-0.784]	0.133	[0.106-0.159]	0.030	[0.018-0.041]
		Upper secondary (Bac)	0.104	[0.073-0.135]	0.708	[0.662-0.754]	0.141	[0.110-0.172]	0.047	[0.029-0.064]
		Tertiary (reference category)	0.107	[0.078-0.136]	0.623	[0.578-0.668]	0.175	[0.146-0.204]	0.095	[0.067-0.124]
Vocational track	First tertile	Lower secondary or less	0.650	[0.582-0.718]	0.287	[0.227-0.347]	0.062	[0.040-0.085]	0.000	[-0.000-0.001]
		Vocational (CAP/BEP)	0.742	[0.695-0.789]	0.229	[0.185-0.272]	0.029	[0.019-0.040]	0.000	[-0.000-0.000]
		Upper secondary (Bac)	0.708	[0.646-0.771]	0.259	[0.201-0.317]	0.032	[0.020-0.045]	0.000	[-0.000-0.000]
		Tertiary (reference category)	0.660	[0.592-0.728]	0.295	[0.234-0.357]	0.044	[0.029-0.060]	0.000	[-0.000-0.001]
	Second tertile	Lower secondary or less	0.627	[0.565-0.689]	0.326	[0.269-0.384]	0.046	[0.029-0.063]	0.000	[-0.000-0.001]
		Vocational (CAP/BEP)	0.664	[0.616-0.712]	0.301	[0.256-0.346]	0.035	[0.023-0.046]	0.000	[-0.000-0.001]
		Upper secondary (Bac)	0.651	[0.584-0.718]	0.307	[0.246-0.369]	0.041	[0.026-0.057]	0.000	[-0.000-0.001]
		Tertiary (reference category)	0.595	[0.520-0.669]	0.353	[0.285-0.421]	0.051	[0.033-0.069]	0.001	[-0.001-0.002]
	Thrid tertile	Lower secondary or less	0.503	[0.430-0.575]	0.435	[0.368-0.503]	0.061	[0.039-0.083]	0.001	[-0.001-0.003]
		Vocational (CAP/BEP)	0.517	[0.463-0.572]	0.433	[0.381-0.484]	0.048	[0.033-0.064]	0.001	[-0.001-0.004]
		Upper secondary (Bac)	0.569	[0.487-0.650]	0.381	[0.306-0.456]	0.048	[0.030-0.066]	0.002	[-0.002-0.007]
		Tertiary (reference category)	0.591	[0.515-0.668]	0.343	[0.275-0.411]	0.061	[0.040-0.082]	0.005	[-0.005-0.014]

Source: Panel d'élèves du second degré, recrutement 1995

95% Confidence intervals in brackets

Appendix 3: Additional material for chapter 3

Table 3.A: Estimation results from the discrete-time hazard model

Estimations from multinomial logit models: reference category is non-event

		Model 1								Model 2								Model 3							
		Dropout				Graduation				Dropout				Graduation				Dropout				Graduation			
Variables		Coefficient		Hazard ratio		Coefficient		Hazard ratio		Coefficient		Hazard ratio		Coefficient		Hazard ratio		Coefficient		Hazard ratio		Coefficient		Hazard ratio	
Gender	Male (reference category)																								
	Female	-0.146**	(0.07)	0.864**	(0.06)	-0.088**	(0.04)	0.916**	(0.04)	0.090	(0.08)	1.094	(0.08)	0.028	(0.04)	1.029	(0.05)	0.016	(0.08)	1.016	(0.08)	-0.015	(0.05)	0.985	(0.05)
Social background	Less than HE & less than salariat	1.885***	(0.11)	6.586***	(0.72)	0.856***	(0.05)	2.354***	(0.12)	0.937***	(0.12)	2.553***	(0.30)	0.530***	(0.05)	1.700***	(0.09)	0.821***	(0.12)	2.273***	(0.27)	0.325***	(0.06)	1.384***	(0.09)
	Less than HE but salariat	1.181***	(0.17)	3.258***	(0.57)	0.541***	(0.09)	1.717***	(0.16)	0.468**	(0.18)	1.597**	(0.29)	0.316***	(0.09)	1.372***	(0.13)	0.598***	(0.19)	1.818***	(0.34)	0.110	(0.11)	1.116	(0.12)
	HE but less than salariat	1.016***	(0.14)	2.762***	(0.38)	0.530***	(0.06)	1.698***	(0.11)	0.674***	(0.14)	1.962***	(0.28)	0.416***	(0.07)	1.516***	(0.10)	0.544***	(0.15)	1.723***	(0.25)	0.284***	(0.08)	1.328***	(0.10)
	HE & Salariat (reference category)																								
Age at upper secondary graduation	On time or in advance									-0.424***	(0.09)	0.654***	(0.06)	-0.184**1	(0.06)	0.832***	(0.05)	-0.320**1	(0.09)	0.726***	(0.07)	0.017	(0.06)	1.017	(0.07)
	1 year late (reference category)																								
	2 years late or more									0.079	(0.11)	1.082	(0.12)	-0.149	(0.10)	0.861	(0.08)	0.114	(0.11)	1.120	(0.13)	-0.102	(0.11)	0.903	(0.09)
Track of upper secondary degree	Academic									-1.390***	(0.10)	0.249***	(0.03)	-0.955**1	(0.06)	0.385***	(0.02)	-1.164**1	(0.11)	0.312***	(0.03)	-0.140*	(0.07)	0.869*	(0.06)
	Technological (reference category)																								
	Vocational									1.601***	(0.11)	4.960***	(0.52)	0.330***	(0.09)	1.391***	(0.13)	1.578***	(0.11)	4.845***	(0.53)	-0.097	(0.10)	0.907	(0.09)
Distinction in upper secondary degree	2nd session									0.573***	(0.11)	1.774***	(0.19)	-0.228**1	(0.08)	0.796***	(0.06)	0.485***	(0.11)	1.624***	(0.18)	-0.100	(0.09)	0.905	(0.08)
	No distinction (reference category)																								
	With distinction									-0.858***	(0.09)	0.424***	(0.04)	-0.134**1	(0.05)	0.874***	(0.04)	-0.649**1	(0.09)	0.522***	(0.05)	0.154***	(0.06)	1.167***	(0.07)
Academic outcome in 1st year	Passed (reference category)																								
	Failed																	0.977***	(0.09)	2.656***	(0.23)	-1.395**1	(0.06)	0.248***	(0.02)
Type of HE program-1st year	Professional																	0.473***	(0.11)	1.604***	(0.17)	1.669***	(0.07)	5.305***	(0.37)
	Academic in university (reference)																								
	Academic in prestigious school																	-0.594**1	(0.21)	0.552***	(0.12)	-1.482**1	(0.08)	0.227***	(0.02)
Years	1st year	-4.416***	(0.12)	0.012***	(0.00)	-22.291	(723.16)	0.000	(0.00)	-3.441***	(0.15)	0.032***	(0.00)	-21.393	(666.72)	0.000	(0.00)	-4.128**1	(0.19)	0.016***	(0.00)	-22.112	(476.57)	0.000	(0.00)
	2nd year	-3.375***	(0.12)	0.034***	(0.00)	-0.888***	(0.05)	0.411***	(0.02)	-2.022***	(0.15)	0.132***	(0.02)	0.017	(0.08)	1.018	(0.08)	-2.731**1	(0.18)	0.065***	(0.01)	-1.150**1	(0.11)	0.317***	(0.04)
	3rd year	-3.033***	(0.12)	0.048***	(0.01)	-0.608***	(0.05)	0.544***	(0.03)	-1.233***	(0.15)	0.291***	(0.05)	0.487***	(0.09)	1.627***	(0.14)	-2.024**1	(0.19)	0.132***	(0.02)	0.073	(0.11)	1.075	(0.12)
	4th year	-3.218***	(0.14)	0.040***	(0.01)	-1.160***	(0.07)	0.313***	(0.02)	-1.231***	(0.17)	0.292***	(0.05)	-0.015	(0.10)	0.985	(0.09)	-2.077**1	(0.20)	0.125***	(0.03)	-0.134	(0.12)	0.875	(0.11)
LL		-9200								-8543								-7416							
Number of individuals		5 590								5 590								5 590							

Standard errors in parentheses

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

Table 3.B: Estimation results from the discrete-time hazard model with interaction term between social origin and academic outcome in 1st year

Estimations from multinomial logit models: reference category is non-event

		Model 4								Model 5								Model 6							
		Dropout				Graduation				Dropout				Graduation				Dropout				Graduation			
Variables		Coefficient		Hazard ratio		Coefficient		Hazard ratio		Coefficient		Hazard ratio		Coefficient		Hazard ratio		Coefficient		Hazard ratio		Coefficient		Hazard ratio	
Gender	Male (reference category)																								
	Female	-0.202***	(0.07)	0.817***	(0.06)	-0.041	(0.04)	0.960	(0.04)	0.044	(0.08)	1.045	(0.08)	0.070	(0.05)	1.072	(0.05)	0.014	(0.08)	1.014	(0.08)	-0.017	(0.05)	0.983	(0.05)
Social background	Less than HE & less than salariat	1.961***	(0.17)	7.104***	(1.18)	1.060***	(0.06)	2.885***	(0.17)	0.865***	(0.17)	2.376***	(0.41)	0.680***	(0.06)	1.973***	(0.12)	0.676***	(0.18)	1.966***	(0.35)	0.357***	(0.07)	1.430***	(0.10)
	Less than HE but salariat	1.297***	(0.24)	3.658***	(0.90)	0.524***	(0.10)	1.690***	(0.17)	0.420	(0.26)	1.522	(0.39)	0.226**	(0.11)	1.253**	(0.13)	0.312	(0.26)	1.366	(0.35)	0.067	(0.12)	1.070	(0.12)
	HE but less than salariat	1.150***	(0.21)	3.157***	(0.66)	0.677***	(0.08)	1.968***	(0.15)	0.815***	(0.22)	2.260***	(0.49)	0.551***	(0.08)	1.735***	(0.14)	0.696***	(0.22)	2.005***	(0.44)	0.315***	(0.09)	1.370***	(0.12)
	HE & Salariat (reference category)																								
Age at upper secondary graduation	On time or in advance									-0.393***	(0.09)	0.675***	(0.06)	-0.220***	(0.06)	0.803***	(0.05)	-0.315***	(0.09)	0.730***	(0.07)	0.016	(0.06)	1.016	(0.07)
	1 year late (reference category)																								
	2 years late or more									0.097	(0.11)	1.101	(0.13)	-0.197**	(0.10)	0.821**	(0.08)	0.137	(0.12)	1.146	(0.13)	-0.097	(0.11)	0.907	(0.10)
Track of upper secondary degree	Academic									-1.406***	(0.10)	0.245***	(0.02)	-0.967***	(0.06)	0.380***	(0.02)	-1.166***	(0.11)	0.312***	(0.03)	-0.142**	(0.07)	0.868**	(0.06)
	Technological (reference category)																								
	Vocational									1.709***	(0.11)	5.521***	(0.60)	0.202**	(0.10)	1.224**	(0.12)	1.592***	(0.11)	4.916***	(0.54)	-0.104	(0.10)	0.901	(0.09)
Distinction in upper secondary degree	2nd session									0.464***	(0.11)	1.590***	(0.18)	-0.117	(0.08)	0.890	(0.07)	0.475***	(0.11)	1.608***	(0.18)	-0.097	(0.09)	0.908	(0.08)
	No distinction (reference category)																								
	With distinction									-0.796***	(0.09)	0.451***	(0.04)	-0.280***	(0.05)	0.756***	(0.04)	-0.655***	(0.09)	0.520***	(0.05)	0.154***	(0.06)	1.167***	(0.07)
Academic outcome in 1st year	Passed (reference category)																								
	Failed	1.162***	(0.20)	3.196***	(0.64)	-0.876***	(0.10)	0.416***	(0.04)	0.965***	(0.21)	2.625***	(0.55)	-0.977***	(0.10)	0.376***	(0.04)	0.818***	(0.21)	2.266***	(0.48)	-1.321***	(0.11)	0.267***	(0.03)
Type of HE program-1st year	Professional																	0.479***	(0.11)	1.614***	(0.17)	1.672***	(0.07)	5.323***	(0.37)
	Academic in university (reference)																								
	Academic in prestigious school																	-0.611***	(0.21)	0.543***	(0.12)	-1.473***	(0.08)	0.229***	(0.02)
Interaction : Outcome of 1st year*social background	Failed* No HE & no salariat	-0.298	(0.22)	0.742	(0.16)	-0.611***	(0.13)	0.543***	(0.07)	0.010	(0.23)	1.010	(0.23)	-0.524***	(0.13)	0.592***	(0.08)	0.234	(0.23)	1.264	(0.29)	-0.149	(0.14)	0.861	(0.12)
	Failed*no HE but salariat	-0.044	(0.35)	0.957	(0.34)	-0.207	(0.26)	0.813	(0.21)	0.503	(0.37)	1.654	(0.62)	0.010	(0.27)	1.010	(0.27)	0.643*	(0.37)	1.902*	(0.71)	0.258	(0.28)	1.294	(0.37)
	Failed*HE but no salariat	-0.382	(0.28)	0.682	(0.19)	-0.380**	(0.16)	0.684**	(0.11)	-0.432	(0.29)	0.649	(0.19)	-0.387**	(0.16)	0.679**	(0.11)	-0.286	(0.29)	0.751	(0.22)	-0.106	(0.17)	0.899	(0.16)
	Failed*HE & Salariat (reference)																								
Years	1st year	-4.777***	(0.17)	0.008***	(0.00)	-23.147	(1,126.95)	0.000	(0.00)	-3.777***	(0.19)	0.023***	(0.00)	-20.482	(463.64)	0.000	(0.00)	-4.038***	(0.22)	0.018***	(0.00)	-23.382	(889.24)	0.000	(0.00)
	2nd year	-3.754***	(0.16)	0.023***	(0.00)	-0.817***	(0.05)	0.442***	(0.02)	-2.338***	(0.19)	0.097***	(0.02)	0.248***	(0.08)	1.281***	(0.11)	-2.635***	(0.21)	0.072***	(0.02)	-1.168***	(0.11)	0.311***	(0.04)
	3rd year	-3.627***	(0.17)	0.027***	(0.00)	-0.354***	(0.06)	0.702***	(0.04)	-1.808***	(0.20)	0.164***	(0.03)	0.903***	(0.09)	2.466***	(0.23)	-1.928***	(0.22)	0.145***	(0.03)	0.058	(0.11)	1.060	(0.12)
	4th year	-3.880***	(0.18)	0.021***	(0.00)	-0.829***	(0.07)	0.436***	(0.03)	-1.885***	(0.21)	0.152***	(0.03)	0.484***	(0.10)	1.622***	(0.17)	-1.979***	(0.23)	0.138***	(0.03)	-0.149	(0.12)	0.861	(0.11)
LL		-8764								-8108								-7411							
Number of individuals		5 590								5 590								5 590							

Standard errors in parentheses

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

Table 3.C: Effect of social background on the hazard of dropout, by academic outcome in first year

Contrast of predicted hazards of dropping out based on models with an interaction term between social background and academic outcome in first year of higher education

		Model 4			Model 5			Model 6		
Social background	**Academic outcome in 1st year**	Contrast of predicted margins	S.E.	P>chi2	Contrast of predicted margins	S.E.	P>chi2	Contrast of predicted margins	S.E.	P>chi2
Less than HE but salariat vs no HE & no salariat	Passed	-0,020	0,007	0,005	-0,008	0,006	0,173	-0,008	0,006	0,191
	Failed	-0,049	0,025	0,053	0,003	0,024	0,903	0,002	0,024	0,937
HE but less than salariat vs no HE & no salariat	Passed	-0,027	0,005	0,000	0,000	0,006	0,980	0,001	0,006	0,825
	Failed	-0,094	0,013	0,000	-0,042	0,012	0,001	-0,043	0,012	0,000
HE & Salariat vs no HE & no salariat	Passed	-0,045	0,004	0,000	-0,017	0,004	0,000	-0,015	0,004	0,001
	Failed	-0,135	0,010	0,000	-0,065	0,011	0,000	-0,067	0,010	0,000
Controls										
Gender		YES			YES			YES		
Academic readiness		NO			YES			YES		
Type of HE program-1st year		NO			NO			YES		
Years		YES			YES			YES		
Log Likelihood		-8 764			-8 108			-7 382		

Table 3.D: Effect of social origin on the hazard of dropout for students, by type of academic outcome in first year

Contrast of predicted hazards of dropping out based on models with an interaction term between social background and academic outcome (three categories) in first year of higher education

		Gross interaction			With controls		
Social background	**Academic outcome in 1st year**	Contrast of predicted margins	S.E.	P>chi2	Contrast of predicted margins	S.E.	P>chi2
HE & Salariat vs no HE & no salariat	Pass	-0,045	0,004	0,00	-0,015	0,004	0,001
	Failure	-0,124	0,011	0,00	-0,058	0,011	0,000
	Withdrawal	-0,163	0,023	0,00	-0,100	0,023	0,000
Controls							
Gender		YES			YES		
Academic readiness		NO			YES		
Type of HE program-1st year		NO			YES		
Years		YES			YES		
Log Likelihood		-8 743			-7 399		

Table 3.E: Discrete time hazards of dropout and graduation for students graduating on-time and with distinction from the academic track in high school

Students entering higher education immediately after high school graduation

		Frequency		Hazard		Cumulative probabilities	
Year	Population	Drop-out	Graduation	Drop-out	Graduation	Drop-out	Graduation
1	1672	15	0	0,9%	0%	1%	0%
2	1640	8	351	0,5%	21%	1,4%	21%
3	1282	19	497	1,5%	39%	2,5%	51%
4	774	21	138	2,7%	17,8%	3,8%	59%

Table 3.F: Estimation results from the discrete-time hazard model with interaction term between social origin and academic outcome in 1st year for best students in high school

Estimations from multinomial logit models: reference category is non-event. Students graduating on-time and with distinction from the academic track in high school

		Model 1								Model 2							
		Dropout				Graduation				Dropout				Graduation			
Variables		Coefficient		Hazard ratio		Coefficient		Hazard ratio		Coefficient		Hazard ratio		Coefficient		Hazard ratio	
Gender	Male (reference category)																
	Female	-0.085	(0.264)	0.919	(0.243)	0.355***	(0.081)	1.427***	(0.115)	-0.109	(0.269)	0.897	(0.241)	0.162*	(0.091)	1.176*	(0.107)
Social background	Less than HE & less than salariat	0.602	(0.454)	1.825	(0.830)	0.768***	(0.104)	2.155***	(0.224)	0.480	(0.464)	1.616	(0.750)	0.243**	(0.119)	1.275**	(0.152)
	Less than HE but salariat	-0.305	(1.041)	0.737	(0.767)	0.386**	(0.177)	1.472**	(0.261)	-0.350	(1.042)	0.705	(0.734)	0.240	(0.202)	1.272	(0.256)
	HE but less than salariat	0.714	(0.474)	2.043	(0.968)	0.611***	(0.115)	1.842***	(0.212)	0.659	(0.476)	1.932	(0.921)	0.375***	(0.130)	1.455***	(0.190)
	HE & Salariat (reference category)																
Academic outcome in 1st year	Passed (reference category)																
	Failed	0.618	(0.454)	1.855	(0.843)	0.583***	(0.147)	0.558***	(0.082)	0.574	(0.491)	1.775	(0.872)	1.092***	(0.162)	0.336***	(0.054)
Type of HE program-1st year	Professional									0.500	(0.456)	1.649	(0.751)	2.010***	(0.134)	7.462***	(1.002)
	Academic in university (reference)																
	Academic in prestigious school									-0.149	(0.358)	0.861	(0.309)	1.405***	(0.108)	0.245***	(0.026)
Interaction : Outcome of 1st year*social background	Failed* No HE & no salariat	1.128*	(0.623)	3.091*	(1.925)	0.753***	(0.259)	0.471***	(0.122)	1.206*	(0.626)	3.339*	(2.089)	-0.523*	(0.276)	0.593*	(0.163)
	Failed*no HE but salariat	1.312	(1.319)	3.714	(4.899)	-0.528	(0.502)	0.590	(0.296)	1.292	(1.320)	3.640	(4.804)	-0.830	(0.547)	0.436	(0.239)
	Failed*HE but no salariat	-0.327	(0.780)	0.721	(0.563)	0.844***	(0.301)	0.430***	(0.129)	-0.294	(0.783)	0.745	(0.583)	0.801**	(0.323)	0.449**	(0.145)
	Failed*HE & Salariat (reference)																
Years	1st year	5.336***	(0.386)	0.005***	(0.002)	-20.110	(449.029)	0.000	(0.000)	5.335***	(0.469)	0.005***	(0.002)	-21.739	(826.507)	0.000	(0.000)
	2nd year	5.710***	(0.451)	0.003***	(0.001)	1.732***	(0.093)	0.177***	(0.017)	5.658***	(0.521)	0.003***	(0.002)	1.634***	(0.126)	0.195***	(0.025)
	3rd year	4.396***	(0.362)	0.012***	(0.004)	0.750***	(0.087)	0.472***	(0.041)	4.274***	(0.461)	0.014***	(0.006)	0.105	(0.118)	1.110	(0.131)
	4th year	4.115***	(0.358)	0.016***	(0.006)	1.754***	(0.115)	0.173***	(0.020)	3.989***	(0.460)	0.019***	(0.009)	0.760***	(0.144)	0.468***	(0.068)
LL		-2276								-1956							
Number of individuals		1 672								1 672							

Table 3.G: Estimation results from the discrete-time hazard model: probability of dropout by type of first programme attended

Average marginal effects from multinomial logit models

		Professional						University						Prestigious					
Variables		Model 1		Model 2		Model 3		Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
Gender	Male (reference category)																		
	Female	-0.011*	(0.007)	-0.000	(0.006)	-0.001	(0.006)	-0.013**	(0.006)	-0.004	(0.006)	-0.004	(0.006)	0.008**	(0.004)	0.009**	(0.004)	0.010**	(0.004)
Social background	Less than HE & less than salariat	0.075***	(0.007)	0.038***	(0.008)	0.038***	(0.008)	0.064***	(0.006)	0.035***	(0.007)	0.035***	(0.007)	0.008	(0.006)	0.006	(0.006)	0.007	(0.006)
	Less than HE or salariat	0.030***	(0.008)	0.024**	(0.010)	0.028***	(0.010)	0.026***	(0.007)	0.016**	(0.007)	0.019**	(0.007)	0.005	(0.005)	0.003	(0.005)	0.004	(0.005)
	HE & Salariat (reference category)																		
Age at upper secondary graduation	On time or in advance			-0.009	(0.007)	-0.005	(0.007)			-0.028***	(0.007)	-0.029***	(0.007)			-0.014	(0.011)	-0.015	(0.011)
	1 year late (reference category)																		
	2 years late or more			0.017*	(0.010)	0.017*	(0.009)			0.000	(0.012)	0.004	(0.012)			-0.024**	(0.011)	-0.025**	(0.011)
Track of upper secondary degree	Academic			-0.046***	(0.005)	-0.045***	(0.005)			-0.065***	(0.011)	-0.049***	(0.010)			-0.015	(0.013)	-0.012	(0.011)
	Technological (reference category)																		
	Vocational			0.167***	(0.013)	0.166***	(0.013)			0.159***	(0.037)	0.150***	(0.034)			-0.025*	(0.013)	-0.021*	(0.011)
Distinction in upper secondary degree	2nd session			0.060***	(0.016)	0.048***	(0.015)			0.036***	(0.010)	0.026***	(0.009)			-0.005	(0.014)	-0.003	(0.012)
	No distinction (reference category)																		
	With distinction			-0.043***	(0.007)	-0.040***	(0.006)			-0.029***	(0.006)	-0.027***	(0.006)			-0.007	(0.008)	-0.004	(0.007)
Academic outcome in 1st year	Passed (reference category)																		
	Failed					0.114***	(0.011)					0.052***	(0.005)					0.033**	(0.013)
Years	1st year	Reference		Reference		reference		Reference		Reference		reference		Reference		Reference		reference	
	2nd year	0.041***	(0.007)	0.044***	(0.006)	0.055***	(0.007)	0.001	(0.007)	0.005	(0.007)	0.007	(0.007)	0.005*	(0.003)	0.005*	(0.003)	0.005*	(0.003)
	3rd year	0.124***	(0.014)	0.134***	(0.014)	0.096***	(0.012)	-0.001	(0.008)	0.009	(0.007)	0.010	(0.007)	0.011***	(0.004)	0.011***	(0.004)	0.011***	(0.004)
	4th year	0.163***	(0.030)	0.190***	(0.029)	0.116***	(0.023)	0.012	(0.010)	0.022**	(0.010)	0.015	(0.009)	0.027***	(0.007)	0.028***	(0.008)	0.032***	(0.008)
LL		-3722		-3459		-3260		-3338		-3200		-2986		-885.5		-875.8		-857.2	
Number of individuals		2 856						1 955						779					

Standard errors in parentheses

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

Note: *Given the low frequency of the categories "Less than HE but salariat" and "HE but less than salariat" once the sample is split by type of programmes, they are collapsed into one category "HE or salariat" for these analyses.*

Appendix 4: Additional material for chapter 4

Table 4.A: Attainment in 5th year after high school graduation

Relative risks and average marginal effects from the multinomial logit model: reference category is "No higher education degree"

	No higher education degree			Left with short vocational degree			Left with Bachelor's degree			Still enrolled in first-level program			Attained Master's program			Attained elite program		
Variables	Relative Risk	AME		Relative Risk		AME	Relative Risk		AME	Relative Risk		AME	Relative Risk		AME	Relative Risk		AME
Gender																		
Male (reference category)																		
Female	Reference	-0.046***	(0.01)	0.930	(0.07)	-0.033***	(0.01)	1.600***	(0.15)	0.029***	(0.01)	1.747***	(0.15)	0.055***	(0.01)	1.737***	(0.14)	0.066***	(0.01)	0.764***	(0.06)	-0.071***	(0.01)
Parental education																		
Below higher education	Reference	0.158***	(0.02)	0.992	(0.16)	0.081***	(0.01)	0.699**	(0.12)	0.033***	(0.01)	0.381***	(0.06)	-0.040**	(0.02)	0.312***	(0.04)	-0.083***	(0.02)	0.193***	(0.03)	-0.149***	(0.02)
One parent with higher eduation	Reference	0.050***	(0.02)	1.031	(0.18)	0.029**	(0.01)	1.032	(0.18)	0.029**	(0.01)	0.646***	(0.10)	-0.027*	(0.02)	0.773*	(0.11)	0.005	(0.02)	0.490***	(0.07)	-0.086***	(0.02)
Both parents with higher education (reference category)	Reference																						
Parental social class																		
Working class	Reference	0.088*	(0.05)	0.699	(0.26)	-0.005	(0.04)	0.835	(0.36)	0.011	(0.03)	0.869	(0.31)	0.034	(0.04)	0.612	(0.21)	-0.024	(0.04)	0.355***	(0.13)	-0.104**	(0.04)
Intermediate	Reference	0.041	(0.03)	0.844	(0.24)	-0.001	(0.03)	1.555	(0.50)	0.056***	(0.02)	1.039	(0.27)	0.035	(0.02)	0.661*	(0.16)	-0.041	(0.03)	0.470***	(0.12)	-0.090***	(0.03)
One parent in salariat	Reference	-0.006	(0.03)	1.352	(0.33)	0.042*	(0.02)	1.503	(0.39)	0.032**	(0.01)	1.042	(0.20)	0.006	(0.02)	0.877	(0.16)	-0.025	(0.02)	0.767	(0.13)	-0.048***	(0.02)
Both parents in salariat (reference category)	Reference																						
Parental status (standardized)	Reference	-0.044***	(0.01)	0.958	(0.10)	-0.028***	(0.01)	1.288**	(0.16)	0.007	(0.01)	1.466***	(0.17)	0.027**	(0.01)	1.348***	(0.15)	0.016	(0.01)	1.458***	(0.17)	0.023*	(0.01)
One parent is a teacher																		
No (reference category)	Reference																	
Yes	Reference	0.024	(0.02)	1.072	(0.18)	0.023	(0.02)	0.752	(0.14)	-0.018	(0.01)	0.864	(0.13)	-0.005	(0.01)	0.896	(0.13)	0.002	(0.01)	0.735**	(0.11)	-0.026**	(0.01)
Constant	Reference			0.575**	(0.15)			0.291***	(0.09)			0.829	(0.20)			1.464*	(0.32)			3.217***	(0.73)		
Number of individuals	7,439																						

Source: Enquête sur le devenir des bacheliers - 2008-2012. With survey weights.

Standard errors in parentheses

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

Table 4.B: Attainment in 5th year after high school graduation, with controls for academic readiness

Relative risks and average marginal effects from the multinomial logit model: reference category is "No higher education degree"

Variables		No higher education degree			Left with short vocational degree				Left with Bachelor's degree				Still enrolled in first-level program				Attained Master's program				Attained elite program			
		Relative Risk	AME		Relative Risk		AME		Relative Risk		AME		Relative Risk		AME		Relative Risk		AME		Relative Risk		AME	
Gender	Male (reference category)																							
	Female	Reference	-0.001	(0.01)	0.840**	(0.07)	-0.023***	(0.01)	1.250**	(0.13)	0.024***	(0.01)	1.327***	(0.13)	0.043***	(0.01)	1.102	(0.11)	0.025***	(0.01)	0.540***	(0.06)	-0.069***	(0.01)
Parental education	Below higher education	Reference	0.024	(0.02)	1.208	(0.21)	0.042***	(0.01)	1.145	(0.22)	0.035***	(0.01)	0.656**	(0.11)	-0.027	(0.02)	0.637***	(0.11)	-0.023	(0.01)	0.470***	(0.09)	-0.051***	(0.01)
	One parent with higher eduation	Reference	-0.014	(0.02)	1.152	(0.20)	0.009	(0.01)	1.418*	(0.27)	0.026**	(0.01)	0.916	(0.15)	-0.025*	(0.02)	1.239	(0.20)	0.029**	(0.01)	0.896	(0.16)	-0.025**	(0.01)
	Both parents with higher education (reference category)	Reference																						
Parental social class	Working class	Reference	0.028	(0.04)	0.724	(0.27)	-0.025	(0.04)	1.006	(0.46)	0.013	(0.03)	1.065	(0.42)	0.034	(0.04)	0.865	(0.35)	0.013	(0.04)	0.488	(0.23)	-0.063*	(0.04)
	Intermediate	Reference	0.023	(0.03)	0.788	(0.23)	-0.017	(0.03)	1.517	(0.52)	0.053***	(0.02)	1.011	(0.29)	0.028	(0.02)	0.677	(0.19)	-0.029	(0.03)	0.490**	(0.15)	-0.058**	(0.02)
	One parent in salariat	Reference	-0.024	(0.03)	1.350	(0.33)	0.030	(0.02)	1.602*	(0.43)	0.031**	(0.01)	1.116	(0.24)	0.004	(0.02)	0.976	(0.21)	-0.015	(0.02)	0.881	(0.19)	-0.025*	(0.01)
	Both parents in salariat (reference category)	Reference																						
Parental status (standardized)		Reference	-0.010	(0.01)	0.908	(0.10)	-0.020*	(0.01)	1.130	(0.15)	0.004	(0.01)	1.265*	(0.16)	0.021*	(0.01)	1.114	(0.15)	0.000	(0.01)	1.149	(0.17)	0.003	(0.01)
One parent is a teacher	No (reference category)	Reference																						
	Yes	Reference	0.041**	(0.02)	0.990	(0.17)	0.027	(0.02)	0.616**	(0.12)	-0.019	(0.01)	0.690**	(0.12)	-0.009	(0.01)	0.662**	(0.11)	-0.009	(0.01)	0.520***	(0.09)	-0.030***	(0.01)
Age at upper secondary graduation	On time or in advance (reference category)	Reference																						
	One year or more late	Reference	0.069***	(0.01)	0.707***	(0.06)	-0.003	(0.01)	0.663***	(0.07)	0.000	(0.01)	0.583***	(0.06)	-0.015	(0.01)	0.530***	(0.05)	-0.025**	(0.01)	0.471***	(0.06)	-0.027***	(0.01)
Track of upper secondary degree	Academic Scientific (reference category)	Reference																						
	Academic humanities	Reference	0.130***	(0.02)	0.550***	(0.12)	0.017	(0.01)	0.377***	(0.08)	-0.013	(0.02)	0.429***	(0.07)	0.003	(0.02)	0.492***	(0.08)	0.076***	(0.02)	0.041***	(0.01)	-0.213***	(0.01)
	Academic economics	Reference	0.025*	(0.01)	1.228	(0.23)	0.034***	(0.01)	0.820	(0.14)	0.002	(0.01)	0.609***	(0.09)	-0.050***	(0.01)	1.063	(0.15)	0.087***	(0.02)	0.428***	(0.07)	-0.097***	(0.01)
	Technological	Reference	0.156***	(0.01)	1.442**	(0.22)	0.176***	(0.01)	0.442***	(0.06)	0.023*	(0.01)	0.224***	(0.03)	-0.081***	(0.01)	0.109***	(0.02)	-0.153***	(0.01)	0.126***	(0.02)	-0.121***	(0.01)
	Vocational	Reference	0.572***	(0.02)	0.348***	(0.06)	0.111***	(0.01)	0.028***	(0.01)	-0.088***	(0.01)	0.026***	(0.01)	-0.162***	(0.01)	0.008***	(0.00)	-0.209***	(0.01)	0.004***	(0.00)	-0.225***	(0.01)
Distinction in upper secondary degree	No distinction (reference category)	Reference																						
	Quite good	Reference	-0.134***	(0.01)	2.298***	(0.22)	0.025***	(0.01)	2.546***	(0.30)	0.013	(0.01)	1.876***	(0.21)	-0.042***	(0.01)	3.355***	(0.37)	0.051***	(0.01)	5.870***	(0.75)	0.087***	(0.01)
	Good	Reference	-0.209***	(0.01)	3.431***	(0.64)	-0.011	(0.01)	5.738***	(1.25)	0.007	(0.01)	3.067***	(0.65)	-0.095***	(0.01)	10.542***	(2.14)	0.078***	(0.02)	34.153***	(7.14)	0.230***	(0.02)
	Very good	Reference	-0.183***	(0.04)	1.446	(0.80)	-0.072***	(0.02)	3.588**	(1.96)	-0.025	(0.02)	2.147	(1.11)	-0.114***	(0.02)	6.753***	(3.33)	0.007	(0.02)	53.111***	(25.96)	0.386***	(0.03)
Constant		Reference			0.579*	(0.17)			0.541*	(0.18)			2.368***	(0.66)			2.821***	(0.79)			4.208***	(1.27)		
Number of individuals		7,439																						

Source: Enquête sur le devenir des bacheliers - 2008-2012. With survey weights.

Standard errors in parentheses

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

Table 4.C: Reduction (in %) in the coefficients of gender and social origin due to mediation of high school performance

Decomposition of average marginal effects in direct and indirect effects net of rescaling, using the KHB method

Variables		No higher education	Left with short vocational	Left with Bachelor's	Still enrolled in first level	Attained Master's	Attained Elite
Gender	Female	96,0	45,5	28,8	22,3	65,0	-6,0
Parental education	Below higher education	85,3	49,5	-22,5	29,6	77,3	65,9
	One parent with higher eduation	114,5	70,9	14,7	-8,7	-	71,3
Parental social class	Working class	70,2	-	-50,7	-8,2	126,9	37,5
	Intermediate	56,1	-	3,5	17,8	27,2	35,4
	One parent in salariat	-	20,6	3,1	-	45,3	48,4
Parental status (standardized)		77,2	38,4	-	18,9	104,2	83,4
One parent is a teacher	Yes	-61,0	-22,9	-7,9	-	-	-17,6

Source: Enquête sur le devenir des bacheliers - 2008-2012. High school performance controls include age at graduation, track and distinction. With survey weights.

Note: Only includes the reduction for coefficients which were larger than 1 percentage point in the total effect model (without controls of academic preparation).

Appendix 5: Additional material for chapter 5

Table 5.A: 10 most frequent trajectories among students attaining a grande école

Type of programme/number of semesters	Frequency	Percent
CPGE/4-Grandes écoles/6	301	31.2
CPGE/6-Grandes écoles/4	78	8.1
IUT/4-Grandes écoles/6	62	6.4
Grandes écoles/10	51	5.3
Professional bachelor's/6-Grandes écoles/4	26	2.7
BTS/4-Grandes écoles/6	25	2.6
CPGE/4-Grandes écoles/4 -missing/2	23	2.4
CPGE/2-IUT/4-Grandes écoles/4	18	1.9
BTS/4-Professional bachelor's/4-Grandes écoles/2	13	1.3
CPGE/2-Grandes écoles/8	13	1.3

Source: Enquête sur le devenir des bacheliers - 2008-2012.

Figure 5.A: State distribution, by parental education

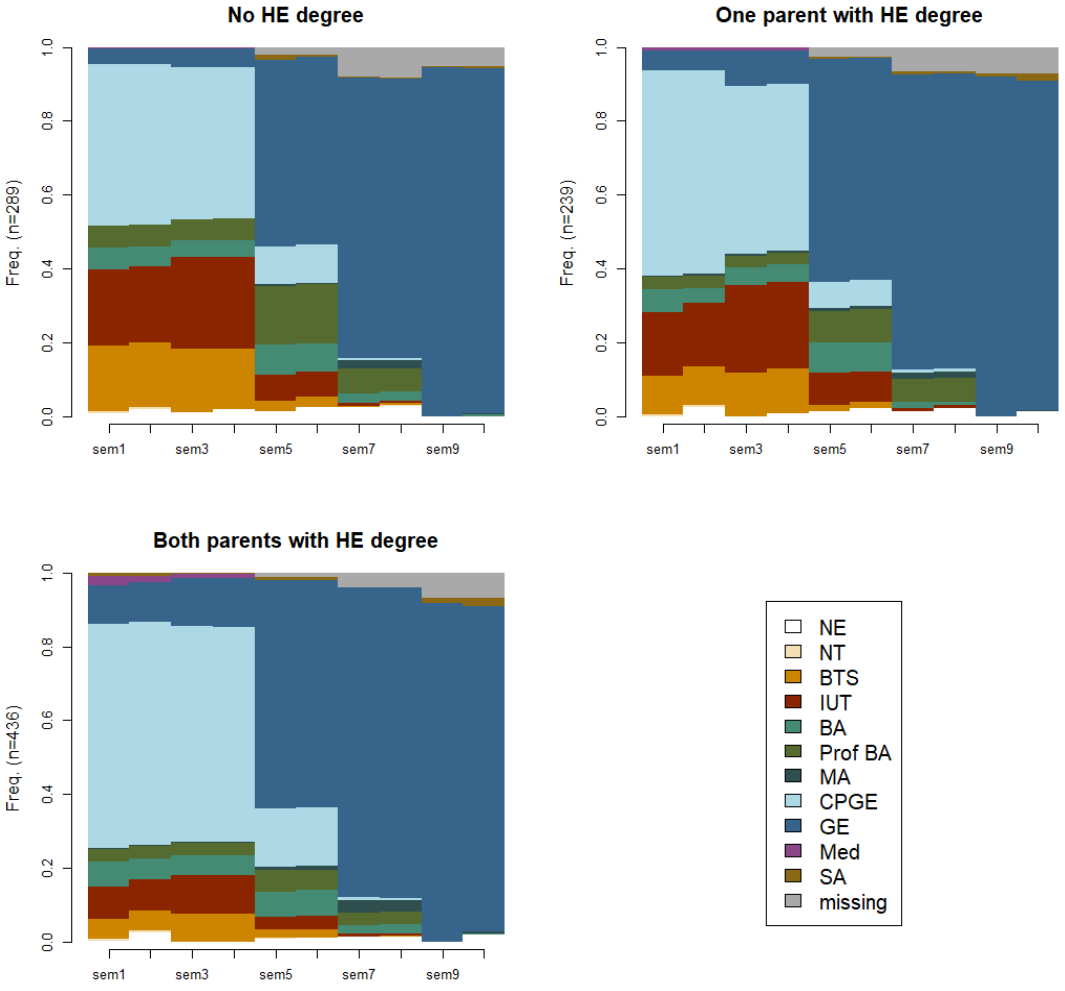


Table 5.B: Average turbulence and distance from typical pathway of grande école students' trajectories, by gender, parental education and parental class

		Turbulence index			LCS distance			
Variables		Mean	95% CI	% difference	Mean	95% CI	% difference	**N**
Gender	Male	0.449	0.440 - 0.457	Ref.	6.156	5.709 - 6.603	Ref.	589
	Female	0.419	0.404 - 0.434	**-7%**	6.827	6.206 - 7.447	-	375
Parental education	Below higher education	0.46	0.450 - 0.470	**10%**	7.571	6.882 - 8.260	**36%**	289
	One parent with higher education	0.445	0.429 - 0.462	-	6.603	5.881 - 7.324	-	239
	Both parents with higher education	0.418	0.404 - 0.431	Ref.	5.55	5.039 - 6.062	Ref.	436
Parental social class	Working class & intermediate	0.467	0.459 - 0.476	**14%**	7.627	7.015 - 8.238	**50%**	386
	One parent in salariat	0.422	0.408 - 0.436	-	5.922	5.381 - 6.464	-	360
	Both parents in salariat	0.409	0.390 - 0.428	Ref.	5.092	4.413 - 5.771	Ref.	218
	All students	**0.437**	**0.429 - 0.445**	**-**	**6.417**	**6.070 - 6.764**	**-**	**964**

Note: bias corrected and accelerated bootstrap confidence intervals reported. Percentage differences calculated with reference category when confidence intervals do not overlap.

Appendix 6: Additional material for chapter 6

Table 6.A: Selected publications for the systematic literature review

Authors	Date	Title	Intervention	Type of publication	Design	Country
Abbiati , Argentin, Barone & Schizzerotto	2017	Information barriers and social stratification in higher education: evidence from a field experiment	Outreach	Journal	RCT	Italy
Alon	2007	The influence of financial aid in leveling group differences in graduating from elite institutions	Financial aid	Journal	IV	United States
Alon	2011	Who Benefits Most from Financial Aid? The Heterogeneous Effect of Need-Based Grants on Students' College Persistence	Financial aid	Journal	IV	United States
Anderson& Goldrick Rab	2016	Aid After Enrollment: Impacts of a Statewide Grant Program at Public Two-year Colleges	Financial aid	Unpublished	RCT	United States
Andrew, Imberman & Lovenheim	2016	Recruiting and Supporting Low-Income, High-Achieving Students at Flagship Universities	Mixed intervention	Unpublished	DiD	United States
Avery	2013	Evaluation of the College Possible program: Results from a randomized controlled trial	Outreach	Unpublished	RCT	United States
Avery	2010	The Effects of College Counseling on High-Achieving, Low-Income Students	Outreach	Unpublished	RCT	United States
Azzolini, Martini, Romano & Vergolini	2018	Affording college with the help of asset building: First experimental impacts from Italy	Financial aid	Journal	RCT	Italy
Barr & Castleman	2017	The Bottom Line on College Counseling	Outreach	Unpublished	RCT	United States
Barrow, Richburg-Hayes, Rouse, & Brock	2014	Paying for Performance: The Education Impacts of a Community College Scholarship Program for Low-Income Adults	Financial aid	Journal	RCT	United States
Baumgartner & Steiner	2006	Does More Generous Student Aid Increase Enrolment Rates into Higher Education? Evaluating the German Student Aid Reform of 2001	Financial aid	Unpublished	DiD	Germany
Bettinger	2015	Need-Based Aid and College Persistence: The Effects of the Ohio College Opportunity Grant	Financial aid	Journal	DiD	United States
Bettinger, Long, Oreopoulos, & Sanbonmatsu	2012	The Role Of Application Assistance And Information In College Decisions: Results From The H&R Block Fafsa Experiment	Outreach	Journal	RCT	United States
Binder, Krause, Miller, & Cerna	2015	Providing Incentives for Timely Progress Toward Earning a College Degree Results from a Performance-Based Scholarship Experiment	Financial aid	Unpublished	RCT	United States

Bird, Castleman, Goodman & Lamberton	2017	Nudging at a National Scale: Experimental Evidence from a FAFSA Completion Campaign	Outreach	Unpublished	RCT	United States
Bonilla, Bottan, & Ham	2017	Information Policies and Higher Education Choices. Experimental Evidence from Colombia	Outreach	Unpublished	RCT	Colombia
Bos et al	2012	The Impacts of SOURCE - A Program to Support College Enrollment through Near-Peer, Low-Cost Student Advising	Outreach	Unpublished	RCT	United States
Bruce & Carruthers	2014	Jackpot? The impact of lottery scholarships on enrollment in Tennessee	Financial aid	Journal	RD	United States
Bulman & Hoxby	2015	The Returns to the Federal Tax Credits for Higher Education	Financial aid	Journal	IV	United States
Carell & Sacerdote	2013	Late interventions matter too: the case of college coaching in New Hampshire	Outreach	Unpublished	RCT	United States
Carruthers & Fox	2016	Aid for all: College coaching, financial aid, and post-secondary persistence in Tennessee	Mixed intervention	Journal	PSM	United States
Carruthers & Ozek	2016	Losing HOPE: Financial aid and the line between college and work	Financial aid	Journal	RD	United States
Castleman & Goodman	2014	Intensive College Counseling and the College Enrollment Choices of Low Income Students	Outreach	Unpublished	RD	United States
Castleman & Long	2013	Looking beyond enrollment: The causal effect of need-based grants on college access, persistence, and graduation	Financial aid	Unpublished	RD	United States
Castleman & Page	2015	Summer Nudging: Can Personalized Text Messages and Peer Mentor Outreach Increase College Going Among Low-Income High School Graduates?	Outreach	Journal	RCT	United States
Castleman & Page	2017	Parental Influences on Postsecondary Decision Making: Evidence From a Text Messaging Experiment	Outreach	Journal	RCT	United States
Castleman, Arnold, & Wartman	2012	Stemming the Tide of Summer Melt	Outreach	Journal	RCT	United States
Castleman, Owen & Page	2015	Stay late or start early? Experimental evidence on the benefits of college matriculation support from high schools versus colleges	Outreach	Journal	RCT	United States
Castleman, Page, & Schooley	2014	The Forgotten Summer: Does the Offer of College Counseling After High School Mitigate Summer Melt Among College-Intending, Low-Income High School Graduates?	Outreach	Journal	RCT	United States
Clotfelter, Hemelt & Ladd	2018	Multifaceted aid for low-income students and college outcomes: evidence from North-Carolina	Financial aid; Mixed intervention	Journal	RD	United States
Cohodes & Goodman	2014	Merit Aid, College Quality, and College Completion: Massachusetts' Adams Scholarship as an In-Kind Subsidy	Financial aid	Journal	RD	United States

Constantine, Seftor, Martin, Silva, & Myers	2006	A Study of the Effect of the Talent Search Program on Secondary and Postsecondary Outcomes in Florida, Indiana and Texas	Outreach	Unpublished	PSM	United States
Cunha, Miller & Weisburst	2018	Information and College Decisions: Evidence From the Texas GO Center Project	Outreach	Journal	DiD	United States
Dearden, Fitzsimmons, Wyness	2014	Money for nothing: Estimating the impact of student aid on participation in higher education	Financial aid	Journal	DiD	United Kingdom
Denning, Marx & Turner	2017	Propelled: the effects of grants on graduation, earnings, and welfare	Financial aid	Unpublished	RD	United States
Denning	2017	College on the Cheap: Consequences of Community College Tuition Reductions	Financial aid	Journal	DiD	United States
Denning	2018	Born Under a Lucky Star: Financial Aid, College Completion, Labor Supply, and Credit Constraints	Financial aid	Journal	RD	United States
Domina	2009	What Works in College Outreach: Assessing Targeted and Schoolwide Interventions for Disadvantaged Students	Outreach	Journal	PSM	United States
Dunlop	2013	What Do Stafford Loans Actually Buy You? The Effect of Stafford Loan Access on Community College Students	Financial aid	Unpublished	IV	United States
Dynarski	2000	Hope for Whom? Financial Aid for the Middle Class and Its Impact on College Attendance	Financial aid	Journal	DiD	United States
Dynarski	2003	Does Aid Matter? Measuring the Effect of Student Aid on College Attendance and Completion	Financial aid	Journal	DiD	United States
Elsayed	2016	The Impact of Education Tax Benefits on College Completion	Financial aid	Journal	PSM	United States
Fack & Grenet	2015	Improving College Access and Success for Low-Income Students: Evidence from a Large Need-Based Grant Program	Financial aid	Journal	RD	France
Ford et al.	2012	Future to Discover: Post-secondary Impacts Report	Outreach; Financial aid; Mixed intervention	Unpublished	RCT	Canada
Ford, Grekou, Kwakye, & Nicholson	2014	Future to Discover: Fourth Year Post-Secondary Impacts Report	Outreach; Financial aid; Mixed intervention	Unpublished	RCT	Canada
Goldrick-Rab, Harris, Kelchen & Benson	2016	Reducing Income Inequality in Educational Attainment: Experimental Evidence on the Impact of Financial Aid on College Completion	Financial aid	Journal	RCT	United States
Gurgand, Lorenceau & Melonio	2011	Student Loans: Liquidity Constraint and Higher Education in South Africa	Financial aid	Unpublished	RD	South Africa

Hahn, Leavitt, & Aaron	1994	Evaluation of the Quantum Opportunities Program (QOP). Did the Program Work?	Mixed intervention	Unpublished	RCT	United States
Hastings, Neilson, & Zimmerman	2015	The effects of Earnings Disclosure on College Enrollment Decisions	Outreach	Unpublished	RCT	Chile
Hoxby & Turner	2013	Expanding college opportunities for high-achieving, low income students.	Outreach	Unpublished	RCT	United States
Jackson	2010	A Little Now for a Lot Later: A Look at a Texas Advanced Placement Incentive Program	Financial aid	Journal	DiD	United States
Kane	2003	A Quasi-Experimental Estimate of the Impact of Financial Aid on College-Going	Financial aid	Unpublished	RD	United States
Kane	1995	Rising Public College Tuition Fees and College Entry. How well do public subsidies promote access to college?	Financial aid	Unpublished	DiD	United States
Kerr, Pekkarinen, Sarvimäki, & Uusitalo	2014	Educational Choice and Information on Labor Market Prospects: A Randomized Field Experiment	Outreach	Unpublished	RCT	Finland
LaLumia	2012	Tax Preferences for Higher Education And Adult College Enrollment	Financial aid	Journal	IV	United States
Linsenmeier, Rosen, & Rouse	2006	Financial Aid Packages and College Enrollment Decisions: An Econometric Case Study	Financial aid	Journal	DiD	United States
Lovenheim & Owens	2014	Does federal financial aid affect college enrollment? Evidence from drug offenders and the Higher Education Act of 1998	Financial aid	Journal	DiD	United States
Loyalka, Song, Wei, Zhong, & Rozelle	2013	Information, college decisions and financial aid: Evidence from a cluster-randomized controlled trial in China	Outreach	Journal	RCT	China
Mayer, Patel, & Gutierrez	2015	Four-Year Effects on Degree Receipt and Employment Outcomes from a Performance-Based Scholarship Program in Ohio	Financial aid	Unpublished	RCT	United States
Myers et al.	2004	The Impacts of Regular Upward Bound: Results from the Third Follow-Up Data Collection	Outreach	Unpublished	RCT	United States
Oreopoulos, Brown, & Lavecchia	2014	Pathways to Education: An Integrated Approach to Helping At-Risk High School Students	Mixed intervention	Unpublished	DiD	Canada
Page, Castleman & Sahadewo	2016	More than Dollars for Scholars: The Impact of the Dell Scholars Program on College Access, Persistence and Degree Attainment	Mixed intervention	Unpublished	RD	United States
Richburg-Hayes et al.	2015	Providing More Cash for College: Interim Findings from the Performance-Based Scholarship Demonstration in California	Financial aid	Unpublished	RCT	United States

Rodríguez-Planas	2012	Longer-Term Impacts of Mentoring, Educational Services, and Learning Incentives: Evidence from a Randomized Trial in the United States	Mixed intervention	Journal	RCT	United States
Rosinger	2016	Can Simplifying Financial Aid Information Impact College Enrollment and Borrowing? Experimental and Quasi-Experimental Evidence	Outreach	Unpublished	RCT	United States
Rubin	2011	The Pell and the Poor: A Regression-Discontinuity Analysis of On-Time College Enrollment	Financial aid	Journal	RD	United States
Scrivener et al.	2015	Doubling graduation rates: Three-year effects of CUNY's Accelerated Study in Associate Programs (ASAP) for developmental education students	Mixed intervention	Unpublished	RCT	United States
Seftor, Mamun, & Schirm	2009	The Impacts of Regular Upward Bound on Postsecondary Outcomes 7-9 Years after Scheduled High School Graduation	Outreach	Unpublished	RCT	United States
Sjoquist & Winters	2015	State Merit-based Financial Aid Programs and College Attainment	Financial aid	Journal	DiD	United States
Solis	2013	Credit access and college enrollment	Financial aid	Unpublished	RD	Chile
Stephan & Rosenbaum	2013	Can High Schools Reduce College Enrollment Gaps With a New Counseling Model?	Outreach	Journal	DiD	United States
Turner & Bound	2003	Closing the Gap or Widening the Divide: The Effects of the G.I. Bill and World War II on the Educational Outcomes of Black Americans	Financial aid	Journal	RD	United States
Vergolini, Zanini, Bazoli, & others	2014	Liquidity Constraints and University Participation in Times of Recession. Evidence from a Small-scale Programme	Financial aid	Unpublished	RD	Italy
Welch	2014	HOPE for community college students: The impact of merit aid on persistence, graduation, and earnings	Financial aid	Journal	RD	United States
Wiederspan	2016	Denying loan access: The student-level consequences when community colleges opt out of the Stafford loan program	Financial aid	Journal	IV	United States
Total	**75 publications**					

RCT: Randomized Control Trial

RD: Regression Discontinuity

DiD: Difference-in-Differences

IV: Instrumental variable

PSM: Propensity Score Matching

Table 6.B1: the impact of outreach programs (any type) on access to postsecondary education

Evaluation Design	Authors (Year)	Intervention (Country)	Location/ Time of evaluation	Details of intervention (duration)	Disadvantaged group (Sample size)	Outcome	Baseline in control group (%)	Estimated effect (p.p.)
PSM	Domina (2009)	College outreach programs (United States)	Nationally representative sample of students/ By 2 years after high school graduation	Any type of outreach programs (?)	Disadvantaged high school students (N=940)	Enrolment (any)	73.9	+5.5
						Enrolment in 4-year institution	44.4	+0.2

Table 6.B2: the impact of "information" outreach programs on access to higher education

Evaluation Design	Authors (Year)	Intervention (Country)	Location/ Time of evaluation	Details of intervention (duration)	Disadvantaged group (Sample size)	Outcome	Baseline in control group (%)	Estimated effect (p.p.)
RCT	Abbiati et al. (2017)	Information intervention (Italy)	Four Italian provinces (Milano, Vicenza, Bologna, Salerno)/ Fall following high school graduation	Detailed and personalized information about: (1) the costs of higher education; (2) the occupational prospects of graduates; (3) the chances of successfully completing specific higher education programmes. (3 meetings during school year)	Senior high school students with low-educated parents (N=1,364)	Enrolment (any)	39.3	-3.2
						Enrolment in “strong" fields of study	7.1	-0.07
					Senior high school students from the working class (N=1,767)	Enrolment (any)	43.2	-0.6
						Enrolment in “strong" fields of study	10.3	0.4

RCT	Bettinger et al. (2012)	H&R Block Fafsa Experiment (United States)	Ohio and North Carolina/ Year following the experiment	Information on financial aid: individualized aid eligibility estimates (one time)	Low-income 17-year-olds whose parents/families received treatment (N=868)	Enrolment (any)	34.2	-0.4
					Low-income young adults, with no prior college (N=9,228)	Enrolment (any)	9.5	+0.3
					Low-income young adults, with some prior college (N=6,646)	Enrolment (any)	26.3	+1.3
RCT	Bird et al. (2017)	Information-only financial aid nudge campaign (United States)	National/ Fall following high school graduation	Messages with information on financial benefits of FASFA completion, making salient the monetary gains (2-4 emails and 5 text messages)	First-generation college-intending high school seniors (N=32,079)	Enrolment (any)	81.7	+0.8
						Enrolment at 2-year institution	12	+0.8
						Enrolment at 4-year institution	69.7	+0.08
RCT	Bonilla, Bottan, & Ham (2017)	Information presentation (Colombia)	Bogota/ Year following the experiment	Presentation by college graduates with information on returns to higher education, financial aid and admission criteria	Low-income high school seniors in public schools (N=6,003)	Enrolment (any)	44.8[a]	+0.6
						Enrolment in academic degree	9.6[a]	+2.4
RCT	Hastings, Neilson & Zimmerman (2015)	Disclosure of information on costs and returns (Chile)	National/ By one year after treatment	Consultation of web pages including information on costs and returns of different tertiary programs (one time)	Low-SES High school graduates applying to federal student loan (N=16,594)	Enrolment (any)	77[a]	0.0

RCT & DiD	Kerr et al (2014)	Information campaign on the returns to education (Finland)	National sample of schools/ One year after treatment	PowerPoint presentation with information on the returns to education (45 minutes)	High school seniors from low-educated districts -Males	Enrolment (any)	?	-1.0
					High school seniors from low-educated districts -Females	Enrolment (any)	?	+0.8
RCT	Loyalka et al (2013)	Information campaign on college costs and financial aid (China)	Shaanxi/ 8 months after treatment	Information on college costs and financial aid through a booklet and an oral presentation (20 minutes)	High school seniors in the poorest counties (N=2,256)	Enrolment (any)	53	+8**
RCT	Rosinger (2015)	Information in financial aid award notifications (United States)	One public university/ Immediately after treatment	Inclusion of a shopping sheet in the online financial aid award notification, providing personalized information about costs and loan options.	Pell-eligible students admitted to the university (N=2,471)	Institutional enrolment (yield rate)	48[a]	-4.1[b]

a: Refers to the whole control group, not specific to disadvantaged students.

b: Own calculations based on interaction terms.

Estimates plotted in figure 6.2

Table 6.B3: the impact of "information and guidance" outreach programs on access to higher education

RCT	Avery (2010)	Individualized college counselling (United States)	New York/ ?	Individualized advice on the choice of college application, completion of college application, financial aid and college choice (10 hours over school year)	High-Achieving, Low-Income high school seniors (N=106)	Enrolment in most competitive institutions	~42	+7.9
RCT	Barr & Castleman (2017)	Bottom Line college advising model (United States)	Boston/ Fall after high school graduation	Individualized counselling providing comprehensive college and financial aid support (One-hour individual meeting per month)	Low-income, first-generation junior or senior high school students with minimum GPA of 2.5	Enrolment (any)	82.7	+7.0***
						Enrolment at 2-year institution	70.3	+10.3***
						Enrolment at 4-year institution	12.7	-3.4**
RCT	Bettinger et al. (2012)	H&R Block Fafsa Experiment (United States)	Ohio and North Carolina/ Year following the experiment	Information on financial aid & Simplification/assistance with financial aid application (one time)	Low-income 17-year-olds whose parents/families received treatment (N=788)	Enrolment (any)	34.2	+8.1**
						Enrolment at 2-year institution	17.6	+4.7*
						Enrolment at 4-year institution	15.8	+3.7
					Low-income young adults, with no prior college (N= 8,506)	Enrolment (any)	9.5	+1.5**
						Enrolment at 2-year institution	6,2	+0.8
						Enrolment at 4-year institution	3,1	+0.5

					Low-income young adults, with some prior college (N=6,646)	Enrolment (any)	26.3	-0.3
RCT	Bird et al. (2017)	Information-only financial aid nudge campaign (United States)	National/ Fall following high school graduation	Messages with planning prompts for FASFA completion, with focus on logistics and step-by-step guidance for completion (2-4 emails and 5 text messages)	First-generation college-intending high school seniors (N=32,079)	Enrolment (any)	81.7	+1.7**
						Enrolment at 2-year institution	12	+1.2*
						Enrolment at 4-year institution	69.7	+0.45
RCT	Bos et al. (2012)	Student Outreach for College Enrollment (SOURCE) program (United States)	Los Angeles, California/ 18 months after high school graduation	Outreach from advisors to support, counsel, and oversee the college and financial aid identification, application, and admission process (over one year)	Junior high school students whose primary language is Spanish (N=1,129)	Enrolment at 4-year institution	40.4	+10.6***
					Junior high school students whose parents did not attend college (N=2,037)	Enrolment at 4-year institution	49.3	+6.1***
RCT	Carell & Sacerdote (2013)	Mentoring program with financial incentives (United States)	New Hampshire	Weekly meetings to help completing FASFA and college applications with financial incentives: application fee waivers and a $100 cash bonus for completing the process (over one month)	Non-white high school seniors (N=419)	Enrolment (any)	51.8[a]	+17.1***[b]
						Enrolment at 4-year institution	22.7[a]	+15.4***[b]
					Low-income high school seniors (N=419)	Enrolment (any)	51.8[a]	+20.2**[b]
						Enrolment at 4-year institution	22.7[a]	+17.3**[b]

RCT	Castleman & Page (2015)	Outreach during summer after high school graduation (United States)	Dallas, Boston, Lawrence & Springfield, Philadelphia/ Fall after high school graduation	Text messaging campaign reminding students of tasks required by intended college and to connect them with counsellor-based support (10 texts sent over the summer)	Low-income college-intending high school graduates (N=5,753)	Enrolment (any)	69.6	+1.9
						Enrolment at 2-year institution	20.2	+3**
						Enrolment at 4-year institution	38.6	-1.8
				Peer-mentor interventions with proactive outreach during summer (over 2 months)	Low-income college-intending high school graduates (N=3,276)	Enrolment (any)	67.6	+2.3
						Enrolment at 2-year institution	14.2	-0.4
						Enrolment at 4-year institution	38.8	+4.5*
RCT	Castleman & Page (2017)	Outreach during summer after high school graduation (United States)	Massachusetts and Florida/ Fall after high school graduation	Text messaging campaign reminding students of tasks required for college enrolment and offering help from counsellors. Texts sent to students or to both students and parents. (14 texts sent over the summer)	Low-income college-intending high school graduates (N=2,010)	Enrolment (any)	66.4	+5.7***
						Enrolment at 2-year institution	24.3	+5.1**
						Enrolment at 4-year institution	42.1	+0.5
					First-generation college-intending high school graduates (N=1,448)	Enrolment (any)	63.8	+4.5*
						Enrolment at 2-year institution	20.8	-0.3
						Enrolment at 4-year institution	42.9	+4.8*

RCT	Castleman, Arnold and Wartman (2012)	Summer individualized counseling (United States)	Providence, Rhode Island/ Fall after high school graduation	Proactive outreach from counsellors during the summer focusing on financial aid package, information barriers & social/emotional barriers to enrolment (over 2 months)	All graduates from high schools with predominantly non-white and low-income students (N=162)	Enrolment (any)	?	+13*
						Enrolment at 2-year institution	?	-4
						Enrolment at 4-year institution	26	+14*
RCT	Castleman, Owen & Page (2015)	Summer college matriculation support (United States)	University of New Mexico, Albuquerque/ Fall after high school graduation	Proactive outreach from a high school- or college-based counsellor, during the summer, focusing on help to complete required summer tasks (financial aid, loan options, procedural tasks...) (over 2 months)	Hispanic high school graduates admitted to university -Males (N=290)	Enrolment (any)	84	+9.5**
					Hispanic high school graduates admitted to university-Females (N=513)	Enrolment (any)	93	-1.1
RCT	Castleman, Page & Schooley (2014)	Summer counseling intervention (United States)	Boston (MA)/ Fall after high school graduation	Proactive outreach from counsellors during the summer with information on college affordability, enrolment process and social barriers (2 months)	Lowest-income college-intending high school graduates (N=487)	Enrolment (any)	76.3	+12.3***
			Fulton County (GA)/ Fall after high school graduation	Proactive outreach from counsellors during the summer (2 months)	Lowest-income college-intending high school graduates (N=586)	Enrolment (any)	63.4	+8.5*

RCT	Ford et al. (2012)	Explore Your Horizons program (Canada)	Manitoba/ 2 years after high school graduation	After-school project activities with enhanced career education and focused information on post-secondary studies. (40 hours over 3-year period)	Low-income and first-generation high school students (from 10th grade) (N=873)	Enrolment (any)	53.7	+9.4
						Enrolment at college (short)	17.4	+11.4*
						Enrolment at university	33.8	+0.8
RCT	Ford et al. (2014)	Explore Your Horizons program (Canada)	New Brunswick/ 4 years after high school graduation	After-school project activities with enhanced career education and focused information on post-secondary studies. (40 hours over 3-year period)	Low-income and first-generation high school students (from 10th grade) (N=1,033)	Enrolment (any)	38.5	+10.1***
						Enrolment in college (short)	21.8	+1.5
						Enrolment at university	18.2	+7.7***
RCT	Hoxby & Turner (2013)	ECO Comprehensive Intervention (United States)	National level/ One year after high school graduation	Materials sent by mail combining Application Guidance, Net cost information in selective colleges, and Fee Waiver to apply to selective colleges	High-performing low-income high school seniors (N=6,000)	Enrolment in a "peer college": matching students' score	28.6	+5.3**
RD+IV	Castleman & Goodman (2014)	"Bottom Line" (United States)	Boston and Worcester, Massachusetts/ Fall after high school graduation	Outreach during senior year to encourage students to apply to a set of target colleges: regular meetings with a counsellor to help navigate the college application process (Over one year)	Low-income college-ready students in senior year of high school (N=2,881)	Enrolment at 2-year institution	29	-35,5**
						Enrolment at 4-year institution	50	+17.3

PSM	Constantine et al. (2006)	Talent search program (United States)	Texas/ 4, 5 or 6 years after 9th grade	Information about college, financial aid, assistance for financial aid applications and college application process (nearly half of Talent Search participants received 10 hours per year of services or fewer)	Primarily targeting low-income, potentially first-generation students in high school (from 9th Grade) (N=34,346)	Enrolment (any public institution)	40	+18***
						Enrolment at 2-year public institution	26	+12***
						Enrolment at 4-year public institution	19	+8***
			Indiana/ 4 or 5 years after 9th grade	Idem	Idem (N=10,927)	Enrolment (any)	52	+4***
						Enrolment at 2-year institution	13	+3***
						Enrolment at 4-year institution	32	+3***
			Florida/ 4 or 5 years after 9th grade	Idem	Idem (N=14,721)	Enrolment (any public institution)	36	+15**
						Enrolment at 2-year public institution	29	+10**
						Enrolment at 4-year public institution	9	+5**

DiD+PSM	Cunha, Miller & Weisburst (2018)	GO Center Project (United States)	Texas/ One year after high school graduation	A dedicated classroom for the college application process with a full-time counsellor and active outreach run by selected student peers	Low-income high school students in selected schools (N=43,230)	Enrolment (any)	67[a]	+3.5**
						Enrolment at 2-year institution	?	+1.8*
						Enrolment at 4-year institution	?	+2.2*
DiD	Stephan & Rosenbaum (2013)	College coach program (United States)	Chicago/ Fall after high school graduation	One coach per high school to provide help in completion of FAFSA, scholarship, and college applications (Over one year)	Disadvantaged High school seniors (primarily African American, Latino and low-income) (N=35,777)	Enrolment (any)	53	+3* (calculated from OR)
						Enrolment at 2 year-institution	20	+1.3 (calculated from OR)
						Enrolment at less selective 4-year institution vs. 2-year	24	+4.1** (calculated from OR)

a: Refers to the whole control group, not specific to disadvantaged students.

b: Own calculations based on interaction terms.

Estimates plotted in figure 6.2

Table 6.B4: the impact of "information, guidance and academic tutoring" outreach programs on access to higher education

Evaluation Design	Authors (Year)	Intervention (Country)	Location/ Time of evaluation	Details of intervention (duration)	Disadvantaged group (Sample size)	Outcome	Baseline in control group (%)	Estimated effect (p.p.)
RCT	Avery (2013)	College Possible Program (United States)	St Paul(MN)/ Fall after high school graduation	After-school curriculum with -Extensive tutoring with test preparation services & -College admissions and financial aid consulting, guidance in the transition to college (320 hours over 2 years)	High school students mostly of colour with below median family income and GPA > 2.0 (from 11th grade) (N=238)	Enrolment (any)	63.8	+1.7
						Enrolment at 4-year institution	34.4	+15.1**
RCT	Myers et al. (2004)	Upward Bound program (United States)	National sample of schools/ by 2 to 4 years after expected high school graduation	Vary but always academic tutoring, preparation for college entrance exams, cultural activities and information on financial aid (average of 477 sessions attended over 21 months)	Low -income or first-generation high school students (from 9th or 10th grade) (N=2,292)	Enrolment (any)	71	+3
						Enrolment at 2-year institution	24	-5
						Enrolment at 4-year institution	44	+6**
RCT	Seftor, Mamun & Schirm (2009)	Upward Bound program (United States)	National sample of schools/ by 7 to 9 years after expected high school graduation	Vary but always academic tutoring, preparation for college entrance exams, cultural activities and information on financial aid (average of 477 sessions attended over 21 months)	Low -income or first-generation high school students (from 9th or 10th grade) (N=2,102)	Enrolment (any)	79.1	+1.5
						Enrolment at 2-year institution	22.4	-2.9
						Enrolment at 4-year institution	51.9	+1.3

Table 6.B5: The impact of outreach programs on graduation in higher education

Evaluation Design	Authors (Year)	Intervention (Country)	Location/ Time of evaluation	Details of intervention (duration)	Disadvantaged group (Sample size)	Outcome	Baseline in control group (%)	Estimated effect (p.p.)
RCT	Ford et al (2014)	Explore Your Horizons program (Canada)	New Brunswick/ 4 years after high school graduation	After-school project activities with enhanced career education and focused information on post-secondary studies. (40 hours over 3-year period)	Low-income and first-generation high school students-from 10th grade (N=1,033)	Any post-secondary degree (by 4 years)	12.5	+1.2
RCT	Seftor, Mamun & Schirm (2009)	Upward Bound program (United States)	National sample of schools/ by 7 to 9 years after expected high school graduation	Vary but always academic tutoring, preparation for college entrance exams, cultural activities and information on financial aid (average of 477 academic and activity sessions attended over 21 months)	Low -income or first-generation high school students-from 9th or 10th grade (N=1,724)	Any post-secondary degree	34.8	+2.26
						Associate degree	9.1	-2.18
						Bachelor's degree	21.6	0.14
PSM	Constantine et al. (2006)	Talent search program (United States)	Florida/ by 4 years after end of intervention	Information about college, financial aid, assistance for financial aid applications and college application process (nearly half of Talent Search participants received 10 hours per year of services or fewer)	Primarily targeting low-income, potentially first-generation students in high school-from 9th Grade (N=14,721)	Associate degree (by 8 years)	8	+5***

DiD+PSM	Cunha, Miller & Weisburst (2018)	GO Center Project (United States)	Texas/ by 8 years after high school graduation	A dedicated classroom for the college application process with a full-time counsellor and active outreach run by selected student peers	Low-income high school students in selected schools (N=43,230)	Any post-secondary degree (by 8 years)	21.7[a]	-1.5
						Associate degree (by 8 years)	7.5[a]	-0.6
						Bachelor's degree (by 8 years)	13[a]	+0.8

a: Refers to the whole control group, not specific to disadvantaged students.

Table 6.C1: The effect of universal financial aid on access to higher education

Evaluation Design	Authors (Year)	Program (Country)	Details of program	Disadvantaged group (Sample size)	Outcome	Baseline in control group (%)	Estimated effect (p.p.)
DiD	Denning (2017)	Community College Tuition Reductions, Texas (United States)	Discount in tuition fees in community colleges based on residency: Annexion of municipalities making residents eligible for reduced tuition at a community college (in-district tuition); community colleges in Texas charged 63 percent more, on average, to out-of-district students relative to in-district students	Economically disadvantaged high school graduates (N=204,448)	Enrolment at community college	27[a]	+5.2***[b]
					Enrolment at 4-year institution	25[a]	-3.1[b]
				Black high school graduates (N=204,448)	Enrolment at community college	27[a]	+4.8***[b]
					Enrolment at 4-year institution	25[a]	-3.4***[b]

a: Refers to the whole control group, not specific to disadvantaged students.

b: Own calculations based on interaction terms.

Table 6.C2: The effect of need-based financial aid on access to higher education

Evaluation Design	Authors (Year)	Program (Country)	Details of program	Disadvantaged group (Sample size)	Outcome	Baseline in control group (%)	Estimated effect (p.p.)
RCT	Azzolini et al (2018)	ACHAB experiment (Italy)	Dedicated savings account for high school students with compulsory savings between 5-50€/month and deposits matched at a rate of 4 to 1. Maximum savings of €2,000 matched for a maximum of €8,000. Money could be spent only on education-related expenses	Low-income high school students (last 2 years) (N=716)	Enrolment (any)	67.1	+8.7***
RCT	Ford et al. (2014)	New Brunswick Learning Accounts (Canada)	Annual grant of CAN$4,000 for maximum two years, with early commitment (deposited while student is in high school and provided conditional on high school completion)	Low-income and first-generation high school students-from 10th grade (N=1,145)	Enrolment (any)	38.6	+10.7***
					Enrolment at college (short)	21.6	+9.8***
					Enrolment at university	17.9	+0.9
RCT	Richburg-Hayes et al (2015)	California Cash for College (CFC) (United States)	One-time scholarship of $1,000 for enrolling in postsecondary education	Low-income high school seniors (N=3,560)	Enrolment (any)	84.4	+3.5
					Enrolment at 2-year institution	43.2	+5.2*
					Enrolment at 4-year institution	42.8	-2.9
DiD	Baumgartner & Steiner (2006)	BaFöG (Germany)	Increase in federal need-based aid by roughly 10 percent (on average 45€ more per month)	Low-income high school graduates (N=456)	Enrolment at university	64	+1.5
DiD	Bettinger (2015)	Ohio College Opportunity Grant (United States)	Increase of about $750 in total grant aid	Low-income first-year students in public institutions (N=83,259)	Enrolment at 4-year institution	?	+1.5***

RD	Castleman & Long (2013)	Florida Student Access Grant (United States)	An additional $1,300 in grant aid (in 2000 dollars), yearly renewable	Low-income high school graduates (N=6,917)	Enrolment (any)	61	+3.2
					Enrolment at 2-year public institution	34	+0.1
					Enrolment at 4-year public institution	26	+3.2*
DiD	Dearden, Fitzsimmons, Wyness (2014)	Maintenance grants (United Kingdom)	Implementation of a grant of £960 on average (in 2006 prices)	Low-income 18-19-year olds (N=11,286)	Enrolment (any)	15.5	+3.8**
RD+IV	Denning, Marx & Turner (2017)	Maximum Pell grants (United States)	An additional $1,000 in first year grant aid due to eligibility to maximum Pell grant	Lowest-income university entrants (EFC=0) (N=36,697)	Enrolment at 4-year public institution	76	+0.4
DiD	Dynarski (2003)	Social Security Student Benefit Program (United States)	Annual renewable grant of $6,700 on average (in 2000 dollars)	High school seniors with father deceased during childhood (more likely to be low-income and/or black) (N=3,986)	Enrolment (any, by age 23)	35.2	+21.9*
RD	Fack & Grenet (2015)	Bourses sur Critères Sociaux (France)	Fee waiver for public university fees, averaging €174 per year for undergraduate students	Low-income grant applicants (N=50,388)	Enrolment (any)	77.3	+0.3
			Annual cash allowances of €1500, in addition to fee waivers	Low-income grant applicants	Enrolment (any) (N=194,513)	78.6	+2.7***
					Enrolment in 1st year (N=16, 467)	73.4	+4.9***

DiD	Kane (1995)	Federal Pell grant (United States)	Annual renewable grant of maximum $3,544 (in 1991 dollars)	Black 18-19-year-old females (N=12,163)	Enrolment (any)	?	-1.5
					Enrolment at 2-year public institution	?	+1.2
				Lowest income quartile 18-19-year-old females (N=12,163)	Enrolment (any)	?	+0.5
					Enrolment at 2-year public institution	?	+2.4
DiD	Linsenmeier et al. (2006)	Institutional grant, replacing loan (United States)	University grant of about $4,000, replacing a loan of the same amount	Admitted low-income students (N=13,701)	Institutional enrolment (yield rate)	51.9	+2.0
				Admitted minority low-income students (N=3,523)	Institutional enrolment (yield rate)	47.1	+8.9
DiD	Lovenheim & Owens (2014)	Ineligibility of federal financial aid (United States)	Ineligibility for federal financial aid due to HEA98 for up to two years	Convicted drug offenders (majority of disadvantaged males) (N=7, 401)	Enrolment (any, by two years)	35.8	-22**
					Enrolment (any, ever enrolled)	40.1	-8
RD	Rubin (2011)	Federal Pell grant (United States)	Pell grant around the eligibility threshold (average $400)	Low-income high school graduates	Enrolment (any, on-time)	86[a]	-1.35 (logit estimates)

a: Refers to the whole control group, not specific to disadvantaged students.

Estimates plotted in figure 6.3

Table 6.C3: The effect of merit-based financial aid on access to higher education

Evaluation Design	Authors (Year)	Program (Country)	Details of program	Disadvantaged group (Sample size)	Outcome	Baseline in control group (%)	Estimated effect (p.p.)
RD	Bruce & Carruthers (2014)	HOPE-scholarship, Tennessee (United States)	Annual grant of max $3.000 (for 2-year colleges) or max $6.000 (for 4-year colleges) to cover tuition -Students must submit FAFSA to receive HOPE (but do not have to be eligible) -Eligibility with near-average high school GPA and ACT scores	Pell-grant eligible high school graduates (N=17,145)	Enrolment (any)	85.9[a]	-0.0
					Enrolment at 2-year public institution	28.5[a]	-2.9**
					Enrolment at 4-year public institution	42.3[a]	+2.4**
				Non-white high school graduates (N=10,609)	Enrolment (any)	85.9[a]	-2.6**
					Enrolment at 2-year public institution	28.5[a]	-2.8*
					Enrolment at 4-year public institution	42.3[a]	+1.1
RD	Cohodes & Goodman (2014)	Adams Scholarship, Massachusetts (United States)	Between $910-$1714 in annual renewable tuition aid (roughly a 20% reduction in costs) -Not need-based -Eligibility with top 25% score in own school district in 10th grade (MCAS test)	Non-white high school seniors (N=88,152)	Enrolment at 4-year institution	71.6[a]	+6.3***
				Low-income high school seniors (N=88,152)	Enrolment at 4-year institution	71.6[a]	+3.7**

DiD	Dynarski (2000)	HOPE-scholarship, Georgia (United States)	Tuition and fee waiver, averaging $1900 per year but amount offset by other aids received (not cumulative with Pell) -Not need-based but application differs by parental income (easier for middle/high-income) -Eligibility with at least a 3.0 GPA (B) in high school graduation -Renewable conditional on maintaining a 3.0 GPA (B) in college	Low-income 18-19-year-olds (N=3,380)	Enrolment (any)	30[a]	-1.4
				Black 18-19-year-olds (N=1,837)	Enrolment (any)	30[a]	-2.7
RD	Kane (2003)	Cal Grant, California (United States)	Fee subsidy of maximum $9,036 - $9,420 per year -Need-based: income and assets below specific limits - Minimum high school GPA around 3.1	17-20-year-old grant low-income applicants (N=5,558)	Enrolment (any)	~87	+4.2**
DiD	Sjoquist & Winters (2015)	State-wide merit aid programs, (United States)	Strong merit aid - defined as not having too restrictive eligibility requirements and providing relatively large awards	Non-White or Hispanic men	Enrolment (any)	63.5[a]	-1.99***
				Non-White or Hispanic Women	Enrolment (any)	63.5[a]	-0.97
RD	Vergolini, Zanini & Bazoli (2014)	Trento 5B grant (Italy)	Annual grant of €1,200-€4,800 -Need-based -Final grade in high school above 93/100	Low-income, high performing students (N=5,535)	University enrolment	~70[a]	+6.5

a: Refers to the whole control group, not specific to disadvantaged students.

Estimates plotted in figure 6.3

Table 6.C4: The effect of performance-based financial aid on access to higher education

Evaluation Design	Authors (Year)	Program (Country)	Details of program	Disadvantaged group (Sample size)	Outcome	Baseline in control group (%)	Estimated effect (p.p.)
RCT	Barrow et al. (2014)	Opening Doors Louisiana (United States)	Additional grant in first year of enrolment of $1,000 per semester, conditional on: -being enrolled for at least 6 credits -maintaining a C GPA.	Low-income parents accepted in community colleges (N=1,019)	Enrolment at institution (2-year) after drop/add period	76.7	+5.3*
RCT	Binder et al. (2015)	VISTA at University of New Mexico (United States)	Additional grant of $1,000 per semester for 4 consecutive semesters, conditional on: -being enrolled in at least 12 credit hours in 1st semester, and 15 credit hours in subsequent semesters -Maintaining a GPA of 2.0 (C) or higher -Meeting with advisers at least twice per semester	Low-income incoming freshmen (N=1,081)	Enrolment at institution (4-year)	99.4	-1.3
RCT	Richburg-Hayes, et al. (2015)	California CFC-PBS (United States)	Additional grants ranging from $1,000 to $4,000, for one semester or up to 2 years, conditional on: -Enrolment -Completion of at least 6 credit hours per semester -Maintaining a "C" average GPA or higher	Low-income high school seniors (N=4,642)	Enrolment (any)	84.4	+4.9***
					Enrolment at 2-year institution	43.2	+4.7***
					Enrolment at 4-year institution	42.8	0
DiD	Jackson (2010)	Texas Advanced Placement Incentive Program (APIP) (United States)	Financial incentives for teachers and students based on scores in advanced placement courses in high school: Students receive between $100 and $500 for each eligible course conditional on a score of 3 or above	Low-income students in minority high schools (226 schools)	Enrolment (any, in Texas)	?	+5.0* (percent increase)

Table 6.C5: The effect of loans on access to higher education

Evaluation Design	Authors (Year)	Program (Country)	Details of program	Disadvantaged group (Sample size)	Outcome	Baseline in control group (%)	Estimated effect (p.p.)
RD	Solis (2013)	National loan programs (Chile)	National loan programs covering tuition costs with interest rates ranging from 2% to 6%, conditional on: - Being in one of the four poorest income quintiles; - Score at least 475 points in the national college admission test (PSU test)	Students taking the college admission test in the lowest income quintile (N=84,605)	Enrolment (any)	13.3	+20***
RD+IV	Gurgand, Lorenceau & Melonio	Eduloan (South Africa)	Short-term loans to cover tuition fees for students admitted in a public university (have to be repaid during the studies)	Admitted applicants to public universities with income below first quartile (N=1,397)	Enrolment at public university	44.3	+41.9*

a: Refers to the whole control group, not specific to disadvantaged students.

b: Own calculations based on interaction terms.

Table 6.C6: The effect of tax credit incentives on access to higher education

Evaluation Design	Authors (Year)	Program (Country)	Details of program	Disadvantaged group (Sample size)	Outcome	Baseline in control group (%)	Estimated effect (p.p.)
IV	Bulman & Hoxby (2015)	American Opportunity Tax Credit (AOTC) (United States)	AOTC allowed tax-payers to deduct yearly up to $2,500 for up to four years of higher education. AOTC is partly refundable: a taxpayer who owes zero taxes can receive a check of up to $1,000.	Low-income 19-year-olds	Enrolment (any)	~32	No effect
Fixed-effect IV	LaLumia (2012)	Hope Tax Credit (HTC); Lifetime Learning Tax Credit (LLTC); Tuition and Fees Deduction (TD) (United States)	HTC allowed tax-payers to deduct yearly up to $1,500 of college expenses for up to 2 years; LLTC allowed tax-payers to deduct yearly up to $2,000 of college expenses an unlimited period of time; TD allowed tax-payers to deduct up to $4,000 of college expenses from adjusted gross income;	Non-white men, aged 33-50	Enrolment (any)	3.4[a]	+2.0
				Non-white women, aged 33-50	Enrolment (any)	6.7[a]	+1.1[b]
				Parents had no college, men aged 33-50	Enrolment (any)	3.4[a]	+0.9
				Parents had no college, women aged 33-50	Enrolment (any)	6.7[a]	-1.7[b]

a: Refers to the whole control group, not specific to disadvantaged students.

b: Own calculations based on interaction terms.

Table 6.D1: The effect of universal financial aid on graduation in higher education

Evaluation Design	Authors (Year)	Program (Country)	Details of program	Disadvantaged group (Sample size)	Outcome	Baseline in control group (%)	Estimated effect (p.p.)
DiD	Denning (2015)	Community College Tuition Reductions, Texas (United States)	Discount in tuition fees in community colleges based on residency: Annexion of municipalities making residents eligible for reduced tuition at a community college (in-district tuition); community colleges in Texas charged 63 percent more, on average, to out-of-district students relative to in-district students	Economically disadvantaged high school graduates (N=204,448)	Associate degree (by 4 years)	4.1[a]	+0.3[b]
				Black high school graduates (N=204,448)	Associate degree (by 4 years)	4.1[a]	+0.9**[b]

a: Refers to the whole control group, not specific to disadvantaged students.

b: Own calculations based on interaction terms.

Table 6.D2: The effect of need-based financial aid on graduation in higher education

Evaluation Design	Authors (Year)	Program (Country)	Details of program	Disadvantaged group (Sample size)	Outcome	Baseline in control group (%)	Estimated effect (p.p.)
RCT	Anderson & Goldrick-Rab (2016)	Wisconsin Scholars Grant (United States)	Annual grant, complementing Pell grant, of $1,800 and renewable for up to five years	Low-income 2-year freshmen (N=3,153)	Associate degree (by 3 years)	30	-1
RCT	Ford et al. (2014)	New Brunswick Learning Accounts (Canada)	Annual grant of CAN$4,000 for maximum two years, with early commitment (deposited while student is in high school and provided conditional on high school completion)	Low-income and first-generation high school students- from 10th grade (N=1,145)	Any postsecondary degree (by 4 years)	12.5	+9.1***

RCT	Goldrick-Rab et al. (2016)	Wisconsin Scholars Grant (United States)	Annual grant, complementing Pell grant, of $3,500 and renewable for up to five years	Low-income 4-year freshmen (N=1,500)	Bachelor's degree (by 4 years, on-time)	16.3	+4.7**
IV	Alon (2007)	Any federal, state or college grant (United States)	An additional $1,000 in annual grant aid	Black freshmen in private and most selective universities (N=15,196)	Bachelor's degree (by 6 years)	76	+3.2[b]***
				Hispanic freshmen in private and most selective universities (N=15,196)	Bachelor's degree (by 6 years)	83	+3.2[b]***
IV	Alon (2011)	Any need-based grant (United States)	Each additional $100 received in the first year	University students in the lowest-income quartile (N=1,937)	Bachelor's degree (by 6 years)	48	+0.6**
RD	Castleman & Long (2013)	Florida Student Access Grant (United States)	An additional $1,300 in grant aid (in 2000 dollars), yearly renewable	Low-income high school graduates (N=6,917)	Associate degree (by 5 years)	17	-0.3
					Bachelor's degree (by 7 years)	25	+5.2**
RD	Clotfelter, Hemelt & Ladd (2018)	Carolina Covenant (United States)	Need-based grant covering the financial costs of college attendance through a mix of grant and work-study awards	Low-income students admitted to a public flagship university (N=1,133)	Bachelor's degree (by 4 years)	76	+2.2
RD+IV	Denning, Marx & Turner (2017)	Maximum Pell grants (United States)	An additional $1,000 in first year grant aid due to eligibility to maximum Pell grant	Lowest-income university entrants (EFC=0) (N=17,109)	Bachelor's degree (by 7 year)	43	+5.7*

RD	Denning (2018)	Any financial aid (United States)	Increase in financial aid (on average + $374 in grants) associated with being declared financially independent	Low-income (Pell recipients) students in 4th year of bachelor's program (N=33,844)	Bachelor's degree (by 5 year)	71.2	+0,9
RD	Fack & Grenet (2015)	Bourses sur Critères Sociaux (France)	Annual cash allowances of €1500, in addition to fee waivers	Low-income grant applicant entering the first year of a bachelor's degree (N=10,951)	Bachelor's degree (by 3 years, on-time)	25.5	+2.1
				Low-income grant applicants entering the final year of a bachelor's degree (N=40,789)	Bachelor's degree (same year)	58.7	+2.9***
DiD	Lovenheim & Owens (2014)	Ineligibility of federal financial aid due to HEA98 (United States)	Ineligibility for federal financial aid due to HEA98 for up to two years	Convicted drug offenders (majority of disadvantaged males) (N=7,401)	Bachelor's degree graduation	7.4	-7.2
RD	Turner & Bound (2003)	GI Bill (United States)	Renewable tuition subsidy of $500 + monthly stipend of up to $120 (1984$) for World War II veterans	Black war veterans	Any postsecondary degree	6	+2.7

a: Refers to the whole control group, not specific to disadvantaged students.

b: Own calculations based on interaction terms.

Table 6.D3: The effect of merit-based financial aid on graduation in higher education

Evaluation Design	Authors (Year)	Program (Country)	Details of program	Disadvantaged group (Sample size)	Outcome	Baseline in control group (%)	Estimated effect (p.p.)
RD	Carruthers & Ozek (2016)	HOPE-scholarship, Tennessee (United States)	Loss of hope scholarship after first year in college because of GPA below the threshold for renewal. Annual grant up to $4,000 (in 4-year institutions) and up to $2,000 (in 2-year institutions), conditional on near-average high school GPA and ACT scores and maintaining a 2.75 or 3.0 GPA in college	College freshmen with family income below median (N=7,248)	Any postsecondary degree (on-time)	?	+1.4
RD	Cohodes & Goodman (2014)	Adams Scholarship, Massachusetts (United States)	Between $910-$1714 in annual renewable tuition aid (roughly a 20% reduction in costs) -Not need-based -Eligibility with top 25% score in 10th grade (MCAS test)	Non-white high school seniors (N=88,152)	Bachelor's degree (by 4 years, on-time)	43.3[a]	-2.4
				Low-income high school seniors (N=88,152)	Bachelor's degree (by 4 years, on-time)	43.3[a]	-1.5
DiD	Sjoquist & Winters (2015)	State-wide merit aid programs (United States)	Strong merit aid - defined as not having too restrictive eligibility requirements and providing relatively large awards	Non-White or Hispanic men	Associate degree or higher	38.8[a]	+0.66
					Bachelor's degree or higher	30[a]	-0.4
				Non-White or Hispanic women	Associate degree or higher	38.8[a]	-0.45
					Bachelor's degree or higher	30[a]	0.23
RD	Welch (2014)	HOPE-scholarship, Tennessee (United States)	In 2005, Annual grant up to $1,500 per year at a community college and up to $3,000 in 4-year institutions, renewable for up to five years, conditional on: -near-average high school GPA (3.0) and ACT scores (21) -Maintaining a 2.75 or 3.0 GPA in college	Community college freshmen with family income below median (N=10,639)	Associate degree (by 3 years)	6.6[a]	-0.4
					Bachelor's degree (by 5 years)	7.2[a]	-3.8

a: Refers to the whole control group, not specific to disadvantaged students.

b: Own calculations based on interaction terms.

Table 6.D4: The effect of performance-based financial aid on graduation in higher education

Evaluation Design	Authors (Year)	Program (Country)	Details of program	Disadvantaged group (Sample size)	Outcome	Baseline in control group (%)	Estimated effect (p.p.)
RCT	Binder, Krause, Miller & Cerna (2015)	VISTA at University of New Mexico (United States)	Additional grant of $1,000 per semester for 4 consecutive semesters, conditional on: -being enrolled in at least 12 credit hours in 1st semester, and 15 credit hours in subsequent semesters -Maintaining a GPA of 2.0 (C) or higher -Meeting with advisers at least twice per semester	Low-income incoming freshmen (N=1,081)	Bachelor's degree (by 5 years)	33.2	+4.5
RCT	Mayer, Patel & Gutierrez (2015)	Ohio Performance-Based Scholarship Program (United States)	Additional grant of $900 per semester, or $600 per quarter, up to a maximum of $1800, conditional on: -Achieving a “C” or better in 12 or more credits -or a part-time award of $450 per semester/$300 per quarter for achieving a “C” or better in 6 to 11 credits	Low-income parents in community colleges (N=2,285)	Any postsecondary degree (by 4 years)	32.9	+1.6

Table 6.D5: The effect of loans on graduation in higher education

Evaluation Design	Authors (Year)	Program (Country)	Details of program	Disadvantaged group (Sample size)	Outcome	Baseline in control group (%)	Estimated effect (p.p.)
IV	Alon (2007)	Any federal, state or college loan (United States)	An additional $1,000 in annual loan aid	Black freshmen in private and most selective universities (N=15,196)	Bachelor's degree (by 6 years)	88[a]	+0.2[b]
				Hispanic freshmen in private and most selective universities (N=15,196)	Bachelor's degree (by 6 years)	88[a]	-1.1[b]
IV	Wiederspan (2016)	Federal loan, Texas (United States)	Federal loan receipt	Low-income community college students (N=132,147)	Associate degree (by 3 years)	9	+20
				Black low-income community college students (N=84,793)	Associate degree (by 3 years)	5	+16.4
IV	Dunlop (2013)	Federal Stafford loans (United States)	An extra $100 in total loan	High-need community college students (N=2,037)	Associate degree (by 5 years)	21[a]	+0.3
				Black community college students (N=437)	Associate degree (by 5 years)	21[a]	+1.0

a: Refers to the whole control group, not specific to disadvantaged students.

b: Own calculations based on interaction terms.

Table 6.D6: The effect of tax credits on graduation in higher education

Evaluation Design	Authors (Year)	Program (Country)	Details of program	Disadvantaged group (Sample size)	Outcome	Baseline in control group (%)	Estimated effect (p.p.)
PSM	Elsayed (2016)	Hope Tax Credit (HTC); Lifetime Learning Tax Credit (LLTC); Tuition and Fees Deduction (TD) (United States)	HTC allowed tax-payers to deduct yearly up to $2,200 of college expenses for up to 2 years; LLTC allowed tax-payers to deduct yearly up to $2,000 of college expenses an unlimited period of time; TD allowed tax-payers to deduct up to $4,000 of college expenses from adjusted gross income	Black college students who had applied to financial aid (N=4,850)	Any postsecondary degree (by 6 years)	41.6[a]	+9.7***

a: Refers to the whole control group, not specific to disadvantaged students.

Table 6.E1: The effect of mixed interventions on access to higher education

Evaluation Design	Authors (Year)	Program (Country)	Details of program	Disadvantaged group (Sample size)	Outcome	Baseline in control group (%)	Estimated effect (p.p.)
RCT	Ford et al (2014)	Expand Your Horizons + Learning Accounts in New Brunswick (Canada)	-40 hours of after-school project activities with enhanced career education and focused information on post-secondary studies over a 3-year period - Annual grant of CAN$4,000 for maximum two years, with early commitment (deposited while student is in high school and provided conditional on high school completion)	Low-income and first-generation high school students- from 10th grade (N=1,148)	Enrolment (any)	37.8	+10.5***
					Enrolment at college (short)	21.6	+5.1*
					Enrolment at university	16.5	+6.9***
RCT	Hahn, Leavitt & Aaron (1994)	Quantum Opportunities Program (United States)	-250 hours of education -250 hours of developmental activities -250 hours of service each year from 9th grade to high school graduation. -$1.00 - $1.33 per hour for participating and a grant amounting total earnings for postsecondary enrolment	Low-income high school students- from 9th grade (N=158)	Enrolment (any)	16	+26****
RCT	Rodriguez-Planas (2012)	Quantum Opportunities Program (United States)	-250 hours of education -250 hours of developmental activities -250 hours of service each year from 9th grade to high school graduation. -$1.00 - $1.33 per hour for participating and a grant amounting total earnings for postsecondary enrolment	Low-income high school students- from 9th grade (N=791)	Enrolment (any postsecondary)	55.8	+7.4**
					Enrolment at 2-year or 4-year institution	37.7	+4.3
DiD	Andrew, Imberman & Lovenheim (2016)	Longhorn Opportunity Scholars (LOS) & Century Scholars (CS) programs (United States)	LOS: Combination of outreach in disadvantaged high schools, financial aid ($4,000 per year) and academic tutoring during college in University of Texas	High-achieving minority & low-income high school seniors (eligible FRL) (N=15,835)	Enrolment in targeted flagship university (UT)	2.7	+2***
			CS: combination of outreach in disadvantaged high schools, financial aid ($5,000 per year for four years) and support service during college in Texas A&M University	High-achieving minority & disadvantaged high school seniors (N=21,327)	Enrolment in targeted flagship university (TAMU)	4.3	+0.2

PSM	Carruthers & Fox (2016)	Knox Achieves, Tennessee (United States)	Combination a college coaching (outreach) and financial aid program, covering the gap between the direct cost of enrolment and aid from other sources, offered to students for making a seamless, immediate transition between high school and one of the state's public community colleges	Lowest-income high school seniors (eligible FRL) (N=5,197)	Enrolment (any)	47.8[a]	+25.7***
					Enrolment at 2-year institution	23[a]	+25.2***
					Enrolment at 4-year institution	29.7[a]	+3*
DiD + Matching	Oreopoulos, Brown & Lavecchia (2014)	Pathways to Education (Canada)	Comprehensive program that included counselling, academic support, social support and financial support.	Low-income high school students-from 9th grade Site 1: Regent's Park (N=1,274)	Enrolment (any)	33.6	+19.2***
					Enrolment at college (short)	11.9	+9.8***
					Enrolment at university	21.6	+9.4***
				Low-income high school students-from 9th grade Site 2: Rexdale (N=737)	Enrolment (any)	40.7	+4.4
					Enrolment at college (short)	14.3	+4.6
					Enrolment at university	26.4	-0.3
RD	Page, Castleman & Sahadewo (2016)	Dell Scholars Program (United States)	Combination of financial support (up to $20,000 of scholarship) and individualized advising, both at college entrance and throughout the duration of postsecondary enrolment	High-achieving low-income high school seniors (N=2,040)	Enrolment at 4-year institution	81.2	+2.8

a: Refers to the whole control group, not specific to disadvantaged students.

Table 6.E2: The effect of mixed interventions on graduation in higher education

Evaluation Design	Authors (Year)	Program (Country)	Details of program	Disadvantaged group (Sample size)	Outcome	Baseline in control group (%)	Estimated effect (p.p.)
RCT	Ford et al (2014)	Expand Your Horizons (EYH) + Learning Accounts (LA) in New Brunswick (Canada)	-40 hours of after-school project activities with enhanced career education and focused information on post-secondary studies over a 3-year period - Annual grant of CAN$4,000 for maximum two years, with early commitment (deposited while student is in high school and conditional on high school completion)	Low-income and first-generation high school students- from 10th grade (N=1,148)	Any postsecondary degree (by 4 years)	12.6	+8.0***
RCT	Rodriguez-Planas (2012)	Quantum Opportunities Program (United States)	-250 hours of education -250 hours of developmental activities -250 hours of service each year from 9th grade to high school graduation. -$1.00 - $1.33 per hour for participating and a grant amounting total earnings for postsecondary enrolment	Low-income high school students- from 9th grade (N=791)	Bachelor's or associate degree (at age 25)	7.1	-0.3
					Bachelor's degree (at age 25)	2.0	+1.1
RCT	Scrivener et al (2015)	Accelerated Study in Associate Programs, New York (United States)	Combination of counselling, tutoring, special courses, and financial support (tuition waiver, metrocard and free textbooks) based on a full-time enrolment requirement	Low-income community college freshmen (N=896)	Associate degree (by 3 years)	21.8	+18.3***
DiD	Andrew, Imberman & Lovenheim (2016)	Longhorn Opportunity Scholars (LOS) & Century Scholars (CS) programs (United States)	LOS: Combination of outreach in disadvantaged high schools, financial aid ($4,000 per year) and academic tutoring during college in University of Texas	High-achieving minority & low-income high school seniors (eligible FRL) (N=15,835)	Graduation from targeted flagship university (UT) (by 6 years)	2.0	+1.5***
			CS: combination of outreach in disadvantaged high schools, financial aid ($5,000 per year for four years) and support service during college in Texas A&M University	High-achieving minority & disadvantaged high school seniors (N=21,327)	Graduation from targeted flagship university (TAMU) (by 6 years)	3.2	-0.0

RD	Clotfelter, Hemelt & Ladd (2018)	Carolina Covenant (United States)	Combination of need-based grant covering the financial costs of college attendance – through a mix of grant and work-study awards – and additional support services, such as mentoring by faculty and peers, career advice, professional development opportunities, and social events	Low-income students admitted to a public flagship university (N=1,838)	Bachelor's degree (by 4 years)	82	+4.7
RD	Page, Castleman & Sahadewo (2016)	Dell Scholars Program (United States)	Combination of financial support (up to $20,000 of scholarship) and individualized advising, both at college entrance and throughout the duration of postsecondary enrolment	High-achieving low-income high school seniors (N=337)	Bachelor's degree (by 6 years)	60.5	+19.2*

a: Refers to the whole control group, not specific to disadvantaged students.