

The dynamics of achievement inequality: the role of performance and choice in Chile[†]

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Abstract

Research on education inequalities has long-established the relationship between the social composition of schools and achievement levels. However, the empirical study of the social processes in choosing schools and their potential effects on achievement inequalities has often been neglected. This article investigates the extent to which such social processes, related to parents' educational preferences and expectations, influence the development of students' achievement inequalities throughout their schooling career, through shaping school communities, as a channel of transmission of socioeconomic inequality. Using longitudinal census data from Chile, which allows us to observe students' achievements between the 4th and 10th grades, we find support for the claim that the development of achievement inequalities operate partly through well-off parents' educational preferences and expectations. Moreover, these preferences and beliefs explain a substantial part of private schools effects and most of the social composition effect of schools on achievement inequalities. We conclude that choice processes should be considered as an integral part of theories aimed to explain achievement inequalities as a dynamic process.

Keywords: achievement inequality, primary effects, secondary effects, school effects, private education

Introduction

Achievement inequalities are a common concern for both sociology scholars and policy makers. A growing literature has shown well-established effects of school characteristics on achievement inequalities. In general, school sectors' performance differences are partly associated with the more advantaged social composition of private schools, translated in better academic and normative environment (e.g. ; Dronkers & Roberts, 2008; Dronkers & Avram, 2010; Morgan & Todd, 2009), which seems to have differential effects on students from different social backgrounds, and also on the development of achievement inequalities throughout the schooling years (Crawford, McMillan & Vignoles, 2017; Maaz, Trautwein, Lüdtke & Baumert, 2008). Moreover, compositional social background effects on academic achievement, understood as a consequence of school choice processes, remain all-pervasive, no matter their relative size, even after controlling for prior achievement (Dronkers & Roberts, 2008; Lauen & Gaddis, 2013; Marks, 2015; Thrupp, Lauder & Robinson, 2002; Van Ewijk & Slegers, 2010).

In spite of these important insights, less attention has been paid to the social process that generates achievement inequalities throughout the schooling career. Differences in academic gains are partly socially determined, based on the individual interactions among students and their parents, and peers at schools, in receiving or eliciting instrumental resources, brought to schools by parents (Crosnoe & Muller, 2014). Such differences in school learning environment may lead even similar-ability students into diverging academic performance later on in their schooling career (e.g. Goldring & Phillips, 2008; Crawford et al., 2017; Maaz, et al., 2008).

In this regard, this paper aims to understand the development of achievement inequalities as a dynamic process. Drawing on the primary/secondary effects perspective, and its relationship with the role of social capital in the conformation of social closure at schools (Boudon 1974; Coleman, 1988; Crosnoe & Muller, 2014), we sought to fill this gap by studying the relationship between achievement gains inequalities and social differences in parents' educational preferences. The following research question is addressed in this study: *To what extent do socioeconomic differences in parents' educational preferences and expectations influence students' achievement gains during compulsory schooling?*

We take Chile's choice-driven school system as an exemplary case, as it is an interesting case for its highly privatized provision of education, and high levels of socioeconomic stratification of achievement between schools (Hsieh & Urquiola, 2006; Mizala & Torche, 2012; Valenzuela, Bellei & Ríos, 2014). There are, we suggest, two channels through which processes of social sorting driven by parents' educational preferences and beliefs generate divergent students' academic trajectories: the direct influence from parents and the school community they shape. This paper also contributes further evidence on the link between segregation, private schooling and achievement.

Theoretical background and evidence

The Chilean school system: a brief overview

The K-12 Chilean school system is split between primary education (eight years) and secondary education (four years). It is a comprehensive school system, with a large proportion of enrolment in private schools. It is divided into three main school sectors: public, private voucher and private paid school, without constraints in geographical catchment areas in terms of enrolling students. Schools differ in key institutional features: admission rules, teachers' contracts and regulations, and complementary alternatives to school financing. Public schools have to accept all applicants and their teacher contracts are centrally regulated. Private voucher schools and privately paid schools are managed by a diverse group of for-profit and not-for-profit organizations, both religious and secular.

Until recently, private voucher schools were funded by a flat per-pupil subsidy paid by the government directly to the school. They were also able to select students through complex admission processes, usually targeting better-skilled students, manage teacher contracts more freely, targeting the more qualified, and charging parents an additional fee (Behrman, Tincani, Todd, & Wolpin, 2016; Contreras, Sepúlveda & Bustos, 2010)¹. Under this scheme, alongside the rapid expansion of voucher school sector, socioeconomic segregation between schools has remained high over time (Hsieh & Urquiola, 2006; Mizala & Torche, 2012), related to fee-paying voucher schools and particularly to private paid schools (Valenzuela et al., 2014). The latter were excluded from this funding scheme, and are virtually absent in the literature.

In addition, many public schools and a substantial share of private voucher schools that cover mostly local demand provide either primary or secondary education, which force a majority of students to enrol into a new school to enter secondary education (Lara, Mizala & Repetto, 2011).

The social dimension in achievement inequalities

The distinction between ascribed and achieved individual characteristics, although informative, has misled the debate on achievement inequalities by focusing on the relative importance of achievement and social background as competing factors, and even further, treating the former as exogenous from the latter (Van de Werfhorst & Hofstede, 2007; Triventi, 2015). A radical view, in this regard, asserts that achievement inequalities are naturally generated from a “sizeable genetic component” of generalizable intelligence, as the foundation of cognitive ability (Marks, 2013, p. 88). However, recent evidence from behavioural

¹The means-tested voucher reform of 2008 retained key features of the market-based model, implemented since 1981, which yielded a modest impact on achievement and social segregation (Valenzuela & Montecinos, 2017).

genetic research points to the potential role of social and environmental factors on educational outcomes². A higher opportunity environment (i.e. advantaged homes or selective schools) matches students' learning experiences with their genetically influenced traits, like learning motivation (Tucker-Drob & Harden, 2012), which influence cognitive achievement (Domingue et al., 2018), and the likelihood of postsecondary education completion (Trejo et al., 2018).

Families' social environments, therefore, influence children's educational outcomes, due to differences in socialization processes, on top of inherited genetic traits. Primary effects comprise these influences that stem from social origin (Breen & Goldthorpe, 1997). Parenting styles, valuation of schooling and involvement in learning processes configure a home learning environment that influences cognitive development (Sullivan, 2001; Nash, 2003). These differences in cultural resources have long-lasting effects on later stages in schooling years (Van de Werfhorst & Hofstede, 2007). In fact, early cognitive achievement is highly correlated with later-life academic achievement and educational attainment. However, over and above cultural resources and the correlation between cognitive abilities at different stages, social background effects persist (Goldstein & Sammons, 1997; Sullivan, 2001; Sullivan, Ketende, & Joshi, 2013).

The role of parents' education preferences and beliefs on achievement inequalities

If we attempt to identify what factors parents bring to bear on children's chances of educational success, we need to look for those that may help them to navigate the school system. In this respect, advantaged parents' educational preferences and beliefs are subjectively rational as they are *purposive*, with the aim of to preserve their present class position and avoid downward social mobility, as Boudon suggests (Breen & Goldthorpe, 1997; Mood, 2009:282). They are expressed in educational decision-making processes (the so-called secondary effects), and probably in the direct influence and support to the student. For instance, more educated parents can translate their educational preferences and beliefs about school performance and quality, and its long-term consequences, into academic engagement at home, drawing from their specific sociocultural and educational resources. Such differences can lead to divergent academic trajectories, even if students have similar levels of achievement earlier in their schooling career (Bourne, Bukodi, Betthäuser & Goldthorpe, 2018; Boonk, Gijsselaers, Ritzen & Brand-Gruwel, 2018; Crosnoe & Muller, 2014; Hatcher, 1998). Therefore, parents' educational preferences and beliefs may be positively associated with the development of students' achievement inequalities. Consequently, we expect that *parents' educational preferences and beliefs about schools and higher education may increase socioeconomic differences in achievement gains (hypothesis 1)*.

Schools play an important role in maintaining or even increasing achievement

²In fact, family environment and the exposure to either chronic or acute stressors in early life stages (even in-utero) from changing conditions in the environment can have long-lasting effects on children's cognitive ability development (Torche, 2018).

inequalities throughout schooling years (Goldstein & Sammons, 1997; Caro, McDonald & Willms, 2009; Crawford et al., 2017). It is often cited that the differences in characteristics of the intake between schools are a proxy of peer effects' influence on individual achievement. These effects are associated to better academic climate (e.g., Dronkers & Roberts, 2008; Dronkers & Avram, 2010), social dynamics of the peer networks (Geven, Weesie & van Tubergen, 2013; Lomi, Snijders, Steglich & Torló, 2011) or, at the organizational level, schools' response to social composition in terms of changes in curriculum or academic selection (Marks, 2015).

Families may decide to invest in developing children's skills by choosing the adequate social environment that matches their academic concerns and aspirations with school requirements. This drives social selection between schools and set in motion social dynamics as parents bring instrumental orientations to schools (Crosnoe & Muller, 2014). Elitists and academically selective schools are perceived as providers of learning opportunities and social networks that would not be available in public, local, non-selective schools (Kosunen & Carrasco, 2014)³, particularly in terms of facilitating parental engagement with the learning process of students (Burgess, Greaves, Vignoles & Wilson, 2015; Goldring & Phillips, 2008). Therefore, schools become socially homogeneous throughout the school career, which may lay the foundations for socioeconomic academic advantage over time, generating different learning rates in different schools (Maaz et al., 2008; Morgan & Todd, 2009).

This point is especially relevant in the Chilean case. In a context of stratified opportunities to learn, parents are led to choose strategically and seek to sustain class distinctions in school choice (Kosunen & Carrasco, 2014; Mizala & Torche, 2012; Valenzuela et al., 2014). Thus, *the influence of school communities shaped by advantaged parents' educational preferences and beliefs about schools and higher education, may increase socioeconomic differences in achievement throughout school careers (hypothesis 2)*.

Data and methods

Sample

We follow a recent cohort of Chilean students across their schooling career, using information from fourth grade (age 9) in 2006, and 10th grade (age 15) in 2012. This data is obtained from three sources. First, we use SIMCE standardised tests data⁴, which provide individual information about academic achievement for the full population of students in Chile. Second, we use the social context

³Disadvantaged families, however, have pragmatic appraisal in choosing available schools, based on economic constrains and also on a rational response to educational failure risk. They privilege present well-being instead of long-term goals in terms of employment (Hatcher, 1998; Reay & Ball, 1997).

⁴In Spanish: *Sistema de Medición de la Calidad de la Educación* (Educational Quality Measurement System).

survey, administered alongside SIMCE tests, which provides information about students' parents and family characteristics, students' attitudes, and parents' educational choices. The final source of data is administrative records from the Ministry of Education of Chile, which provide information about school level characteristics. We utilize a census of students and schools in Chile, which comprises 198,852 students across 2758 schools at 10th grade. The matched cohort for the 4th and 10th grades results in an analytical sample of 141,110 valid cases, distributed across 2715 schools, which represents 71% of valid cases in the 10th grade. The presence of missing data ranges between 5 and 25.5 percent, due to differences in the response rate of the different data sources, particularly from parents questionnaire. To make sure that our models are based on the complete matched cohort, we address this problem by using multiple imputation procedure based on chained equations to create 25 complete datasets for the analyses. The imputation models include all variables of the main analysis (Von Hippel, 2007). Regression model is used for continuous variables, and binary logistic model is used for dummy variables.

Variables

The dependent variable, academic achievement at the 10th grade, is measured by the SIMCE mathematics standardized test scores, calculated by the National Agency of Quality of Education using the Item Response Theory (IRT) methodology, with a mean of 250 and standard deviation (SD) of 50. These variables were standardized to z-scores with mean 0 and SD of unity. The SIMCE data includes cognitive variables, language and mathematics. It has been well documented that socioeconomic effects are quite stable across these tests and are not much larger or smaller for a particular subject (Mizala & Torche, 2012; Van Ewijk & Slegers, 2010).

The main predictor at individual level is socioeconomic status (SES). We constructed a standardized sum score of four main indicators—schooling years of mother, schooling years of father, household income and the number of books at home in the 10th grade—to indicate social position (Cronbach's alpha = 0.795), and for 4th grade (Cronbach's alpha = 0.803). By using this technique, the socioeconomic status of each student is represented in a standardized scale, with a mean of 0 and SD of unity (Mizala & Torche, 2012). Socioeconomic groups were constructed from the individual SES indicator, taking cut-off points similar to Torche (2005) to present descriptive evidence, which represents the main social differences in Chile⁵. We control for prior achievement, measured by the SIMCE mathematics standardized test scores in 4th grade (year 2006, age nine). This variable has a mean of 250 and SD of 50. It was standardized to z-scores with mean 0 and SD of unity. Additional control variables included are grade

⁵The correlation between SES indexes is 0.85. We take cut-off points from the correspondence between occupational class and SES scores (Torche, 2005: 439). The high SES group is located over 1 standard deviation of the SES distribution. The middle SES group is located between one standard deviation and zero, while the low SES group is represented by values under zero

retention (yes=1), and gender (female=1).

We include measures of parental educational preferences about schools and beliefs about expected transition to higher education (Morgan & Todd 2009), from the parental survey: i) choice of school due its academic prestige; ii) choice of school due to its values/religion; iii) expectations that the student will enrol at university or postgraduate degree. Figure 1 shows the differences of parental preferences and educational expectations across socioeconomic groups. The differences are more pronounced in terms of educational expectations, despite the fact that in all social groups there is a considerable proportion of parents with high expectations.

[Figure 1 about here]

At the school level, following Dronkers and Roberts (2008), we added school composition of parents' educational preferences and beliefs, which are aggregates from the individual parents' responses (proportions). We control social composition of the school, measured as the school average of SES index in 10th grade, and the actual choice of parents: dummies for school sector (private voucher and private paid school, public school as reference), whether the school is religious, and rural schools. Last, we control for school level averages of several schools' screening mechanisms as reported by parents (Contreras et al., 2010)—personal interview, entry academic test, request of religious marriage and/or certificate and baptism, plus information on the enrolment fee, and the monthly tuition fee of the school from administrative registers—by constructing a school selectivity index (Cronbach's Alpha = 0.7688). Table 1 shows descriptive statistics and differences across school sectors for the complete cohort, which are very similar compared with original data⁶.

[Table 1 about here]

Empirical strategy

This study applies two-level hierarchical linear models to estimate the relation between parents' educational preferences and achievement gains, throughout the school career. The inclusion of a lag of the dependent variable, prior achievement, adds a dynamic specification for a particular timespan (2006-2012). The slopes of the covariates represent effects on relative achievement progress⁷. These models are mostly known as lagged-score models, and they have the advantage of accounting for student-specific unobserved heterogeneity in endowments, due to

⁶See Appendix Table A.2.1 for a summary with the description of the variables in the models, and Table A.2.2 for percentage of missing cases and descriptive statistics using the original dataset.

⁷Test score are standardised at each grade. Residuals represent the quantity of individual change within cohort as the difference between observed and predicted achievement given prior achievement levels. That is to say, relative gains above or below statistical expectation (Briggs & Betebenner, 2009). As to compared to rank transformations or discretising data, normalized z-scores render very similar patterns of relative progress (Wilson, Burgess, & Briggs, 2011). In this regard, we use gains and progress indistinctly.

the fact that prior achievement captures the contribution of all previous inputs (Andrabi, Das, Ijaz Khwaja & Zajonc, 2011)⁸.

Thus, the general equation of these models (Equation 1) is defined as a value-added model, which allows us to decompose the SES effect (β_2) on 10th grade achievement ($y_{ij,t}$), for student i in school j , by controlling for pre-existing achievement differences, measured by achievement in 4th grade ($y_{ij,t-1}$). Then, the effect of prior achievement (β_1) represents the process of learning development and thus, the generation of primary effects. Therefore, the coefficient of interest, the effect of SES index (β_2), measures achievement gains inequality, over and above prior achievement baseline differences. Hence, it may capture primary effects not explained by processes that affect the individual learning process.

$$y_{ij,t} = \beta_{j0} + \beta_1 y_{ij,t-1} + \beta_2 SES_{ij} + \beta'_3 c_{ij} + \beta'_4 x_{ij} + \beta_5 SES_j + \beta'_6 C_j + \beta'_7 X_j + v_{j0} + v_{j1} SES_{ij} + \epsilon_{ij} \quad (1)$$

where $v_{j0}, v_{j1} \sim N(0, \sigma_v^2)$; $\epsilon_{ij} \sim N(0, \sigma_\epsilon^2)$

In the model, the intercept (β_{j0}) is the adjusted school mean of mathematics progress in 10th grade. At the individual level, we add parents' educational preferences and beliefs (c_{ij}) and controls for students' characteristics (x_{ij}). At the school level, the parameter (β_5) captures the effect of socioeconomic composition of school j , while the effect of the social dimension of parents' educational preferences in school j is measured by (β_6). The term X_j represents school characteristics, such as the actual choice of type of school and the school selectivity index. We have included two random effects: the first is the variance of school intercepts (v_{j0}), which is the effect of unobserved characteristics of schools j on mathematics achievement, uncorrelated to individual level variables. The second is the variance of the slope of SES across schools (v_{j1}), which captures unobserved school effects on achievement gains inequality. Finally, (ϵ_{ij}) is the error term for student i in school j .

Non-random selection of students and potential sources of bias

One source of bias in observational studies that could influence the model estimates is the non-random selection of students in schools. This may indicate biased parameter estimates, due to the potential correlation between unobserved individual and school level characteristics related to sorting, with covariates in our model (Castellano, Rabe-Hesketh & Skrandal, 2014). Our data and modelling

⁸Although we cannot test endogeneity of prior achievement with a prior test as instrument, lagged value-added models seem to perform as well as dynamic panel models due to the countervailing bias between unobserved learning heterogeneity and measurement error of lagged achievement, which may act as proxy for omitted heterogeneity in learning (Andrabi et al., 2011).

strategy allow us to mitigate these issues in three ways: First, indicators of parents' educational preferences and beliefs, both at individual and at school level, help to account for selection of students into schools, alongside the school selectivity index (Clarke, Crawford, Steels & Vignoles, 2013). Second, our census data allows an estimation of precise measures, particularly in case of school-level effects (Mizala & Torche, 2012). Third, the structural characteristics of the Chilean school system, in which most of students are obligated to witch schools after graduation from primary education (8th grade) makes potential school-level effects on achievement reasonably exogenous, nor captured by prior achievement.

Results

Variance decomposition

First, we present the variance decomposition analysis by fitting null models and a three-way variance decomposition analysis⁹, which allows us to observe possible trends between the grades in achievement across schools, and the conformation of socially differentiated school communities.

The results of the null models show that the between-school component of the variance in achievement is roughly 50%, which doubled between 4th and 10th grades. Table 2 shows an increase in the achievement stratification between schools in each school sector, which is higher in both private paid and private voucher school sectors (panel A). There is a higher variance between private voucher schools and private schools than in public schools, which is consistent with the literature (Mizala & Torche, 2012; Valenzuela et al., 2014). However, the high socioeconomic segregation between schools increases slightly from 61 to 64% and remains relatively stable across school sectors between the 4th and 10th grades (panel B). Hence, the analysis suggests that the increase in achievement differences between schools, across grades, is associated with a high level of socioeconomic segregation between schools.

[Table 2 about here]

Another way to understand the apparent relationship between the relative stability of socioeconomic segregation between schools and changes in the variance of academic achievement across grades between schools is to decompose the variance of both academic achievement and socioeconomic background into the three components: between school sectors (BSS), between schools/within school sectors (BS/WSS), and within schools (WS). We decomposed the variance of academic achievement and socioeconomic background, which helped us to understand the overall trends of the three components between the two time points considered. Table 3 present the trends across grades for the three components. We can see a similar trend across grades in academic achievement. The variance in BSS and BS/WSS components doubled, whereas the WS component decreased. For

⁹See Weeden, Kim, Carlo & Grusky (2007).

socioeconomic segregation, however, the apparent overall stability hides changes. We see a relatively small decrease in the BS component as much as a slight increase in the BS/WSS component.

In other words, this finding suggests that social differences among school communities show differential learning rates throughout the timespan considered (Maaz et al., 2008). The formation of socially homogeneous communities between schools, within school sectors, produces specific developmental environments in which student learnings rates differ, making schools key units of social and educational stratification of learning processes over time (Crawford et al., 2017; Langenkamp & Carbonaro, 2018; Mizala & Torche, 2012)¹⁰.

[Table 3 about here]

The influence of parents' educational preferences and beliefs on achievement inequalities

This section and the following show the models that estimate how student characteristics and parents' educational preferences and beliefs affect achievement inequalities during the schooling career, at individual and school level.

Model 1, in Table 4, shows the basic relationship, the extent of achievement inequality for 10th graders in 2012, which shows the increase of 1 standard deviation (SD) in students' socioeconomic background increments mathematics achievement by 0.13 SD. In Model 2 we estimate the effect of social origin on academic achievement in the 10th grade, controlling by prior achievement (4th grade). Not surprisingly, there is a strong effect of prior achievement on academic achievement in the 10th grade, consistent with the literature. A one SD increase in prior achievement yields a 0.46 SD increase in later academic achievement. These are primary effects that run completely through prior achievement baseline differences, which may reflect cultural differences in family upbringing, partly due to genetic endowments or even past school social influences (Van de Werfhorst & Hofstede, 2007; Trejo et al., 2018).

This means that socioeconomically advantaged students have a higher academic achievement between the 4th and 10th grades, but there is still a remaining effect of socioeconomic background, which is not explained by inequalities in cognitive development. Figure 2 shows the descriptive achievement gradient between grades by socioeconomic groups. Figure 3 shows the distribution of achievement gains in mathematics across socioeconomic groups (a) and how they are stratified between school sectors (b). We can see that students from higher social backgrounds have an academic advantage over those from lower

¹⁰Around 75% of students switched schools before and after primary education graduation, mostly between and within public and private voucher school sectors. However, although students differ in performance, social background, and parents' educational preferences and expectations across school sectors, their social composition remains very similar across schooling career. Hence, families may have chosen schools with similar characteristics to the former (Appendix Tables A.1.3 to A.1.6).

social backgrounds, which also means relative academic gains for the former and losses for the latter between the 4th and 10th grades. By controlling for prior achievement, the variance explained at school level increases from 20 to 57%, whereas at student level it increases to 30%, while the intra-class correlation coefficient (ICC) decreases. This suggests that schools differ largely in the social and ability composition of their intake. All in all, it allows us to avoid over-estimation of *school effects* in a context of high socioeconomic segregation among schools (Hobbs, 2016).

[Figure 2 about here]

[Figure 3 about here]

Model 3 controls parents' educational preferences and beliefs, which decrease the SES coefficient 27% with respect to Model 2. This may reflect that privileged parents' preferences in choosing schools are translated into students' relative gains. These effects may harbour the influence of parents' involvement in students' learning and aspirations (Boonk et al., 2018; Gubbins & Otero, 2016)¹¹. The variance explained at school level increases to 62%, which points to compositional effects of these variables. Model 4 shows the effect of the actual choices of parents on schools, which decreases the SES effect on achievement gains by 23% with respect to Model 3, and 44% with respect to Model 2. There is a sharp decrease in achievement segregation (ICC) of about 0.8 points and an increase in the variance explained at school level to 74%. Parents' preferences and beliefs effect remains positive and significant, suggesting a direct influence from parents to children. However, school type effects indicate pure association of school choice with achievement gains, which still need to be explained.

The influence of socially patterned parents' educational preferences and beliefs on achievement inequality between schools.

Table 5 presents the association between school compositional effects on achievement gains inequality in the 10th grade. According to the literature, compositional effects explain most of school choice effects, which are shown in Model 5. Hence, the social sorting of advantaged students between schools is associated with around two thirds of the private voucher effect and virtually disappears in case of privately paid schools. The social composition of schools also mediates the SES effect on achievement gains at student level, regarding Model 4, which means that socially advantaged students benefit academically from belonging to a socially homogeneous and well-off school community. However, Model 6 shows that the compositional measures of parents' educational preferences and beliefs have considerable effects on school sectors, on their own. Regarding Model 4, these compositional measures explain around half of the private paid school effect, and slightly less than two thirds of the private voucher sector.

¹¹In fact, there are differences in parental school preferences and educational expectations across socioeconomic groups, which are more pronounced in case of expectations. (See Appendix Figure A.2.1.).

Compositional effects of educational preferences and beliefs on achievement remain in Model 7. A remarkable finding is that they explain around 70% of the effect of school social composition from Model 5, whereas expectations of higher education decrease by around one quarter. This means that well-off parents, with higher expectations for their children to pursue a university or postgraduate degree, tend to choose specific schools among private voucher schools and particularly among private paid schools. Finally Model 8 accounts for school selectivity which explain further the effects of both private voucher and private paid schools, and also the school social composition coefficient. Variance explained at school level increases slightly to 87%, while ICC decreases to 0.158.

Therefore, most of the variance between schools is associated with social processes of sorting of students, instead of the so-called “school effects”, that seem to be reduced. In other words, advantaged families’ socially patterned educational preferences shape school communities in a way that may allow students to elicit instrumental resources from families and among peers, which are then translated into academic advantages. Figure 4 summarize these effects on academic gains inequality as a percentage of SES coefficient in Model 2. Sensitive analysis was performed using a trimmed sample with students who switched school to enter secondary education. Results did not change noticeably (See Appendix, tables A.1.6 and A.1.7).

[Table 5 about here]

[Figure 4 about here]

Finally, Model 9 and Model 10, in Table 6, present the full model with interaction between parents’ educational preferences and beliefs and the social background of the students, and a cross-level interaction between the latter and the school composition of such preferences and beliefs, respectively. The significant and positive sign in both suggests an increase in students’ achievement gains through the transmission of social inequalities from their advantaged parents as they hold higher expectation for them (Model 9), and from the school communities that these parents shape after enrolling their children in private schools (Model 10). These findings, alongside the mediation effects in previous models, give support to our hypotheses. As a test of robustness, we estimated fixed effects models for these interactions, controlling out all possible differences between schools, which show similar results (Appendix, Table A.1.8).

[Table 6 about here]

Discussion

In this paper, we empirically examined how parents' educational preferences and beliefs affect the generation of inequalities in pupils' achievement gains across schools. For this we focused on the distinction between primary effects and secondary effects, the subjective rationality of preferences and beliefs (Boudon, 1974; Mood, 2009), and the school choice scholarship. Using longitudinal census data from the SIMCE national assessment of Chile, we distinguished two components of socioeconomic advantage in achievement gains: one, the baseline effect, channelled through prior achievement, which represents the development of primary effects over time; and two, the remaining socioeconomic inequalities. We have shown that such inequalities in achievement gains are explained in 27% by parents' educational preferences and beliefs. On top of that, the shaping of school communities associated to such preferences and beliefs explain up to more than half of such differences in academic gains.

Our results also show that these effects are mostly driven by parents' educational expectations. One possible explanation is that well-off parents hold forward-looking beliefs about their child attaining higher levels of education which mean they are expose their children to a wide range of instrumental resources. This plausible mechanism, under the form of parents' direct influence through academic valuing, encouragement and discussion about long term school plans at home (Boonk et al., 2018), render higher academic gains, that may make university enrolment more likely to happens later (Crosnoe & Muller, 2014).

Furthermore, by choosing more selective or elitist schools, well-off parents seek their educational preferences and beliefs to be realized not only due the higher quality resources and instruction these schools offer (Behrman et al., 2016), but by maximizing the learning and educational potential of their children through their induction into a more socially exclusive and academically oriented learning environment (Kosunen & Carrasco, 2014; Reay & Ball, 1997). Therefore, these social processes configure a dynamic of attraction of advantaged students, which as surrogate channels of instrumental resources (Crosnoe & Muller, 2014), may enhance a normative social environment within each school community that may foster most students' attitudes towards academic work and further attainment.

Notwithstanding the unique feature of this study, in which we have accounted for parents' educational preferences and beliefs and school selection using self-reported parental information, it should be noted that we cannot claim causal effects of school level characteristics on achievement inequalities. The reflection problem arises when social composition of schools of any kind is itself determined by social characteristics of each student, even in longitudinal designs (Manski, 2000). Students may elicit information and adopt behaviours from peers, which are set in motion once parent's educational decisions to enrol them into specific schools. Therefore, achievement inequalities are endogenized through parents' educational preferences and beliefs, which seem to drive school choice.

A further limitation of our study is that we have insufficient detail on character-

istics of school peers over time. Dynamics of the peer networks could magnify or even out instrumental resources throughout child’s schooling (Geven et al., 2013; Lomi et al., 2011). We have assumed that school level associations represent the effects of previous dynamics of social processes that capture contextual effects (Castellano et al., 2014). However, changes in school social contexts render smaller effects on achievement gains (Lauen & Gaddis, 2013), although the timing of students’ exposure to specific social context within schools, particularly in the early years, is related to student learning (Langekamp & Carbonaro, 2018). Furthermore, this study has not covered the case of educated parents that do not actively manage their children’s schooling, or less educated parents that in an agentic fashion do so. Thus, caution is needed in interpreting findings with these limitations.

In this regard, future research should evaluate these assumptions when using this data, particularly in a new institutional context in which structural reforms are ongoing in Chile. For example, the Law for School Inclusion of year 2015, will gradually eliminate tuition fees, selection of students and for-profit voucher schools. However, its impacts on tackling segregation could be limited if for profit fee-paying voucher schools become fully private schools, or if teaching quality differential between schools remain (Behrman et al., 2016; Valenzuela & Montencinos, 2017). Overall the results presented here contribute to contemporary education policy debates by highlighting the key role of choice processes on the generation of achievement inequalities as intertwined social phenomena. Put simply, our findings suggest that the formation of relatively homogeneous school communities as consequence of parents’ educational decisions widens achievement inequalities throughout the school years (Maaz et al., 2008; Crawford et al., 2017). In this way, we have advanced our understanding of the social processes involved in the transmission of social inequalities on academic achievement.

References

- Andrabi, T., Das, J., Ijaz Khwaja, A., & Zajonc, T. (2011). Do Value-Added Estimates Add Value? Accounting for Learning Dynamics. *American Economic Journal: Applied Economics*, 3(3), 29-54.
- Behrman, J. R., Tincani, M. M., Todd, P. E., & Wolpin, K. I. (2016). Teacher Quality in Public and Private Schools under a Voucher System: The Case of Chile. *Journal of Labor Economics*, 34(2), 319-362.
- Boonk, L., Gijsselaers, H. J., Ritzen, H., & Brand-Gruwel, S. (2018). A review of the relationship between parental involvement indicators and academic achievement. *Educational Research Review*, 24, 10-30.
- Boudon, R. (1974). *Education, Opportunity, and Social Inequality. Changing Prospects in Western Societies*. New York: Wiley.
- Bourne, M., Bukodi, E., Betthäuser, B., & Goldthorpe, J. H. (2018). 'Persistence of the social': The role of cognitive ability in mediating the effects of social origins on educational attainment in Britain. *Research in Social Stratification and Mobility*, 58, 11-21.
- Breen, R. & Goldthorpe, J. H. (1997). Explaining educational differentials. Towards a formal rational action theory. *Rationality and Society*, 9, 275-305.
- Briggs, D. C., & Betebenner, D. (2009). *Is growth in student achievement scale dependent?* Paper presented at the annual meeting of the National Council for Measurement in Education (NCME), San Diego, CA.
- Burgess, S., Greaves, E., Vignoles, A., & Wilson, D. (2015). What parents want: School preferences and school choice. *The Economic Journal*, 125(587), 1262-1289.
- Caro, D. H., McDonald, T., & Willms, J. D. (2009). Socio-economic status and academic achievement trajectories from childhood to adolescence. *Canadian Journal of Education*, 32(3), 558-590.
- Castellano, K. E., Rabe-Hesketh, S., & Skrondal, A. (2014). Composition, context, and endogeneity in school and teacher comparisons. *Journal of Educational and Behavioral Statistics*, 39(5), 333-367
- Clarke, P., Crawford, C., Steele, F., & Vignoles, A. (2015). Revisiting fixed-and random-effects models: some considerations for policy-relevant education research. *Education Economics*, 23(3), 259-277.
- Coleman, J. S. (1988). Social capital in the creation of human capital. *American journal of sociology*, 94, S95-S120.
- Contreras, D., Sepúlveda, P., & Bustos, S. (2010). When Schools Are the Ones that Choose: The Effects of Screening in Chile *. *Social Science Quarterly*, 91(5), 1349-1368.

- Crawford, Claire, Macmillan, Lindsey, & Vignoles, Anna. (2017). When and Why Do Initially High-Achieving Poor Children Fall Behind? *Oxford Review of Education*, 43(1), 88-108.
- Crosnoe, R., & Muller, C. (2014). Family socioeconomic status, peers, and the path to college. *Social problems*, 61(4), 602-624.
- Domingue, B. W., Belsky, D. W., Fletcher, J. M., Conley, D., Boardman, J. D., & Harris, K. M. (2018). The social genome of friends and schoolmates in the National Longitudinal Study of Adolescent to Adult Health. *Proceedings of the National Academy of Sciences*, 115(4), 702-707.
- Dronkers, J., & Robert, P. (2008). School Choice in the Light of the Effectiveness Differences of Various Types of Public and Private Schools in 19 OECD Countries. *Journal of School Choice*, 2(3), 260-301.
- Dronkers, J., & Avram, S. (2010). A Cross- National Analysis of the Relations of School Choice and Effectiveness Differences between Private- Dependent and Public Schools. *Educational Research and Evaluation* (2), 151-175.
- Geven, S., Weesie, J., & Van Tubergen, F. (2013). The influence of friends on adolescents' behavior problems at school: The role of ego, alter and dyadic characteristics. *Social Networks*, 35(4), 583-592.
- Goldring, E., & Phillips, K. (2008). Parent preferences and parent choices: The public-private decision about school choice. *Journal of Education Policy*, 23(3), 209-230.
- Goldstein, H., & Sammons, P. (1997). The Influence of Secondary and Junior Schools on Sixteen Year Examination Performance: A Cross-classified Multilevel Analysis. *School Effectiveness and School Improvement*, 8(2), 219-230.
- Gubbins, V., & Otero, G. (2016). Effect of the parental involvement style perceived by elementary school students at home on Language and Mathematics performance in Chilean schools. *Educational Studies*, 42(2), 121-136.
- Hatcher, R. (1998). Class Differentiation in Education: Rational choices? *British Journal of Sociology of Education*, 19(1), 5-24.
- Hobbs, Graham. (2016). Explaining Social Class Inequalities in Educational Achievement in the UK: Quantifying the Contribution of Social Class Differences in School "Effectiveness". *Oxford Review of Education*, 42(1), 16-35
- Hsieh, Chang-Tai, & Urquiola, Miguel. (2006). The effects of generalized school choice on achievement and stratification: Evidence from Chile's voucher program. *Journal of Public Economics*, 90(8), 1477-1503.
- Kosunen, S., & Carrasco, A. (2014). Parental preferences in school choice: Comparing reputational hierarchies of schools in Chile and Finland. *Compare: A Journal of Comparative and International Education*, 1-22.

- Lara, B., Mizala, A., & Repetto, A. (2011). The effectiveness of private voucher education: Evidence from structural school switches. *Educational Evaluation and Policy Analysis*, 33(2), 119-137.
- Langenkamp, A. G., & Carbonaro, W. (2018). How school socioeconomic status affects achievement growth across school transitions in early educational careers. *Sociology of Education*, 91(4), 358-378.
- Lauen, D. L., & Gaddis, S. M. (2013). Exposure to classroom poverty and test score achievement: Contextual effects or selection?. *American Journal of Sociology*, 118(4), 943-979.
- Lomi, A., Snijders, T. A., Steglich, C. E., & Torló, V. J. (2011). Why are some more peer than others? Evidence from a longitudinal study of social networks and individual academic performance. *Social Science Research*, 40(6), 1506-1520.
- Maaz, K., Trautwein, U., Lüdtke, O., & Baumert, J. (2008). Educational Transitions and Differential Learning Environments: How Explicit Between-School Tracking Contributes to Social Inequality in Educational Outcomes. *Child Development Perspectives*, 2(2), 99-106.
- Manski, C. F. (2000). Economic analysis of social interactions. *Journal of economic perspectives*, 14(3), 115-136.
- Marks, G. N. (2013). *Education, social background and cognitive ability: The decline of the social*. Routledge.
- Marks, G. N. (2015). Are school-SES effects statistical artefacts? Evidence from longitudinal population data. *Oxford Review of Education*, 41(1), 122-144.
- Mizala, A., & Torche, F. (2012). Bringing the schools back in: the stratification of educational achievement in the Chilean voucher system. *International Journal of Educational Development*, 32(1), 132-144.
- Mood, Carina (2009). "Problems without ends: How rational choice theory escapes its explanatory task." In Hamilton, P. and Cherkaoui, M. (Eds.) *Raymond Boudon: A Life in Sociology*. Oxford: The Bardwell Press.
- Morgan, S. L., & Todd, J. J. (2009). Intergenerational closure and academic achievement in high school: A new evaluation of Coleman's conjecture. *Sociology of Education*, 82(3), 267-286.
- Nash, R. (2003). Is the school composition effect real?: A discussion with evidence from the UK PISA data. *School effectiveness and school improvement*, 14(4), 441-457.
- Reay, D., Ball, S. (1997) 'Spoilt for Choice: The Working Classes and Educational Markets', *Oxford Review of Education*, 23(1), pp. 89-101.
- Sullivan, A. (2001). Cultural capital and educational attainment. *Sociology*, 35(4), 893-912.

- Sullivan, A., Ketende, S., & Joshi, H. (2013). Social Class and Inequalities in Early Cognitive Scores. *Sociology*, 47(6), 1187-1206.
- Thrupp, M., Lauder, H., & Robinson, T. (2002). School composition and peer effects. *International journal of educational research*, 37(5), 483-504.
- Torche, F. (2005). Unequal but Fluid: Social Mobility in Chile in Comparative Perspective. *American Sociological Review*, 70(3), 422-450.
- Torche, F. (2018). Prenatal exposure to an acute stressor and children's cognitive outcomes. *Demography*, 55(5), 1611-1639.
- Trejo, S., Belsky, D. W., Boardman, J. D., Freese, J., Harris, K. M., Herd, P., ... & Domingue, B. W. (2018). Schools as moderators of genetic associations with life course attainments: evidence from the WLS and Add Heath. *Sociological science*, 5, 513-540.
- Triventi, M. (2015). Gary N. Marks, "Education, Social Background and Cognitive Ability: The Decline of the Social." New York: Routledge, 2014, 292 pp. *Sociologica*, 9(2), 0-0.
- Tucker-Drob, E. M., & Harden, K. P. (2012). Learning motivation mediates gene-by-socioeconomic status interaction on mathematics achievement in early childhood. *Learning and Individual Differences*, 22(1), 37-45
- Valenzuela, J. P., Bellei, C., & Ríos, D. D. L. (2014). Socioeconomic school segregation in a market-oriented educational system. The case of Chile. *Journal of education Policy*, 29(2), 217-241.
- Valenzuela, J. P., & Montecinos, C. (2017). Structural reforms and equity in Chilean schools. In *Oxford Research Encyclopedia of Education*.
- Van Ewijk, R., & Sleegers, P. (2010). The effect of peer socioeconomic status on student achievement: A meta-analysis. *Educational Research Review*, 5(2), 134-150.
- Van De Werfhorst, H., & Hofstede, S. (2007). Cultural capital or relative risk aversion? Two mechanisms for educational inequality compared. *British Journal of Sociology*, 58(3), 391-415.
- Von Hippel, P. T. (2007). 4. Regression with missing Ys: an improved strategy for analyzing multiply imputed data. *Sociological Methodology*, 37(1), 83-117.
- Weeden, K. A., Kim, Y. M., Di Carlo, M., & Grusky, D. B. (2007). Social class and earnings inequality. *American Behavioral Scientist*, 50(5), 702-736.
- Wilson, D., Burgess, S., & Briggs, A. (2011). The dynamics of school attainment of England's ethnic minorities. *Journal of Population Economics*, 24(2), 681-700.

Figure 1. Distribution of parents' preferences of schools and higher education across socioeconomic groups

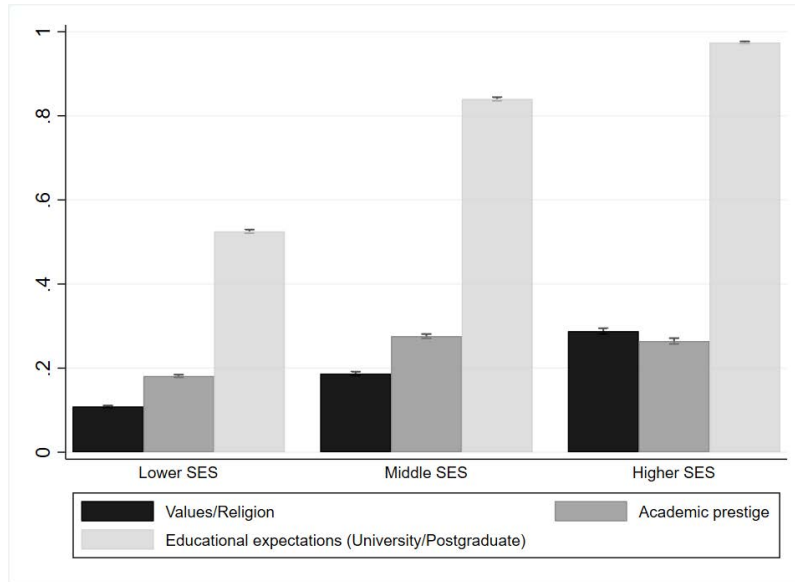


Figure 2. Achievement gradient in Mathematics 4th grade (2006) - 10th grade (2012) by socioeconomic group. Random sample (5%).

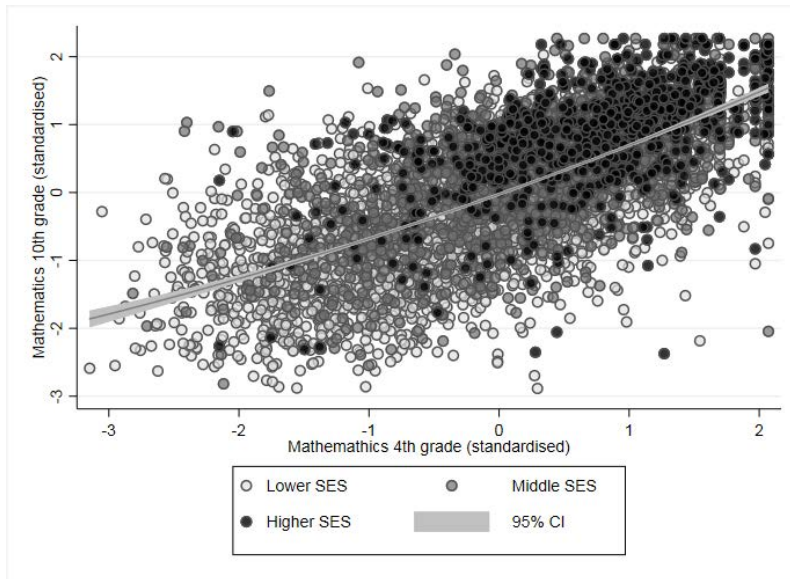
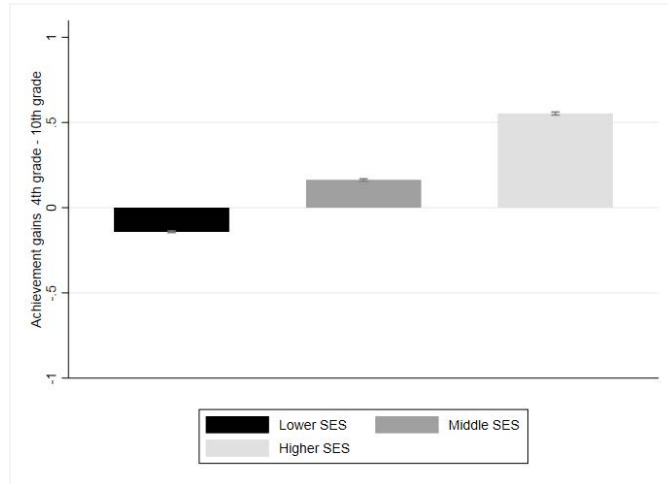


Figure 3. Academic gains between 4th and 10th grade by socioeconomic group and school sector.

(a)



(b)

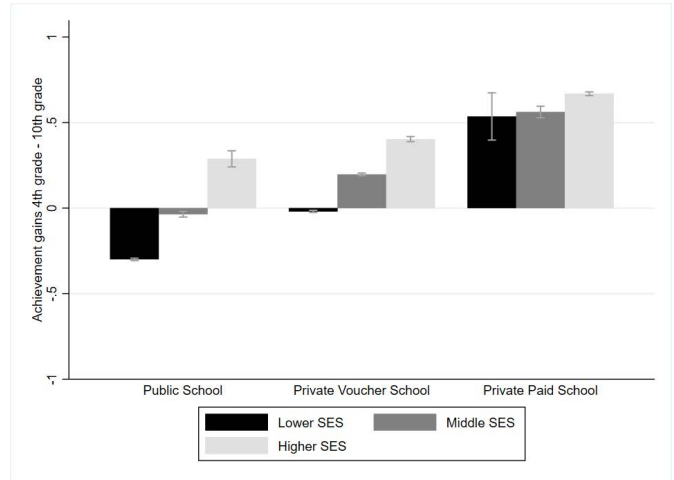


Figure 4. Inequality in achievement gains across models.

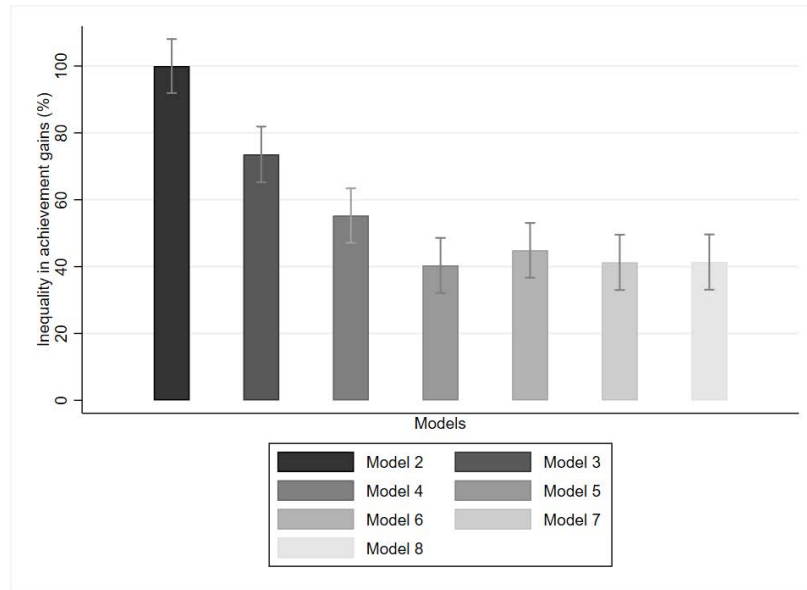


Table 1. Descriptive statistics for individual and school variables.

Variables	Total		Public School		Private Voucher		Private-Paid	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Individual level								
Achievement (10 th grade)	0.000	1.000	-0.439	0.938	0.057	0.919	1.078	0.727
Achievement (4 th grade)	0.000	1.000	-0.256	1.027	0.016	0.958	0.736	0.757
SES (10 th grade)	-0.013	1.017	-0.516	0.785	-0.046	0.841	1.820	0.715
SES (4 th grade)	0.006	1.008	-0.500	0.763	-0.025	0.808	1.832	0.717
Female	0.519		0.521		0.522		0.494	
Grade retention	0.054		0.074		0.047		0.027	
Educational preference (academic prestige)	0.215		0.234		0.202		0.232	
Educational preference (values/religion)	0.152		0.022		0.191		0.339	
Educational expectations (University/Postgraduate)	0.671		0.533		0.695		0.977	
N (Students)	141110		44431		82959		13720	
School level								
Mean school SES	-0.021	0.697	-0.452	0.371	-0.050	0.482	1.547	0.329
Public school (reference)	0.315		1.000		0.000		0.000	
Private voucher school	0.588		0.000		1.000		0.000	
Private paid school	0.097		0.000		0.000		1.000	
Religious school	0.419		0.133		0.541		0.607	
Rural school	0.034		0.033		0.038		0.016	
Mean school Educational preference(values/religion)	0.152		0.022		0.190		0.339	
Mean school Educational preference (academic prestige)	0.213		0.233		0.201		0.229	
Mean school Educational expectations (University/Postgraduate)	0.672		0.533		0.695		0.977	
School selectivity	-0.011	0.711	-0.500	0.175	-0.002	0.503	1.515	0.685
N (Schools)	2715		737		1607		371	

Source. SIMCE assessments 4th grade (2006) - 10th grade (2012), and administrative records. Own calculations.

Table 2. ANOVA Models. Percentage of total variance of SIMCE mathematics achievement (Panel A) and social background (Panel B) between schools. 4th grade (2006) and 10th grade (2012).

A	Mathematics 10th grade	Variance between schools	Variance within schools	% Variance between schools
	All	0,530	0,503	51,3%
	Public School	0,245	0,530	31,63%
	Private Voucher School	0,370	0,507	42,21%
	Private Paid School	0,275	0,390	41,41%
	Mathematics 4th grade			
	All	0,266	0,740	26,46%
	Public School	0,151	0,841	15,19%
	Private Voucher School	0,242	0,701	25,66%
	Private Paid School	0,076	0,494	13,27%
B	SES 10th grade			
	All	0,704	0,398	63,88%
	Public School	0,128	0,374	25,43%
	Private Voucher School	0,288	0,406	41,52%
	Private Paid School	0,171	0,430	28,46%
	SES 4th grade			
	All	0,598	0,383	60,98%
	Public School	0,122	0,363	25,16%
	Private Voucher School	0,374	0,390	49,00%
	Private Paid School	0,167	0,444	27,41%

Source. SIMCE assessments 4th grade (2006) - 10th grade (2012), and administrative records. Own calculations.

Table 3. Three-way decomposition of total variance attributable to the components of achievement inequality in mathematics scores and socioeconomic status.

	4th grade (2006)	10th grade (2012)	$\Delta\%$
Mathematics			
Between school sectors (BSS)	0.086	0.172	100.86%
Between schools/within school sectors (BS/WSS)	0.158	0.314	98.73%
Within schools (WS)	0.740	0.503	-32.03%
SES			
Between school sectors (BSS)	0.434	0.389	-10.35%
Between schools/within school sectors (BS/WSS)	0.194	0.221	14.13%
Within schools (WS)	0.383	0.398	3.97%

Source. SIMCE assessments 4th grade (2006) - 10th grade (2012), and administrative records. Own calculations.

Table 4. Multilevel Linear Regression. Mathematics test 10th grade. Effects of parents' educational preferences on academic gains inequality.

		Model 1	Model 2	Model 3	Model 4
Fixed Effects	Individual level				
	SES	0.13*** (0.003)	0.071*** (0.003)	0.052*** (0.003)	0.040*** (0.003)
	Early Achievement (4 th grade)		0.449*** (0.002)	0.437*** (0.002)	0.437*** (0.002)
	Female	-0.18*** (0.004)	-0.099*** (0.004)	-0.106*** (0.004)	-0.106*** (0.003)
	Grade retention	-0.311** (0.01)	-0.152*** (0.008)	-0.131*** (0.008)	-0.132*** (0.008)
	Educational preference (academic prestige)			0.068*** (0.005)	0.069*** (0.005)
	Educational preference (values/religion)			0.016** (0.006)	0.069** (0.005)
	Educational expectations (University/Postgraduate)			0.188*** (0.005)	0.187*** (0.005)
	School-level				
	Mean school SES				
		Private voucher school (Ref.: Public School)			0.309*** (0.02)
		Private paid school			0.813*** (0.026)
		Religious school			0.09*** (0.02)
		Rural school			-0.131*** (0.012)
	Mean school Educational preference (academic prestige)				
	Mean school Educational preference(values/religion)				
	Mean school Educational expectations (University/Postgraduate)				
	School selectivity				
	Constant	0.013*** (0.009)	-0.125*** (0.009)	-0.124*** (0.009)	-0.441*** (0.01)
Random Effects	Σv_{j1} (SES)	0.004** (0.0007)	0.002** (0.0005)	0.003** (0.0005)	0.002** (0.0005)
	Σv_{j0}	0.401** (0.012)	0.214** (0.006)	0.189** (0.006)	0.13** (0.004)
	$\Sigma \epsilon_{ij}$	0.491** (0.002)	0.352** (0.001)	0.346** (0.001)	0.346** (0.001)
	ICC (School)	0.452	0.382	0.356	0.276
	%Variance explained (Student level)	2%	30%	31%	31%
	%Variance explained (School level)	20%	57%	62%	74%
	Observations	141110	141110	141110	141110
	Number of schools	2715	2715	2715	2715

Source: SIMCE 2006, 2012 and administrative records. Own calculations.

Note: Standard error in brackets. All standard errors calculated by taking into account both the variance between and within plausible values.

***p<0.01, **p<0.05, *p<0.1 two-tailed tests.

Table 5. Multilevel Linear Regression. Mathematics test 10th grade. Compositional effects of parents' educational preferences and beliefs on academic gains inequality.

		Model 5	Model 6	Model 7	Model 8
Fixed Effects	Individual level				
	SES	0.029*** (0.003)	0.032*** (0.003)	0.030*** (0.003)	0.030*** (0.003)
	Early Achievement (4 th grade)	-0.107*** (0.003)	-0.108*** (0.003)	-0.108*** (0.003)	-0.108*** (0.003)
	Female	-0.133*** (0.008)	-0.130*** (0.008)	-0.131*** (0.008)	-0.131*** (0.008)
	Grade retention	0.436*** (0.002)	0.434*** (0.002)	0.434*** (0.002)	0.433*** (0.002)
	Educational preference (academic prestige)	0.006 (0.006)	0.000 (0.006)	0.000 (0.006)	-0.000 (0.006)
	Educational preference (values/religion)	0.067*** (0.005)	0.055*** (0.005)	0.055*** (0.005)	0.055*** (0.005)
	Educational expectations (University/Postgraduate)	0.184*** (0.005)	0.179*** (0.005)	0.180*** (0.005)	0.180*** (0.005)
	School level				
	Mean school SES	0.433*** (0.016)		0.132*** (0.021)	0.046** (0.021)
	Private voucher school (Ref.: Public School)	0.109*** (0.017)	0.137*** (0.015)	0.116*** (0.015)	0.103*** (0.015)
	Private paid school	-0.005 (0.038)	0.424*** (0.024)	0.265*** (0.034)	0.133*** (0.035)
	Religious school	0.079*** (0.014)	0.035** (0.014)	0.043*** (0.014)	0.030** (0.014)
	Rural school	0.076*** (0.029)	0.074*** (0.025)	0.099*** (0.025)	0.095*** (0.024)
	Mean school Educational preference (academic prestige)		0.300*** (0.038)	0.280*** (0.038)	0.006 (0.043)
	Mean school Educational preference(values/religion)		0.808*** (0.037)	0.819*** (0.037)	0.761*** (0.036)
	Mean school Educational expectations (University/Postgraduate)		0.603*** (0.033)	0.409*** (0.045)	0.440*** (0.044)
	School selectivity				0.209*** (0.017)
	Constant	-0.223*** (0.015)	-0.843*** (0.018)	-0.686*** (0.030)	-0.625*** (0.030)
	Random Effects	Σv_{j1} (SES)	0.0015*** (0.000)	0.0018*** (0.000)	.0018*** (0.000)
Σv_{j0}		0.097*** (0.003)	0.067*** (0.002)	0.068*** (0.002)	0.062*** (0.002)
$\Sigma \epsilon_{ij}$		0.346*** (0.001)	0.346*** (0.001)	0.346*** (0.001)	0.346*** (0.001)
ICC (School)		0.222	0.170	0.168	0.158
% Variance explained (Student level)		31%	31%	31%	31%
% Variance explained (School level)		81%	86%	86%	87%
Observations		141110	141110	141110	141110
Number of schools		2715	2715	2715	2715

Source: SIMCE 2006, 2012 and administrative records. Own calculations.

Note: Standard error in brackets. All standard errors calculated by taking into account both the variance between and within plausible values.

Significance: ***p<0.01, **p<0,05, *p<0,1 two-tailed tests.

Table 6. Multilevel Linear Regression. Mathematics test 10th grade. Interaction effects between educational preferences and beliefs with socioeconomic background on achievement inequality. Selected coefficients.

		Model 9	Model 10
Fixed Effects	Individual level		
	SES	-0.007 (0.005)	-0.054*** (0.008)
	Educational preference (academic prestige)	0.055*** (0.005)	0.055*** (0.005)
	Educational preference (values/religion)	-0.003 (0.006)	0.000 (0.006)
	Educational expectations (University/Postgraduate)	0.202*** (0.005)	0.182*** (0.005)
	SES x Educational preference (academic prestige)	0.001 (0.005)	
	SES x Educational preference (values/religion)	0.009 (0.005)	
	SES x Educational expectations (University/Postgraduate)	0.051*** (0.006)	
	Controls (Student level)	Yes	Yes
	School level		
	Mean School SES	0.040* (0.021)	0.025 (0.021)
	Mean school Educational preference (academic prestige)	0.760*** (0.036)	0.764*** (0.036)
	Mean school Educational preference(values/religion)	0.005 (0.043)	0.006 (0.043)
	Mean school Educational expectations (University/Postgraduate)	0.449*** (0.043)	0.505*** (0.044)
	SES x Mean school Educational preference (academic prestige)		-0.005 (0.015)
	SES x Mean school Educational preference(values/religion)		-0.029* (0.016)
	SES x Mean school Educational expectations (University/Postgraduate)		0.133*** (0.015)
	Controls (School level)	Yes	yes
	Constant	-0.656*** (0.030)	-0.690*** (0.030)
Random Effects	Σv_{j1} (SES)	0.0013** (0.000)	0.0011** (0.000)
	Σv_{j0}	0.062** (0.004)	0.061** (0.002)
	$\Sigma \epsilon_{ij}$	0.346** (0.001)	0.346** (0.001)
	ICC (school)	0.155	0.154
	%Variance explained (student level)	31%	31%
	%Variance explained (school level)	88%	88%
	Observations	141110	141110
	Number of schools	2715	2715

Source: SIMCE 2006, 2012 and administrative records. Own calculations.

Note: Standard error in brackets. All standard errors calculated by taking into account both the variance between and within plausible values.

***p<0.01, **p<0.05, *p<0.1 two-tailed tests.

Appendix

Table A.1.1. Overview of individual and school level variables.

Variables	Description	Grade
Individual level		
Achievement	z-score mathematics national assessment	10 th
SES 10 th	z-score (linear combination of parents' years of education, household income and number of books at home)	10 th
SES 4 th	z-score (linear combination of parents' years of education, household income and number of books at home)	4 th
Early Achievement	z-score mathematics national assessment	4 th
Female	1=Female	10 th
Grade retention	1=Student repeated grade once or more times	10 th
Educational preference (academic prestige)	1=yes, 0=otherwise	10 th
Educational preference (values/religion)	1=yes, 0=otherwise	10 th
Educational expectations (University/Postgraduate)	1= University/Postgraduate, 0=lower expectations	10 th
School level		
Mean school SES	z-score (aggregated from individual level SES)	
Public school	Reference	10 th
Private voucher school	1=Private voucher school, 0=other	10 th
Private paid school	1=Private paid school, 0=other	10 th
Religious school	1=Religious school, 0=Secular school	
Rural school	1=Rural school, 0=Urban school	10 th
Mean school choice by academic prestige	Aggregated from individual level dummy	10 th
Mean school choice by values/religion	Aggregated from individual level dummy	10 th
Mean school educational expectations	Aggregated from individual level dummy	10 th
School selectivity	z-score (linear combination of mean school responses of parents reported been interviewed, child took academic test, requested religious marriage and baptism of child, school enrolment fee and monthly tuition fee)	10 th

Table A.1.2. Descriptive statistics for individual and school variables. Original sample.

Variables	Total		N	Missing %	Public school		N	Private voucher school		N	Private paid school		N
	Mean	SD			Mean	SD		Mean	SD		Mean	SD	
Individual level													
Achievement (10 th grade)	0.000	1	141110	0.0	-0.439	0.938	44431	0.057	0.919	82959	1.078	0.727	13720
Achievement (4 th grade)	0.000	1	141110	0.0	-0.256	1.027	44431	0.016	0.958	82959	0.736	0.757	13720
SES (10 th grade)	0.000	1	109488	22.4	-0.519	0.737	34752	-0.016	0.809	64200	1.809	0.669	10536
SES (4 th grade)	0.000	1	134266	4.9	-0.497	0.758	42550	-0.022	0.802	79193	1.831	0.713	12523
Female	0.519		141110	0.0	0.521		44431	0.522		82959	0.494		13720
Grade retention	0.051		109578	22.4	0.072		34703	0.044		64307	0.027		10568
Educational preference (academic prestige)	0.222		107565	23.8	0.243		33853	0.208		63228	0.235		10484
Educational preference (values/religion)	0.160		107565	23.8	0.022		33853	0.206		63228	0.331		10484
Educational expectations (University/Postgraduate)	0.685		105120	25.5	0.540		33404	0.716		61569	0.978		10147
School level													
Mean school SES	-0.007	0.688	2554	5.9	-0.446	0.349	706	-0.032	0.456	1502	1.552	0.307	346
Public school (reference)	0.315		2715	0.0	1.000		737	0.000		1607	0.000		371
Private voucher school	0.588		2715	0.0	0.000		737	1.000		1607	0.000		371
Private paid school	0.097		2715	0.0	0.000		737	0.000		1607	1.000		371
Religious school	0.419		2715	0.0	0.133		737	0.541		1607	0.607		371
Rural school	0.034		2715	0.0	0.033		737	0.038		1607	0.016		371
Mean school Educational preference(values/religion)	0.214		2554	5.9	0.232		706	0.202		1502	0.227		346
Mean school Educational preference (academic prestige)	0.153		2554	5.9	0.021		706	0.195		1502	0.333		346
Mean school Educational expectations (University/Postgraduate)	0.676		2552	6.0	0.534		705	0.703		1502	0.978		345
School selectivity	-0.011	0.711	2715	0.0	-0.500	0.175	737	-0.002	0.503	1607	1.515	0.685	371

Source: SIMCE 2006, 2012 and administrative records. Own calculations.

Table A.1.3. Transitions across school sectors between 4th grade (2006) and 10th grade (2012), by social background and early achievement.

4th grade (2006)		10th grade (2012)			
		Public	Private Voucher	Private Paid	Total
Public	SES	-0.308	-0.185	0.549	-0.248
	Achievement (4th grade)	.592	-0.353	1.191	-0.478
	N	33114	27100	364	60578
Private Voucher	SES	-0.022	0.140	0.566	0.127
	Achievement (4th grade)	.202	0.129	1.333	0.113
	N	11144	54855	2139	68138
Private Paid	SES	0.793	0.537	0.794	0.773
	Achievement (4th grade)	.998	1.093	1.893	1.812
	N	173	1004	11217	12394
Total	SES	-0.232	0.039	0.752	0.023
	Achievement (4th grade)	0.489	-0.007	1.788	0.012
	N	44431	82959	13720	141110

Source: SIMCE 2006, 2012 and administrative records. Own calculations.

Table A.1.4. Transition across school sectors between 4th grade (2006) and 10th grade (2012), by parents' educational preferences and beliefs.

4th grade (2006)		10th grade (2012)			
		Public	Private Voucher	Private Paid	Total
Public	Academic prestige	19.87%	20.57%	36.50%	20.27%
	Values/religion	2.23%	16.89%	22.81%	8.69%
	Expectations (University/Postgraduate)	49.79%	60.09%	95.33%	54.46%
	N	33114	27100	364	60578
Private Voucher	Academic prestige	37.05%	20.98%	36.64%	23.99%
	Values/religion	1.95%	22.25%	21.14%	19.01%
	Expectations (University/Postgraduate)	66.32%	76.40%	97.12%	75.42%
	N	11144	54855	2139	68138
Private Paid	Academic prestige	62.68%	21.66%	20.60%	21.31%
	Values/religion	1.41%	18.07%	35.55%	33.57%
	Expectations (University/Postgraduate)	95.71%	93.69%	97.95%	97.56%
	N	173	1004	11217	12394
Total	Academic prestige	24.33%	20.86%	23.46%	22.20%
	Values/religion	2.16%	20.56%	33.02%	15.99%
	Expectations (University/Postgraduate)	54.05%	71.62%	97.76%	68.57%
	N	44431	82959	13720	141110

Source: SIMCE 2006, 2012 and administrative records. Own calculations.

Table A.1.5. Social composition across and within school sectors between 4th grade (2006) and 10th grade (2012). Structural switches.

4th grade (2006)		10th grade (2012)			
		Public	Private Voucher	Private Paid	Total
Public	Lower SES	84.4%	74.2%	8.0%	79.4%
	Middle SES	14.4%	23.1%	34.3%	18.4%
	Higher SES	1.2%	2.6%	57.7%	2.2%
	N	33114	27100	364	60578
Private Voucher	Lower SES	64.2%	45.3%	2.0%	47.1%
	Middle SES	31.6%	43.1%	24.7%	40.6%
	Higher SES	4.2%	11.6%	73.3%	12.3%
	N	11144	54855	2139	68138
Private Paid	Lower SES	9.8%	3.7%	0.4%	0.8%
	Middle SES	41.0%	37.6%	7.6%	10.5%
	Higher SES	49.1%	58.7%	92.0%	88.7%
	N	173	1004	11217	12394
Total	Lower SES	79.0%	54.3%	0.9%	56.9%
	Middle SES	18.8%	36.5%	10.9%	28.5%
	Higher SES	2.1%	9.2%	88.2%	14.7%
	N	44431	82959	13720	141110

Source: SIMCE 2006, 2012 and administrative records. Own calculations.

Table A.1.6. Transition across and within school sectors between 4th grade (2006) and 10th grade (2012).
Structural switches.

4th grade (2006)		10th grade (2012)			
		Public	Voucher	Private	Total
Public	Stayed at school	8.69%	0.05%	0.00%	4.77%
	Switched school after 8th grade	66.86%	59.21%	28.30%	63.21%
	Switched school before 8th grade	4.84%	17.42%	43.41%	10.70%
	Switched school before and after 8th grade	19.62%	23.32%	28.30%	21.33%
N		33114	27100	364	60578
Private Voucher	Stayed at school	0.12%	41.25%	4.58%	33.37%
	Switched school after 8th grade	51.67%	28.54%	26.27%	32.26%
	Switched school before 8th grade	16.22%	15.52%	47.12%	16.63%
	Switched school before and after 8th grade	32.00%	14.68%	22.02%	17.75%
N		11144	54855	2139	68138
Private Paid	Stayed at school	0.00%	9.36%	73.96%	67.69%
	Switched school after 8th grade	15.03%	19.72%	6.21%	7.43%
	Switched school before 8th grade	53.18%	46.22%	14.70%	17.79%
	Switched school before and after 8th grade	31.79%	24.70%	5.13%	7.08%
N		173	1004	11217	12394
Total	Stayed at school	6.50%	27.40%	61.18%	24.11%
	Switched school after 8th grade	62.85%	38.46%	9.93%	43.36%
	Switched school before 8th grade	7.88%	16.51%	20.52%	14.18%
	Switched school before and after 8th grade	6.50%	27.40%	61.18%	24.11%
N		44431	82959	13720	141110

Source: SIMCE 2006, 2012 and administrative records. Own calculations.

Table A.1.7. Multilevel Linear Regression. Mathematics test 10th grade. Effects of parents' educational preferences on academic inequality. School switchers sample.

		Model 1	Model 2	Model 3	Model 4	
Fixed Effects	Individual level					
	SES	0.132*** (0.004)	0.071*** (0.003)	0.052*** (.003)	0.035*** (0.003)	
	Early Achievement (4 th grade)		0.440*** (0.002)	0.428*** (0.002)	0.427*** (0.002)	
	Female	-0.182*** (0.005)	-0.010*** (0.004)	-0.108*** (0.004)	-0.108*** (0.004)	
	Grade retention	-0.315** (.011)	-0.158*** (0.009)	-0.138*** (0.009)	-0.139*** (0.009)	
	Educational preference (academic prestige)			0.081*** (0.006)	0.082*** (0.006)	
	Educational preference (values/religion)			0.013* (0.008)	0.002 (0.007)	
	Educational expectations (University/Postgraduate)			0.184*** (0.006)	0.183*** (0.006)	
	School level					
	Mean school SES					
	Private voucher school (Ref.: Public School)				0.299*** (0.018)	
	Private paid school				0.803*** (0.027)	
	Religious school				0.098*** (0.016)	
	Rural school				-0.151*** (0.032)	
	Mean school Educational preference (academic prestige)					
	Mean school Educational preference (values/religion)					
	Mean school Educational expectations (University/Postgraduate)					
	School selectivity					
	Constant		0.010 (0.013)	0.000 (0.009)	-0.139*** (0.010)	-.446*** (0.015)
	Random Effects	$\sum v_{j1}$ (SES)	0.005*** (0.001)	0.002*** (0.001)	0.003*** (0.001)	0.001*** (0.001)
	$\sum v_{j0}$	0.391*** (0.012)	0.214*** (0.007)	0.186*** (0.006)	0.131*** (0.004)	
	$\sum \epsilon_{ij}$	0.496*** (0.002)	0.357*** (0.002)	0.352*** (0.002)	0.352*** (0.002)	
	ICC (School)	0.444	0.377	0.349	0.273	
	% Variance explained (Student level)	3%	31%	32%	32%	
	% Variance explained (School level)	24%	58%	64%	75%	
	Observations	107094	107094	107094	107094	
	Number of schools	2710	2710	2710	2710	

Source: SIMCE 2006, 2012 and administrative records. Own calculations. Note: Standard error in brackets. All standard errors calculated by taking into account both the variance between and within plausible values. ***p<0.01, **p<0.05, *p<0.1 two-tailed tests.

Table A.1.8. Multilevel Linear Regression. Mathematics test 10th grade. Compositional effects of parents' educational preferences and beliefs on academic inequality. School switchers sample.

		Model 5	Model 6	Model 7	Model 8
Fixed Effects	Individual level				
	SES	0.021*** (0.003)	0.026*** (0.003)	0.023*** (0.003)	0.023*** (0.003)
	Early Achievement (4 th grade)	0.425*** (0.002)	0.423*** (0.002)	0.423*** (0.002)	0.423*** (0.002)
	Female	-0.110*** (0.004)	-0.111*** (0.004)	-0.111*** (0.004)	-0.111*** (0.004)
	Grade retention	-0.140*** (0.009)	-0.137*** (0.009)	-0.137*** (0.009)	-0.137*** (0.009)
	Educational preference (academic prestige)	-0.003 (0.008)	-0.011 (0.008)	-0.011 (0.008)	-0.011 (0.008)
	Educational preference (values/faith)	0.078*** (0.006)	0.062*** (0.006)	0.062*** (0.006)	0.061*** (0.006)
	Educational expectations (University/Postgraduate)	0.180*** (0.006)	0.175*** (0.006)	0.176*** (0.006)	0.176*** (0.006)
	School level				
	Mean school SES	0.449*** (0.017)		0.142*** (0.022)	0.053** (0.022)
	Private voucher school (Ref.: Public School)	0.095*** (0.018)	0.132*** (0.015)	0.110*** (0.015)	0.095*** (0.015)
	Private paid school	-0.033 (0.040)	0.418*** (0.025)	0.250*** (0.036)	0.109*** (0.037)
	Religious school	0.083*** (0.015)	0.034** (0.015)	0.043*** (0.015)	0.030** (0.014)
	Rural school	0.067** (0.030)	0.067*** (0.026)	0.092*** (0.026)	0.091*** (0.025)
	Mean school Educational preference (academic prestige)		0.332*** (0.041)	0.314*** (0.040)	0.026 (0.046)
	Mean school Educational preference (values/faith)		0.878*** (0.038)	0.893*** (0.038)	0.831*** (0.037)
	Mean school Educational expectations (University/Postgraduate)		0.580*** (0.035)	0.371*** (0.047)	0.408*** (0.046)
	School selectivity				0.220*** (0.018)
	Constant	-0.221*** (0.016)	-0.848*** (0.018)	-0.681*** (0.031)	-0.616*** (0.031)
Random Effects	$\sum v_{j1}$ (SES)	0.001*** (0.001)	0.001*** (0.001)	0.001*** (0.001)	0.001*** (0.001)
	$\sum v_{j0}$	0.099*** (0.003)	0.067*** (0.002)	0.066*** (0.002)	0.061*** (0.002)
	$\sum \epsilon_{ij}$	0.352*** (0.002)	0.352*** (0.002)	0.352*** (0.002)	0.352*** (0.002)
	ICC (School)	0.221	0.162	0.160	0.150
	% Variance explained (Student level)	32%	32%	32%	32%
	% Variance explained (School level)	81%	87%	87%	88%
	Observations	107094	107094	107094	107094
	Number of schools	2710	2710	2710	2710

Source: SIMCE 2006, 2012 and administrative records. Own calculations. Note: Standard error in brackets. All standard errors calculated by taking into account both the variance between and within plausible values. ***p<0.01, **p<0.05, *p<0.1 two-tailed tests.

Table A.1.9. Fixed effects Linear Regression. Mathematics test 10th grade. Interaction effects between educational preferences and beliefs with socioeconomic background on achievement gains. Selected coefficients. Full sample and school switchers sample.

		Model 9	Model 10	Model 9	Model 10
Fixed Effects	Student level	Full sample		School Switchers	
		SES	-0.004 (0.005)	-0.033*** (0.009)	-0.004 (0.005)
	Educational preference (academic prestige)	0.055*** (0.005)	0.054*** (0.005)	0.061*** (0.007)	0.060*** (0.007)
	Educational preference (values/religion)	-0.002 (0.006)	-0.000 (0.006)	-0.010 (0.008)	-0.011 (0.008)
	Educational expectations (University/Postgraduate)	0.200*** (0.006)	0.182*** (0.006)	0.194*** (0.007)	0.177*** (0.006)
	SES x Educational preference (academic prestige)	0.001 (0.005)		0.008 (0.006)	
	SES x Educational preference (values/religion)	0.009 (0.006)		0.002 (0.008)	
	SES x Educational expectations (University/Postgraduate)	0.046*** (0.006)		0.037*** (0.006)	
	Controls (Student level)	Yes	Yes	Yes	Yes
<hr/>					
School level					
Mean school Educational preference (academic prestige)					
Mean school Educational preference(values/religion)					
Mean school Educational expectations (University/Postgraduate)					
	SES x Mean school Educational preference (academic prestige)		-0.006 (0.016)		-0.009 (0.018)
	SES x Mean school Educational preference(values/religion)		0.014 (0.017)		-0.015 (0.022)
	SES x Mean school Educational expectations (University/Postgraduate)		0.091*** (0.017)		0.081*** (0.019)
	School fixed effects	Yes	Yes	Yes	Yes
	Constant	-0.091*** (0.005)	-0.085*** (0.005)	-0.176*** (0.006)	-0.168*** (0.005)
	ρ	0.394	0.394	0.492377	0.492822
	σ_{μ}	0.474	0.474	0.593201	0.593246
	σ_{ϵ}	0.589	0.589	0.407918	0.408318
	Observations	141110	141110	107094	107094
	Number of schools	2715	2715	2710	2710

Source: SIMCE 2006, 2012 and administrative records. Own calculations. Note: Standard error in brackets. All standard errors calculated by taking into account both the variance between and within plausible values. ***p<0.01, **p<0.05, *p<0.1 two-tailed tests.