I Z A Institute
of Labor Economics
Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 15652

Private Tutoring and Academic Achievement in a Selective Education System

Maria Zumbuehl
Stefanie Hof
Stefan C. Wolter

OCTOBER 2022

I Z A Institute
of Labor Economics

Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 15652

Private Tutoring and Academic Achievement in a Selective Education System

Maria Zumbuehl
CPB Netherlands Bureau for Economic Policy Analysis

Stefanie Hof
University of Basel

Stefan C. Wolter
University of Bern, SKBF Swiss Coordination Center for Research in Education, IZA and CESifo

OCTOBER 2022

ISSN: 2365-9793

IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

Private Tutoring and Academic Achievement in a Selective Education System*

Decisions about admission to selective schools usually rely on performance measures. To reach a required achievement threshold students may make use of additional resources, such as private tutoring. We investigate how the use of private tutoring relates to the transition probability to an academically demanding post compulsory school and the probability to successfully pass through this school, controlling for the students competencies after tutoring, but before the transition. Using PISA and linked register data from Switzerland, we find that students who had private tutoring before the transition are more likely to fail in the selective school than students who had the same level of competencies without tutoring.

JEL Classification: D82, I21, I24

Keywords: private tutoring, educational achievment, PISA, Switzerland

Corresponding author:
Maria Zumbuehl
CPB Netherlands Bureau for Economic Policy Analysis
Bezuidenhoutseweg 30
2594 AV The Hague
The Netherlands
E-mail: m.a.zumbuehl@cpb.nl

* We thank Lisette Swart as well as the participants in several workshops for helpful discussions and comments. Further,we are grateful to Markus Schwyn, Jacques Babel, and other staff of the Swiss Federal Statistical Office for the provision of the register data and their support. The funding by the Swiss Leading House on Economics of Education is gratefully acknowledged.

1 Introduction

In most countries, access to prestigious, high quality schools at upper-secondary level is selective and restrictive. In order to positively influence the chances of their children to access such schools, parents often organize private tutoring for their children. Therefore, it is not surprising that while private tutoring is widely prevalent in many countries all over the world (Park et al., 2016; Hille et al., 2016), participation rates are higher in countries with a highly selective school system (Bray, 2009; Guill and Lintorf, 2019). While there is a growing, although not abundant, literature about the causal impact of private tutoring on competencies (Cole, 2016; Hof, 2014; Fryer and Howard-Noveck, 2020; Zhang and Xie, 2015; Zhang, 2013), there is — to our knowledge — still a lack of knowledge about the mid- and long-term effects of private tutoring.

In this paper we fill some of this gap by looking at the impact of private tutoring on successfully finishing a selective academic school at upper-secondary level (baccalaureate schools). We are not addressing the question, whether the use of private tutoring increases the competencies of the students,[1] but rather look at the success rates of students of comparable pre-transition competencies, comparing those who entered the schools without private tutoring lessons to those who had made use of private tutoring before entering. Hence, if we assume that private tutoring has a positive impact on competencies, we compare the success probability of students who had reached a certain competence level without private tutoring to students who had reached the same levels only thanks to private tutoring. If, however, the impact of private tutoring is modest or negligible, we just compare students with similar abilities with and without private tutoring.

From the point of view of educational policy making, this paper is of interest, because the admission processes to selective schools are all explicitly or implicitly designed in a way to predict a students' academic potential, which should be linked to the probability to successfully pass the baccalaureate school. Independent of whether grade point averages (GPA) of previous school years, teacher recommendations or standardized external tests are used to make the entry selection, these systems all have in common that those students who pass the entry threshold are seen fit to pass the selective

[1] Hof (2014) studies the direct effects of tutoring on competencies in a similar setting.

upper-secondary academic schools. However, some students may have passed the thresholds only by taking extra training (private tutoring) and others have passed the thresholds without any extra support. This difference — and the information contained therein — is not taken into account when the educational authorities make their selection, but it could be predictive for future academic success. Our paper addresses this question whether students of comparable competencies with and without prior private tutoring really have the same success probabilities in a selective academic program.

To address this research question, we use PISA (Program for International Student Assessment) test data from 2012 from over 12'000 Swiss students, merged with register data. This allows us to follow the educational achievements of these students after the PISA test was taken. We also make use of the fact that in 2012, as a national option, Switzerland included a detailed survey on private tutoring in the PISA questionnaire. PISA is a low-stake exam as the outcome does not matter for the student taking it. Learning to the test will therefore not be an issue. As we focus on the students skills — a snapshot of where the student is — a low-stake exam is preferable to a high-stake one, as the students will not make any extra effort to raise their scores (Akyol et al., 2021). However, we have to assume that students with and without private tutoring do not differ in their attitude to taking a low stake test and that individual test scores are not biased in a systematic way.

Our empirical results indicate that it matters for the success rate in a selective program how a certain competence level before entering the program was reached. Students with private tutoring do worse in baccalaureate schools, i.e. they have a lower probability to receive a diploma in the baccalaureate school, within the regular time-frame and overall. The results highlight the fact that passing a particular threshold at the time of selection does not reveal all the necessary information to predict the future academic ability of students.

This paper is structured as follows. Section 2 describes the Swiss education system. Section 3 describes the data. Section 4 reports the results, and Section 5 presents the conclusion.

2 Swiss Education System

Compulsory education in Switzerland comprises kindergarten plus nine years of schooling, with six years of primary school and three years of lower secondary school. At the lower secondary school level, different school type models exist that vary from region (canton) to region. The majority of school type models sort students into different school tracks according to their intellectual abilities. Although two to four different tracks exist, the majority of regions apply a three-track model: an upper-level school track (pre-baccalaureate), which teaches the more intellectually demanding courses; an advanced level school track, and finally, one offering basic-level courses.

After finishing compulsory schooling (9th grade), students can choose between two different possibilities: full-time general schooling (baccalaureate school preparing for university) or vocational schooling, of which most of the programs are so-called dual (school plus firm based training; apprenticeships). Approximately 20% of school graduates attend an academic baccalaureate school, which prepares for university. All baccalaureate schools in Switzerland lead to nation-wide free access to all universities. However there exists neither a national leaving exam at the end of compulsory education, nor a national entrance exam for baccalaureate schools.

The Swiss education system comprises different regions with independent educational policies, which leads to a considerable variation in the education options within compulsory education (tracking), as well as in how baccalaureate schools and the access to them is organized. Requirements and entry procedures for admission to baccalaureate schools differ considerably by the track in compulsory education and regional rules, but in simplified terms, we can identify three types of entry procedure. Type 1 concerns students who are pre-tracked for baccalaureate schools and requires the students mainly to reach a sufficient GPA in order to transition into the post-compulsory baccalaureate school. Type 2 (for not pre-tracked students) characteristically does not entail a leaving or entrance exam, but relies instead on previous attainment records (Grade Point Average, GPA) and/or the teachers' evaluation of the students. Under Type 3, a leaving or entrance exam usually determines admission to the baccalaureate school, comparable to a standardized achievement test (SAT). Several regions offer Type 1 combined with either Type 2 or 3.

3 Data

We match data from the PISA 2012 survey to register data on student enrollment in the Swiss educational system. This allows us to follow the PISA participants' transition into upper secondary education and their success within their chosen educational path. The register data is provided by the Federal Statistical Office Switzerland and contains yearly information on all students who are enrolled in any type of educational institution. We follow students for seven years after their compulsory education. We register whether a students receives a diploma from a baccalaureate school and whether this degree is reached in the nominal study duration or with a delay.

We use two different samples for the different stages of our analysis: In the first step we analyze whether the students enter a baccalaureate school, using the transition sample, which includes all students in the PISA study. In the second step we investigate whether students in baccalaureate schools finish the school successful witin the seven years we observe. For this analysis we focus only on students, who did transition into a baccalaureate school; the baccalaureate sample.

Due to regional oversampling of students in the last year of compulsory school in the PISA study we observe a large sample of 12'696 graduates from compulsory school in 2012 and a sample of 3055 students who started studying at a baccalaureate school. Additional to the international student background questionnaire, the Swiss PISA 2012 questionnaire included a detailed survey on private tutoring as a national option.[2] The survey focused on self-initiated tutoring, i.e., private tutoring not initiated by the school or some official party but rather by the student's parents or the student him or herself. Furthermore, it is a fee-based private tutoring in academic subjects.[3] The questions provide information about the frequencies, motives, and other relevant variables related to private tutoring in 8/9th grade among 9th graders.[4] The combination of this additional information, the PISA

[2]For the first time, private tutoring in Switzerland was surveyed in 2009. In the period between 2009 and 2012 the rate in self-initiated private tutoring increased by 10 percent (Hof and Wolter, 2014).

[3]Past research (for example Banerjee et al., 2007; De Paola and Scoppa, 2014) focused mainly on remedial private tutoring programs, i.e., tutoring programs explicitly targeting weaker students lagging behind in some academic skills.

[4]While we base our main analyses on an aggregated index that includes any tutoring, it is possible to distinguish between different types of tutoring and different motives. Table A1 in the Appendix reports the average share of students by the relevant group and type

scores and the register data allows us to analyze whether students who had obtained the same PISA scores and are comparable in many other ways (the PISA background survey provides us with a rich set of observable student characteristics), but differ in relation of making use of private tutoring prior to the PISA test, have similar or different success receiving an academic baccalaureate school, conditional on transitioning into this educational track.

We code the variable private tutoring as binary variable if the student had any private tutoring in the 8/9th grade. As a robustness check we additionally create a variable that captures only private tutoring that took place on a regular basis, e.g., tutoring over several weeks or months (as a distinction to private tutoring on an irregular basis, e.g., tutoring during some lessons, which is included in the first binary variable).

The PISA data set further provides data on the achievement scores in mathematics, language and science which we use as proxies for cognitive skills. The focus of the 2012 PISA test was on mathematics, therefore the math scores are the most precisely measured test scores. Further not all students have had a language or science test, which is why we focus on math skills in our main analysis. It is important to note again that these skills are measured after the tutoring has taken place. We also use the OECD thresholds to categorize students into competence levels from 1 (low) to 6 (high) which help to better understand the actual meaning of the continuous PISA scores. Since we investigate the transition into and success in baccalaureate schools, which are academically demanding, we are particularly interested in high-performing students (PISA competence level 4 to 6). While the PISA test as such is not used for the transition decision, the competencies that are demanded for the transition into a baccalaureate school closely correspond to a PISA competence level of at least 4 in all subjects.

The PISA student survey elicits whether the students had been late for class during the weeks preceding the test. We use this information on punctuality as a proxy for non-cognitive skills[5], as a binary variable, with a value 1 if never late for school.

In addition to the tutoring and skills variables we include a number

or motive of tutoring. Using the additional information on motives in the analysis does not lead to qualitatively different results.

[5]Punctuality is a facet of conscientiousness, a personality trait that is highly predictive for education and labor market outcomes (see e.g. Almlund et al., 2011).

of socio-demographic and regional control variables. Most of the socio-demographic variables are taken from the PISA test. The migration background indicates whether the student has been either born abroad or whose parents have not been born in Switzerland. We generate a dummy variable for missing migration background. Language is a binary variable that captures if the language the student speaks at home matches with the language of the PISA test.[6] Missing values are again captured by a dummy variable. The variable parents' education reports the highest education of any parent in the family in years of education. The socio-economic status is captured by the HISEI index for the parent with the higher ranking occupation. For the regional controls we use additional information from the statistical office Switzerland. We include an indicator for the share of students in baccalaureate schools. Finally we control for the language region with a dummy for the German speaking part of Switzerland.

Table 1 reports the summary statistics for the most important variables for both samples, transition and baccalaureate. The samples are split in the group of students who report to have had any paid private tutoring in the 8th or 9th grade and those who did not. We can observe that overall the students with tutoring are less likely to transition into a baccalaureate school, and fare worse on all cognitive and non-cognitive skills than the average of students who did not take private tutoring. This is not surprising, because it can be assumed that students with lower competencies have a larger need for private tutoring and that they have on average worse competencies than other students even after private tutoring. This reverse causality, however, is not problematic for our study, since we conduct our analyses conditional on having the same competencies with or without private tutoring. We further observe that the parents' education is positively related with having tutoring. Living in the German-speaking part of Switzerland is negatively related to having had any tutoring. Among the students who do transition into a baccalaureate school, those who had tutoring have a lower rate of receiving a diploma. But also in this sub-sample they have on average lower skills.

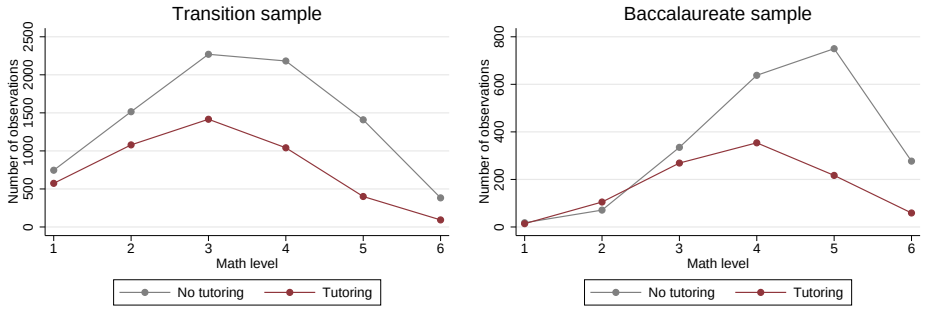
Figure 1 illustrates the number of students with and without tutoring by math level. The baccalaureate sample is a more selective sample, in which the majority of students scored on the PISA math test above level 4.

[6]Depending n the language region within Switzerland this can be either German, French or Italian.

Table 1: Descriptive statistics

	Transition sample				Baccalaureate sample			
	No tutoring		Tutoring		No tutoring		Tutoring	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
transition	0.25	(0.43)	0.23	(0.42)				
success					0.88	(0.32)	0.79	(0.41)
math score	536.98	(81.90)	512.20	(77.52)	599.67	(65.30)	565.70	(67.26)
language score	510.89	(79.64)	497.23	(77.84)	575.43	(60.88)	554.80	(60.81)
science score	515.34	(77.91)	496.04	(74.96)	574.48	(62.79)	548.28	(63.11)
punctuality	0.76	(0.43)	0.70	(0.46)	0.73	(0.45)	0.68	(0.47)
migrant	0.23	(0.42)	0.26	(0.44)	0.21	(0.41)	0.25	(0.43)
language	0.78	(0.42)	0.76	(0.43)	0.81	(0.39)	0.79	(0.40)
female	0.49	(0.50)	0.55	(0.50)	0.56	(0.50)	0.62	(0.49)
age	15.76	(0.66)	15.79	(0.69)	15.52	(0.60)	15.58	(0.64)
parents' edu	14.01	(2.89)	14.33	(2.91)	15.37	(2.57)	15.49	(2.58)
SES	53.84	(18.81)	55.56	(18.47)	61.78	(16.55)	61.41	(17.11)
German-speaking	0.49	(0.50)	0.43	(0.50)	0.34	(0.47)	0.30	(0.46)
share GE	26.44	(10.29)	27.63	(10.48)	31.29	(12.68)	32.08	(12.25)
share VE	48.50	(11.97)	46.76	(12.29)	44.16	(13.29)	42.68	(13.17)
Observations	8,248		4,448		2,052		1,003	

Figure 1: Number of students with and without tutoring



4 Results

We start by estimating the marginal effects of tutoring on the probability to enter a baccalaureate school. For the students who did start a baccalaureate school, we then estimate the probability to finish the program successfully and receive a diploma. In addition to the average marginal effects of private tutoring we are especially interested in the marginal effects of tutoring at different levels of math skills. Assuming that the impact of tutoring, as well as the intentions behind it, differs between students along the skills distribution, we allow for an interaction between math skills and tutoring.

Using a probit regression, we estimate the following model:

$$P(y|x) = f(\beta_0 + \beta_1 Tutoring + \beta_2 Skills + \beta_3 Tutoring\#Skills + \gamma \mathbf{Z} + \epsilon),$$

where $P(y)$ is either the probability to transition into a baccalaureate school or the probability to finish a baccalaureate school with a diploma. $Tutoring$ is a binary variable that captures any kind of paid private tutoring during grade 8 or 9.[7] $Skills$ captures the competence level of a student, which we proxy with the PISA math score in the main specification. Z contains individual and regional characteristics. The residual is likely to be correlated for students in the same region, we therefore cluster on this level.

4.1 Transition and success

Table 2 shows a negative average marginal effect of tutoring on the probability to transition into a baccalaureate school in column (1). However, students who have taken tutoring are on average lower skilled, even after the tutoring, and thus less likely to enter a baccalaureate school. Once controls for cognitive and non-cognitive skills are added the average marginal effect of tutoring turns positive (column (2)). The probability to enter a baccalaureate school is highly dependent on cognitive skills, as we show in the top left panel of figure 2. This also means that a (marginal) improvement of skills through tutoring is not equally productive for students at different skills levels. The lower left panel of figure 2 reports the average marginal effects of tutoring on the probability to transition into a baccalaureate school along the distribution of math skills. We find significant positive effects for students with math skill levels 2-4. However, these effects are small given the total probability of transition. Since the math skills are measured after the tutoring, the effects are on top of any skill improvement the students (upper bound) gained from the private tutoring. We make no claims on the causality or even direction of the relation. In fact, it is likely that students who intend to enter a baccalaureate school are more inclined to seek tutoring, especially if their initial competencies are close to or below minimally required skills level for the baccalaureate school. Nevertheless, documenting the transition process is an important first step to answer our main question on the later success.

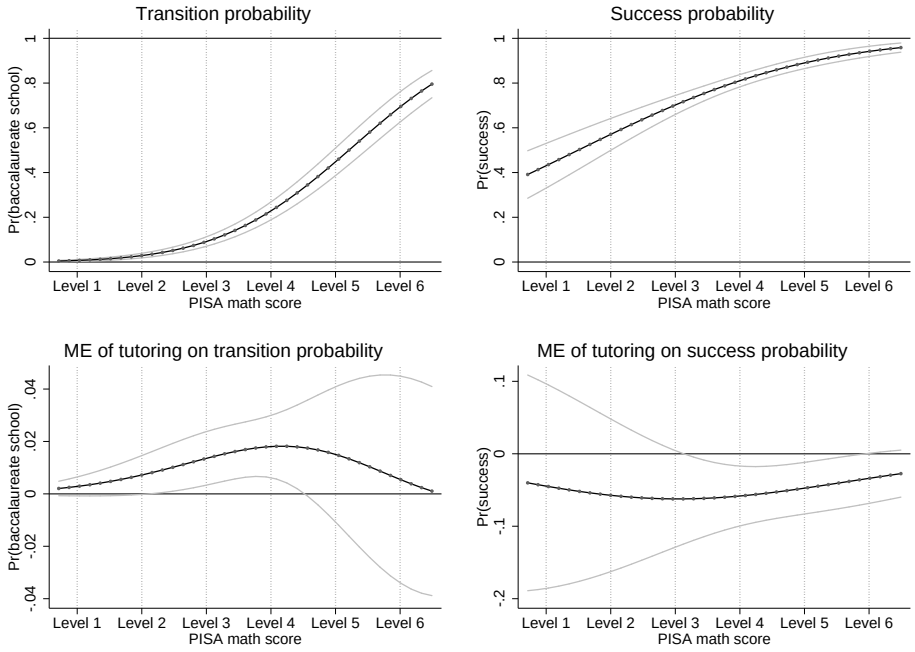
[7] Alternatively using only tutoring in math or only regularly occurring tutoring does not substantially alter our results.

Table 2: Average marginal effects on transition and success probabilities

VARIABLES	(1) Pr(transition)	(2) Pr(transition)	(3) Pr(success)	(4) Pr(success)
tutoring	-0.043***	0.014**	-0.084***	-0.048***
	(0.009)	(0.006)	(0.022)	(0.016)
math score		0.002***		0.001***
		(0.000)		(0.000)
punctuality	0.011	-0.022**	0.017	0.006
	(0.014)	(0.011)	(0.014)	(0.015)
migrant	0.003	0.056***	-0.026**	-0.013
	(0.010)	(0.012)	(0.013)	(0.013)
language	-0.019	-0.037***	0.017	0.004
	(0.012)	(0.010)	(0.026)	(0.026)
female	0.072***	0.112***	0.040***	0.067***
	(0.009)	(0.008)	(0.014)	(0.017)
age	-0.061***	-0.011	-0.059***	-0.049***
	(0.018)	(0.014)	(0.012)	(0.010)
parents' edu	0.027***	0.015***	0.002	0.000
	(0.003)	(0.002)	(0.003)	(0.003)
SES	0.003***	0.002***	0.001***	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)
German-speaking	0.013	-0.030	0.061*	0.028
	(0.041)	(0.037)	(0.036)	(0.038)
share GE	0.007***	0.009***	-0.004***	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	12,696	12,696	3,055	3,055

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

Figure 2: Tutoring on the transition and success probability



Column (3) and (4) in Table 2 and the right panels of figure 2 display the more interesting phase of succeeding in the baccalaureate school. In the upper panel the predicted probability to complete the baccalaureate school receive a diploma is displayed for all students who have started the baccalaureate school directly after the compulsory school. Again, we see a strong relation between skills and the probability to receive a degree that gives access to university. While we also display the predictions for students at low skill levels, there are only few students below at least level 3 in mathematics in this sample (as can be seen in figure 1). The marginal effects of tutoring that are displayed in the lower right panel indicate that students who had private tutoring before the transition have a lower success rate, even after controlling for their skills at the time of transition. This negative effect is significant from level 3 on until almost the highest level of math skills. It slightly decreases with increasing skill levels. Unlike the marginal effects in the transition stage, the effects we find on success are quite sizable and also economically significant. The predicted success probability for a student at the threshold of math level 4 is around 5.8% points lower for students who had tutoring, down from a base probability of receiving a diploma of 83%

for students who had no tutoring. At the threshold of level 5 this difference in probability is smaller (4.7% points, with a base probability of 91%) but still highly significant.

4.2 Tutoring by subject

Students receive tutoring in different subjects. The large majority of students who receive private tutoring, does so in math (exclusively or as part of the tutoring). In the total student population 71% of tutored students report that the some of their tutoring was in math, in the baccalaureate sample 65% respectively. Fewer students receive tutoring in the school language (34% and 24% respectively). While in the previous section we considered any kind of tutoring we now look closer at the type of tutoring. In particular we look at tutoring in math and language, along the distribution of the corresponding PISA skill.[8]

The marginal effects of both tutoring in math and language on the transition into a baccalaureate school are small. While the marginal effects of math tutoring are very similar to our main results, the effects of tutoring in language are not significantly different from zero at any language skill level (Figure A1).

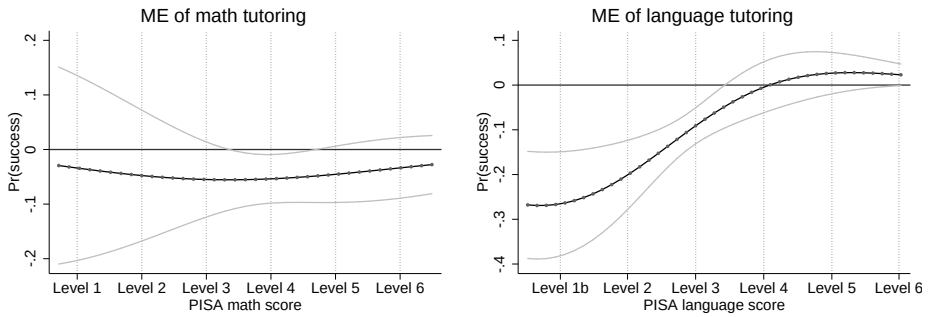
Figure 3 shows the marginal effects of tutoring in math and language on the probability to successfully finish a baccalaureate school. We find a negative effect of math tutoring on the probability of success on all levels of math skills, however this effect is only statistically significant for students around level 4 of math skills. Having had tutoring in language relates to a lower probability of success mainly at the lower end of the language skills.

4.3 Skills bundles

In this next step we investigate the marginal effects of tutoring within groups of students with specific skills bundles (that are measured after the tutoring has taken place). We consider five groups: students, who are 1) at an advanced level in both math and language, 2) at least average in both subjects, but at most advanced in one, 3) average in both subjects, 4) on

[8]Since not all students have had a PISA booklet that tested language, the sample for tutoring in language is smaller by one third.

Figure 3: Tutoring by subject on the success probability



a basic level in both subjects, and finally 5) advanced in math but at most average in language.

Table 3 reports the marginal effects of private tutoring on the probability to successfully finish a baccalaureate school for the 5 respective student groups.[9] Again the sample is reduced due to the smaller sample of students who have completed a PISA booklet on language. As expected, the success probabilities differ significantly between the different ability groups, from an average 96% among the best to only 62% among the worst students (for students, who have not had any tutoring). While the marginal effects of tutoring are negative for all types of students this negative effect is only statistically significant for students who are average in one and advanced in the other subject.

Alternatively estimating a non-parametric model using nearest neighbor matching on math and language scores, as well as all the control variables, with tutoring as treatment, leads to similar results (5.2% points reduction of the success probability on average and 6.4% points reduction on the average treated, both significant at the 1% level).

4.4 Heterogeneity in personal characteristics

For further analysis on specific groups we return to the main specification, with math scores as general skills proxy and tutoring in any subject as main variable of interest.

[9] Table A2 in the appendix reports the marginal effects on the probability to transition into a baccalaureate school.

Table 3: Success probabilities by skills groups

	(1) best	(2) average +	(3) average	(4) worst	(5) mathy
Math level	5 - 6	3 - 4 (5 - 6)	3 - 4	1 - 2	5 - 6
Language level	5 - 6	3 - 4 (5 - 6)	3 - 4	1 - 2	1 - 4
Success probability					
$P(y\|\text{tutoring=0})$	0.957***	0.895***	0.842***	0.618***	0.953***
	(0.012)	(0.015)	(0.024)	(0.060)	(0.012)
$P(y\|\text{tutoring=1})$	0.934***	0.854***	0.793***	0.441***	0.920***
	(0.016)	(0.018)	(0.024)	(0.056)	(0.022)
ME tutoring	-0.022	-0.040**	-0.049	-0.178	-0.033
	(0.024)	(0.020)	(0.033)	(0.109)	(0.024)
Observations	338	1,893	985	77	536

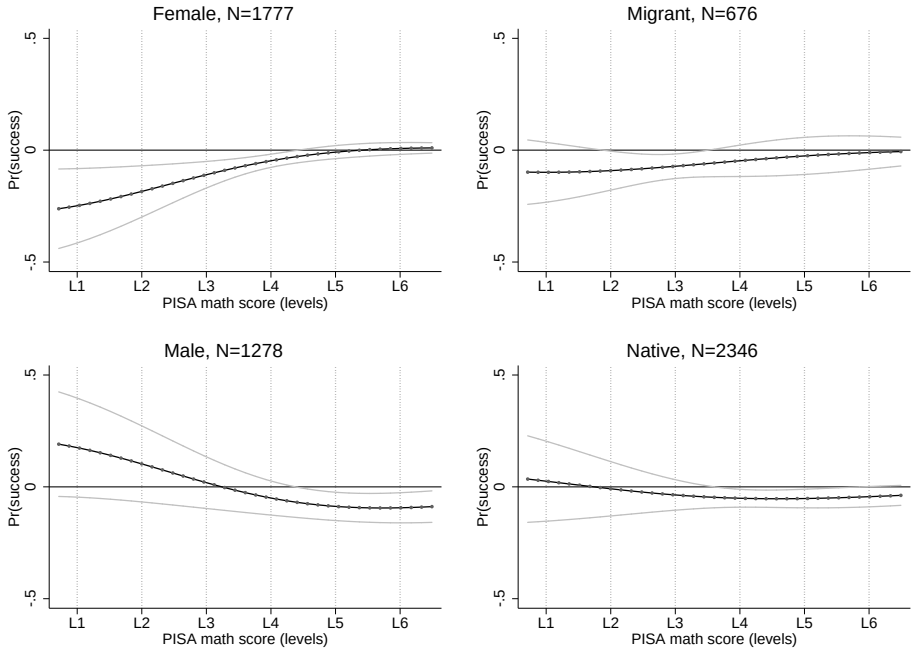
Average + means that the students have at least level 3 in both math and language, but at most level 4 in one of the skills (excluding the best students who have at least a level 5 in both skills). Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

4.4.1 Gender and migration status

The left panel of Figure 4 shows the marginal effects of tutoring on the success probability for female students in the top and male students in the bottom graph. We find significant effects mainly for female students with skills levels below and around level 4, for whom also the transition probability is related to tutoring (Figure A2). For male students we also find negative marginal effects of tutoring, however they are significant at the 5% level only at the upper end of the skills distribution.

In the panels on the right side we split our sample by migration status. We observe negative marginal effects of tutoring in both groups. However, due to the smaller sample size the confidence interval is much larger in the migrant sample, so that we cannot exclude a zero effect on the 5% level, except for students at a relatively low level of around 3. For native students we find that students who reach a level of 4 and above with tutoring, have a lower probability to be successful in the baccalaureate school than students who reach this level without tutoring. This difference remains significant at the 5% level until almost the highest possible levels of math skills.

Figure 4: Tutoring on the success probability by personal characteristics



4.4.2 Transition procedures

In most regions students in lower secondary education (starting from grade seven) are already tracked based on their ability. After grade nine compulsory education ends and the students decide between different types of vocational and general education, or whether to continue education at all. Dependent on the previously attended track, students who wish to enter baccalaureate schools may face different admission requirements. Pre-baccalaureate tracks offer barrier-free entrance into baccalaureate schools, while regular tracks with advanced requirements allow the transition if the student has a sufficiently high GPA, a recommendation by a teacher or if the student passes an entrance exam.[10] Tracks with only basic academic skills do not allow for a direct transition into a baccalaureate school.

We now analyse the transition- and success probabilities of students by the admission requirements they have to fulfill for the transition, for the groups that are eligible.[11] We distinguish 3 groups: 1) Pre-baccalaureate

[10]However most of the students in these tracks start an academically demanding vocational education instead of entering general education.

[11]The basic track prepares students exclusively for vocational education. Students in

track: In this track most students transition into a baccalaureate school. Given they have a passing grade at the end of the last year of compulsory education, students are automatically admitted to the baccalaureate school. 2) Regular track (advanced requirements) without exam: Students in these tracks either need to reach a pre-specified GPA threshold, the teachers' recommendation, or both to be admitted to a baccalaureate school. 3) Regular track (advanced requirements) without exam with an entrance exam: Students in this group have to pass a regionally administered exam to gain access to a baccalaureate school.

In the pre-baccalaureate schools the transition probability is negatively related to the instance of tutoring before the transition (Figure 5). Students in this track have already taken the decision to enter a baccalaureate school and receive a precise feedback on their abilities and the needed skills for their future education in their track. Thus mainly failing students might engage in tutoring. For the transition probability of students from the regular tracks it is important to account for the admission procedure. Students who need to reach a certain GPA and/or need an endorsement from their teachers indeed have a higher probability of transitioning if they have taken private tutoring in the last year of compulsory education. This positive effect is statistically significant at the 10% level for students who have a level 4 in mathematics. In regions where an admission exam is required for baccalaureate schools the picture looks different. Firstly we observe that the admission to baccalaureate schools is more strict, we do not observe any student who is below level 3 in math transitioning into a baccalaureate school (hence we restrict the displayed marginal effects in 5 and 6 to students above level 3). We further find that at a given math skill after tutoring, having had tutoring is not significantly related to the transition into a baccalaureate school for students within this group. Unlike for the transition procedure without exam, here we find no indication of an increase in the transition probability due to private tutoring, beyond the effect might have on the skills at the time of transition.

For the success probability we observe for the first two groups that students who had tutoring before the transition are more likely to fail. For students from the advanced track this is however not statistically significant,

this track who want to start a baccalaureate school never the less need to repeat the last year of compulsory education. We therefore exclude students from this track from this analysis.

Figure 5: Tutoring on the transition probability by school track

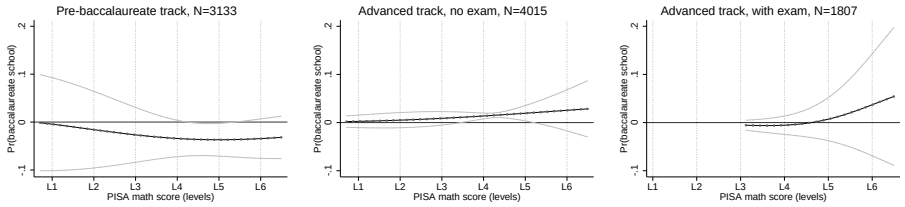
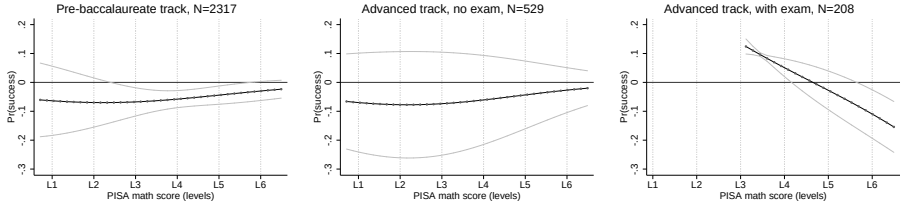


Figure 6: Tutoring on the success probability by school track



as can be seen in Figure 6. Students who enter the baccalaureate school from a regular track after taking an entrance exam display a different pattern. Students who are around the threshold and just below have a higher probability to succeed if they had tutoring before the transition. This effect is significant just above the threshold of level 4. Students with higher scores seem to have a negative impact of tutoring, though this is not statistically significant.

4.5 Robustness checks

In the following section we test our anlyses by using different definitions for 'success', the outcome variable and for 'private tutoring', our variable of interest.

4.5.1 Diploma without delay

Our dependent variable captures any baccalaureate diploma within seven years since transition as a success. However, the regular duration needed to attain such a diploma is between 3 and 4 years, dependent on the regional system. Having a larger share of students who repeat one or several years decreases the overall efficiency of the system, and makes it more costly for both the student and society. Out of the 3055 students in our baccalaureate sample 474 do not receive a diploma within seven years. An additional 567

students finish with a delay. In this robustness check we use a more strict definition of success, which captures whether a student received a diploma within the regular study time. The results in Table A3 show that the relation between private tutoring before transition and success in the baccalaureate school is even stronger when we use this strict definition. The probability to finish in time is 7.3% points lower for students who have made use of private tutoring.

4.5.2 Regular tutoring

While around two thirds of the students report that they receive tutoring on a regular basis, some tutored students have had tutoring on an irregular basis. In this robustness check we use regular tutoring as main variable of interest. Table A4 in the Appendix reports the results of our main specification with regular tutoring.

The positive relation between tutoring and transition into a baccalaureate school disappears if we only look at regular tutoring. This is not surprising, since tutoring on an irregular basis before the transition is likely to be taken up by students with higher educational aspirations. This positive selection of students is less present in the group that had tutoring on a regular basis.

We do find howerver, that our main results on the success probability are robust to the alternative definition of tutoring. Students in baccalureate schools who had tutoring on a regular basis before the transition are less likely to receive a diploma than their peers with similar pisa scores who did not did not have tutoring at a regular basis.

5 Conclusion

Private tutoring is a commonly observed phenomenon in many countries and educational systems. It is often used to prepare students for admission to prestigious and selective schools or types of schools, rather than for remedial purposes. While the number of studies on the causal effect on (immediate) educational achievement has remained quite limited and does not always show positive effects, in this paper we turn to another aspect of private tutoring. We examine how accessing a selective school with the help of private tutoring

relates to the future success in that educational trajectory. To do so we compare students who display the same test performance shortly before entering a selective type of school, having reached this level of performance either with or without private tutoring. We first test whether tutored students are equally likely to enter the selective type of school. We then examine whether previously tutored students are just as successful in persisting in the selective school as those students, who have reached the same level of performance without private tutoring.

This analysis does not claim to make a causal statement on the impact of tutoring. Rather, the descriptive analysis addresses how the use of private tutoring can distort the selection mechanism into prestigious and demanding schools, and by that lead to a sub-optimal distribution of the limited study places.

We investigate the relation between success in a selective school and pre-transition tutoring accross different subjects (mathematics and school language), performance profiles (skills bundles), genders, migration backgrounds, and ways students are selected for this type of education. In practically all groups the prior use of private tutoring is related to a lower probability of success. This relation is stronger for girls, pupils without a migration background and those who were able to enter the selective type of education without an external examination, i.e. on the basis of GPA and teacher advice. The effects are not only statistically but also economically significant. Students who entered the selective type of school after private tutoring have a much higher risk of drop out.

To answer the question of why the probability of success differs between students with and without tutoring further research and more data is needed. In principle, three channels are conceivable which can either work individually or together. Firstly, it could be that students who achieve a performance threshold only thanks to the help of tutoring are closer to the limits of their potential than students who pass the same threshold without extra help. As a result, the first group is struggling to further improve their performance and meet the expectations after moving on to a selective school, while the second group still has room to grow. Secondly, it is possible that private tutoring crowds out the development of an independent work attitude and learning strategies that are required in the more selective school. In this case the tutoring would be causally responsible for the failure in the

following educational period. Thirdly, the attendance of tutoring can be related to unobservable personality traits that have an influence on the further educational success. The tutoring as such has in this case no negative influence on the educational success, but is a sign for the negative selection into tutoring.

Since the uptake of private tutoring is not random, we cannot make a causal statement in this paper as to whether the private tutoring is causally responsible for the greater educational failure in a selective type of education. However, the gap in performance that we observe suggests that the selection mechanisms for entering this selective type of education could be improved.

References

Akyol, P., Krishna, K., and Wang, J. (2021). Taking pisa seriously: How accurate are low-stakes exams? *Journal of Labor Research*, 42(2):184–243.

Almlund, M., Duckworth, A. L., Heckman, J., and Kautz, T. (2011). Personality psychology and economics. *Handbook of the Economics of Education*, 4(1):1–181.

Banerjee, A. V., Cole, S., Duflo, E., and Linden, L. (2007). Remedying education: Evidence from two randomized experiments in India. *The Quarterly Journal of Economics*, 122(3):1235–1264.

Bray, T. (2009). *Confronting the shadow education system: What government policies for what private tutoring?* United Nations Educational, Scientific and Cultural Organization; International Institute for Educational Planning.

Cole, R. (2016). Estimating the impact of private tutoring on academic performance: Primary students in Sri Lanka. *Education Economics*, 25(2):142–157.

De Paola, M. and Scoppa, V. (2014). The effectiveness of remedial courses in italy: A fuzzy regression discontinuity design. *Journal of Population Economics*, 27(2):365–386.

Fryer, R. G. and Howard-Noveck, M. (2020). High-dosage tutoring and reading achievement: Evidence from New York city. *Journal of Labor Economics*, 38(2):421–452.

Guill, K. and Lintorf, K. (2019). Private tutoring when stakes are high: Insights from the transition from primary to secondary school in Germany. *International Journal of Educational Development*, 65:172–182.

Hille, A., Spieß, C. K., and Staneva, M. (2016). More and more students, especially those from middle-income households, are using private tutoring. *DIW Economic Bulletin*, 6(6):63–71.

Hof, S. (2014). Does private tutoring work? The effectiveness of private tutoring: A nonparametric bounds analysis. *Education Economics*, 22(4):347–366.

Hof, S. and Wolter, S. C. (2014). Ausmass und Wirkung bezahlter Nachhilfe in der Schweiz. Staff Paper 14, SKBF-CSRE.

Park, H., Buchmann, C., Choi, J., and Merry, J. J. (2016). Learning beyond the school walls: Trends and implications. *Annual Review of Sociology*, 42(1):231–252.

Zhang, Y. (2013). Does private tutoring improve students' national college entrance exam performance?—A case study from Jinan, China. *Economics of Education Review*, 32:1–28.

Zhang, Y. and Xie, Y. (2015). Family background, private tutoring, and children's educational performance in contemporary China. *Chinese Sociological Review*, 48(1):64–82.

Figure A1: Tutoring by subject on the transition probability

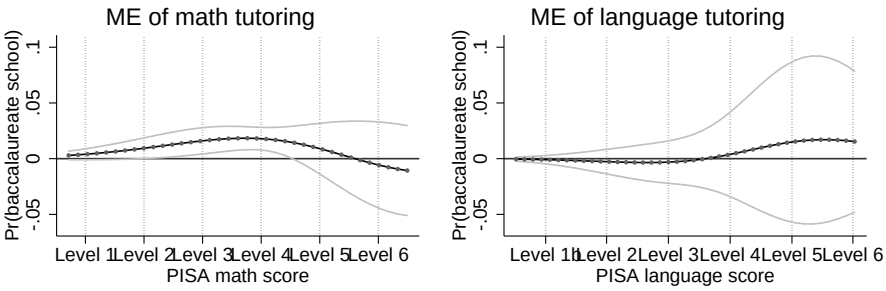


Figure A2: Tutoring on the transition probability by personal characteristics

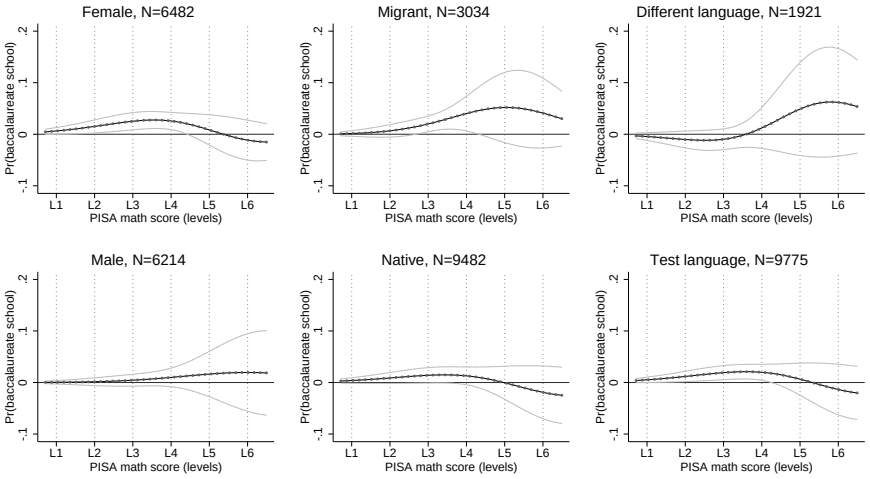


Table A1: Descriptive statistics for types and motives for tutoring

	Transition sample		Baccalaureate sample	
	no transition	transition	no diploma	diploma
Any tutoring	0.36	0.33	0.47	0.30
Subject:				
math	0.26	0.22	0.34	0.19
language	0.13	0.07	0.12	0.07
second language	0.17	0.16	0.20	0.15
other subject	0.08	0.05	0.09	0.05
study techniques	0.07	0.03	0.05	0.03
Tutoring suggested by:				
teacher	0.09	0.05	0.12	0.04
parents	0.24	0.23	0.36	0.21
family	0.03	0.02	0.02	0.02
peers	0.02	0.01	0.03	0.01
themselves	0.14	0.16	0.22	0.15
others	0.02	0.01	0.02	0.01
Reason for tutoring:				
future education	0.09	0.11	0.18	0.10
entrance exam	0.07	0.06	0.12	0.06
better performance	0.22	0.20	0.29	0.19
catch up	0.04	0.03	0.05	0.03
better understanding	0.15	0.17	0.25	0.15
other	0.02	0.02	0.02	0.01
Tutor was:				
student	0.14	0.14	0.22	0.13
friend of family	0.08	0.07	0.10	0.06
teacher different school	0.07	0.05	0.09	0.05
professional tutor	0.04	0.04	0.05	0.04
online tutor	0.01	0.01	0.02	0.00
block-course	0.02	0.02	0.03	0.02
retired teacher	0.03	0.03	0.04	0.03
other	0.04	0.03	0.05	0.02
Observations	9,641	3,054	458	2,596

Share of students who choose this answer. Multiple answers are possible per block.

Table A2: Transition probabilities by ability group

	(1) best	(2) average +	(3) average	(4) worst	(5) mathy
Math level	5 - 6	3 - 4 (5 - 6)	3 - 4	1 - 2	5 - 6
Language level	5 - 6	3 - 4 (5 - 6)	3 - 4	1 - 2	1 - 4
Transition probability					
$P(y\|\text{tutoring=0})$	0.799***	0.353***	0.258***	0.031***	0.475***
	(0.026)	(0.021)	(0.020)	(0.008)	(0.028)
$P(y\|\text{tutoring=1})$	0.726***	0.374***	0.293***	0.045***	0.489***
	(0.045)	(0.024)	(0.025)	(0.006)	(0.040)
ME tutoring	-0.073*	0.021	0.035***	0.014	0.014
	(0.040)	(0.013)	(0.012)	(0.010)	(0.035)
Observations	432	5,225	3,618	2,056	1,119

Average + means that the students have at least level 3 in both math and language, but at most level 4 in one of the skills (excluding the best students who have at least a level 5 in both skills). Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A3: ME of tutoring on success probability without delay

VARIABLES	(1) Pr(success without delay)	(2) Pr(success without delay)
tutoring	-0.129***	-0.073***
	(0.033)	(0.019)
math score		0.002***
		(0.000)
punctuality	0.043**	0.027
	(0.019)	(0.019)
migrant	-0.026*	-0.006
	(0.015)	(0.016)
language	0.021	0.000
	(0.037)	(0.038)
female	0.090***	0.131***
	(0.025)	(0.030)
age	-0.039*	-0.024
	(0.023)	(0.020)
parents' edu	0.001	-0.002
	(0.003)	(0.003)
SES	0.002***	0.002***
	(0.000)	(0.000)
German-speaking	0.037	-0.016
	(0.058)	(0.059)
share GE	-0.006***	-0.003**
	(0.001)	(0.002)
Observations	3,055	3,055

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

Table A4: ME of tutoring regularly

VARIABLES	(1) Pr(transition)	(2) Pr(transition)	(3) Pr(on-track)	(4) Pr(on-track)
tutoring: regularly	-0.054***	0.002	-0.090***	-0.055***
	(0.009)	(0.005)	(0.021)	(0.016)
math score		0.002***		0.001***
		(0.000)		(0.000)
punctuality	0.011	-0.023**	0.019	0.007
	(0.013)	(0.011)	(0.016)	(0.016)
migrant	0.004	0.057***	-0.027**	-0.014
	(0.010)	(0.012)	(0.013)	(0.013)
language	-0.020	-0.037***	0.015	0.002
	(0.012)	(0.010)	(0.026)	(0.026)
female	0.072***	0.112***	0.039***	0.067***
	(0.009)	(0.008)	(0.013)	(0.016)
age	-0.061***	-0.011	-0.061***	-0.050***
	(0.018)	(0.014)	(0.012)	(0.010)
parents' edu	0.027***	0.015***	0.002	-0.000
	(0.003)	(0.002)	(0.003)	(0.003)
SES	0.003***	0.002***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
German-speaking	0.012	-0.030	0.059*	0.027
	(0.041)	(0.037)	(0.036)	(0.038)
share GE	0.007***	0.009***	-0.004***	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	12,696	12,696	3,055	3,055

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