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ABSTRACT

University Tuition Fees and High School Students' Educational Intentions*

This paper studies whether higher education tuition fees influence the intention to acquire a university degree among high school students and, if so, whether the effect on individuals from low-income households is particularly strong. We analyze the introduction and subsequent elimination of university tuition fees in Germany across states and over time in a difference-in-differences setting. Using data from the Youth Questionnaire of the German Socio-Economic Panel (SOEP), we find a large negative effect of tuition fees on the intention of 17-years-olds to acquire a higher educational degree, with a decrease of around eight percentage points (ten percent). Individuals from low-income households mainly drive the results. This study documents that the introduction of relatively low university tuition fees of 1,000 euros per academic year can considerably lower young people's educational intentions and choices.

JEL Classification: I22, I23, I24

Keywords: tuition fees, educational inequality, difference-in-differences

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I. Introduction

In many countries around the world, increasing the rate of participation in higher education is an important educational policy goal. It has even been enshrined in the United Nations' Universal Declaration of Human Rights: "Technical and professional education shall be made generally available and higher education shall be equally accessible to all on the basis of merit" (Article 26, paragraph 1). At the same time, in many OECD countries, tuition fees play a relevant role in the funding of higher education. In 2011, for example, only eight OECD countries (31 percent) did not charge tuition fees, one-third charged relatively low tuition fees (USD 1,500 and below), and one-third charged fees above USD 1,500 to nationals of the respective country (OECD 2013).¹

What role do university tuition fees play in adolescents' educational plans? How does the introduction of relatively low tuition fees affect adolescents' educational aims and intentions? Do even low tuition fees exacerbate educational inequality? One might expect that tuition fees mainly deter individuals from low-income households from enrolling in higher education. On the other hand, the majority of individuals who aim at attending university come from middle or high-income backgrounds and are unlikely to be credit-constrained. Moreover, the net present value of lifetime earnings is higher and the risk of unemployment is lower for highly educated individuals than for individuals with lower education. Thus, one could hypothesize that free access to higher education is most beneficial to students from middle and high-income families. If (low) tuition fees do not significantly affect individuals' educational choices, there might be plausible reasons for the introduction of tuition fees: they could lead to greater equality because students who benefit from higher education contribute to the funding of their studies. However, if poor students lower their intentions and do not continue with education as a result of higher anticipated costs in form of tuition fees, there are equality arguments for free access to higher education.

This paper analyzes the effect of the introduction and subsequent elimination of university tuition fees on adolescents' intentions to pursue higher education in Germany. We investigate (i) whether adolescents' educational plans are affected by relatively low tuition fees (1,000 euros per academic year) and (ii) whether the effect depends on their socio-economic backgrounds, based on longitudinal data from the German Socio-Economic Panel (SOEP). A key advantage of the German setting is that tuition fees were only introduced in some federal states. States that did not introduce university tuition fees therefore serve as a comparison group. Since many countries introduced tuition fees at the national level (e.g., Australia in 1989, United Kingdom in 1998), it is difficult to disentangle po-

¹These figures are calculated for the 26 OECD countries for which data was available (OECD 2013).

tential behavioural effects from secular trends in higher education. Several studies exploit variation in tuition fees across universities or time, or use both kinds of variation (Kane 1994; Denny 2014). However, to obtain unbiased estimates in this setting requires the restrictive assumption that the level of tuition fees is not affected by the demand for access to university degree programs. Moreover, most of the existing literature studies the influence on college enrollment in countries with high tuition fees such as the US, UK, and Australia (McPherson and Schapiro 1991; Kane 1994; Cameron and Heckman 2001; Dearden et al. 2004; Chapman and Ryan 2005).² Relatively little is known about potential effects of low tuition fees and, in particular, about how tuition fees influence adolescents' educational intentions and plans in countries with a history of free access to higher education.

In Germany, the introduction of tuition fees was a political decision made by the governments of the federal states, and not by the universities. Thus, we argue and document that the demand for higher education is unlikely to have affected the introduction of university tuition fees, and that changes in higher university fees at the state level over time are likely to be exogenous for 17-year-old high school students. To the best of our knowledge, this is the first study to investigate the responsiveness of high school students to the introduction and elimination of relatively low university tuition fees. As such, our research contributes to the literature on how educational reforms and (public) interventions influence adolescents' educational choices (Oreopoulos and Dunn 2013; Avery and Kane 2004). Using data from the SOEP, we show that university tuition fees considerably influence adolescents' educational plans. The results suggest that tuition fees of 1,000 euros per academic year result in a reduction in the intention of high school students to pursue higher education of about eight percentage points in Germany. This corresponds to a drop of 11 percent, since 80 percent of all high school students aim at acquiring a higher educational degree. Moreover, individuals from low-income households tend to lower their educational intentions considerably following the introduction of university tuition fees. For instance, the intention to continue with higher education drops by around 33 percentage points (43 percent) among those whose family income is in the lowest ten percent of the income distribution. These effects could be driven by students (and their parents) having distorted views of the costs and benefits of higher education (Horn et al. 2003; Oreopoulos and Dunn 2013; Belfield et al. 2016; Boneva and Rauh 2018), being unaware of the financial aid that is available for low-income families (Ikenberry and Hartle 1998; Dinkelman and Martinez 2014), and the complexity of the application process in applying

²Note that the net price, i.e., the difference between tuition fees and student aid, might differ across these countries even though they have the highest tuition fees (OECD 2011).

for grants and scholarships (Bettinger et al. 2012).³ In many cases, low-income students have a more limited understanding of the costs and benefits of higher education (Horn et al. 2003), the admission processes, and the financial aid opportunities (Oreopoulos and Dunn 2013; Avery and Kane 2004).

Using data from the federal statistical office, the studies by Tecu (2009), Hübner (2012) and Bruckmeier et al. (2013) analyze the effect of tuition fees on enrollment in Germany. However, these studies do not address the question whether tuition fees contribute to educational inequality, which plays an important role in the political and public discussion. In Germany, only 20% of 25-34 year-old non-students acquire a higher educational degree than their parents, which is considerably below the OECD average of 37% (OECD 2012). A key advantage of studying educational aspirations of 17-year-olds is that educational plans might better reflect actual demand for higher education than enrollment. Further, examining educational intentions is important as student enrollment is likely to be a problematic outcome measure for analyzing the consequences of tuition fees. This is because enrollment in higher education in Germany offers several monetary benefits such as cheaper tickets for public transport and lower health insurance costs. Thus, enrollment in higher education without the intention to actually study and graduate might be an attractive option in universities do not charge tuition fees, and a reduction in enrollment as a result of university tuition fees might simply reflect a decrease of these “passive” students. Several studies document that educational expectations and intentions of students have real consequences for their educational outcomes. For example, Jacob and Wilder (2011) show that educational expectations of high school students about college achievements are important predictors for college enrollment. Goux et al. (2017) use a field experiment to demonstrate that more realistic expectations of low-achieving middle school students about educational objectives reduces the drop out rate in high school. Similarly, Stinebrickner and Stinebrickner (2012) find that students who have over-optimistic expectations at university enrollment have a higher likelihood to drop out of college. We also evaluate the predictive validity of the data and document a strong relationship between individuals’ educational intentions and their actual educational choices later in life using the longitudinal structure of the data. The decline in young people’s educational intentions is therefore likely to have long-term consequences.

The empirical findings suggest that introducing relatively low tuition fees (i.e., around three percent of the average annual tuition fees charged by public institutions in the US (OECD 2011)—which are not accompanied by comprehensive and widely advertised financial aid program for students from low-income households—can have a considerable impact

³Financial aid take-up is very low in Germany, with only two percent of students who had to pay tuition fees reporting use of financial aid (Heine and Quast 2011).

on individuals' educational plans and educational inequality in society. The empirical results should be particularly relevant to those countries and policy makers considering the introduction of (low) tuition fees without a comprehensive financial aid scheme for low-income individuals.

The structure of the article is as follows. Section II discusses the related literature, and section III describes the institutional background. Section IV presents the data, section V discusses the empirical strategy, and section VI presents the estimation results. Section VII discusses several robustness checks, section VIII presents results for other educational intentions, actual behaviour, and abolition of tuition fees, and the final section concludes.

II. Related Literature

The international evidence of the consequences of tuition fees and the role of family income for educational choices is mixed. McPherson and Schapiro (1991) estimate the effect of net price, the difference between tuition costs and student aid, on college enrollment for white students in the US. Their results reveal a significant negative influence of net price on college enrollment for students from low-income families, but not for students from middle- or high-income families. Kane (1994) also finds a negative effect of tuition fees on enrollment. Moreover, he demonstrates that in the United States, tuition fees mainly deter black individuals from low-income families from university study. Cameron and Heckman (2001) emphasize the importance of considering educational transitions prior to deciding whether to go to college. They show that income is more important at earlier educational stages than at the time when transitions from high school to college in the US normally take place. The authors argue that family income plays a crucial role in the extent to which young people are able to develop their abilities, which in turn is a key factor in the decision to attend college. Further, Cameron and Heckman (2001) show that, *ceteris paribus*, the influence of family income on educational choice is rather low at the time of the college decision. Neill (2009) and Coelli (2009) estimate the impact of tuition fees on enrollment in Canada. Both studies find a negative effect of tuition fees on enrollment, with the effect size varying with family income. Using data from Ireland, Denny (2014) documents that the elimination of tuition fees in the nineties did not increase the probability that students with low socio-economic background enter university.

Borrowing constraints might be one reason why individuals from low-income families may be more affected by tuition fees than individuals from higher-income families. However, the evidence whether borrowing constraints affect an individual's education decision is mixed. Keane and Wolpin (2001) and Cameron and Taber (2004) study the relevance of borrowing constraints in the US. Their findings suggest that borrowing constraints are

not a hindrance to college attendance. Similarly, Dearden et al. (2004) find that the share of individuals who are borrowing constrained is rather small. Their results demonstrate that borrowing constraints are more relevant for 16-years-olds than for 18-years-olds when deciding whether to stay in full-time education. Lochner and Monge-Naranjo (2011, 2012) show that the relevance of borrowing constraints changed in the US. Their findings suggest that in the 80s borrowing constraints were not important, but many youth are borrowing constrained today. Similarly, Abbott et al. (2013) find that credit constraints play a role in educational decisions. It is important to point out that the US and UK have extensive student financial aid programs and high tuition fees (OECD 2011). How the findings translate to countries when no (or low levels of) student financial aid is available is not clear.

A few studies have analyzed the average impact of tuition fees in Germany. Hübner (2012) estimates that after several German states introduced tuition fees, university enrollment decreased there by about 4.8 percentage points. Tecu (2009) also reports a negative effect of tuition fees on student enrollment. In contrast, Bruckmeier et al. (2013) do not find a negative impact. All three studies use administrative data from the German federal statistical office. Hübner (2012) uses data up to 2007, and Bruckmeier et al. (2013) use data up to 2008. Since most states introduced tuition fees in 2007, these studies can only analyze short-term effects of the reform. Furthermore, they do not address the question of whether the effect of tuition fees on the enrollment decision depends on students' socio-economic background and whether the introduction of tuition fees influences young people's educational intentions.⁴

III. The Education System, University Tuition Fees, and Student Support System in Germany

In Germany, children usually start school at the age of six or seven. After primary school, students are streamed into three main types of secondary school: lower, middle and academic school track (*Haupt-, Realschule* and *Gymnasium*).⁵ In general, the lower track comprises five, the middle track six, and the academic track eight or nine years of schooling. The three school types differ not only in duration, but also in quality and

⁴The study by Heine et al. (2008) analyzes whether the effect of tuition fees on individual educational plans depends on the educational background of the parents, using data from the Hochschul-Informationssystem (HIS). A major limitation of this study is that the HIS changed the survey design in the time period when tuition fees were introduced in Germany. The change in the survey design might severely bias their estimates.

⁵There are also comprehensive schools in Germany that track students within a school. In Germany, the share of students attending comprehensive schools is rather low. In 2016, approximately 18.6 percent of seventh grade students attended a comprehensive school. Own calculation based on data from the German Federal Statistical Office.

intensity. Students in the academic track spend about four hours more in school per week than those in lower or middle track (Dustmann et al. 2001). In the academic track school, the curriculum is also more advanced and teachers have a higher formal qualification. Students from all three school tracks can enter vocational training on completing school. However, in general, only the academic track qualification (upper secondary leaving certificate, *Abitur*) enables students to enrol in university. After graduating from the lower or middle school track, individuals with sufficiently high grades can transition to the academic school track. Changing the school track before graduating is also possible, but rather rare, particularly when it comes to moving to a higher school track. Tracking might lower equality of opportunity and increase inequality because track placement might be related to children’s socio-economic background (Tamm 2008). Indeed, there are considerable differences in the percentage of children attending the academic school track between children from academic and non-academic households in Germany (Bildungsberichterstattung Autorengruppe 2018).

Tuition fees. In 2003, six of Germany’s sixteen federal states challenged a federal law that prohibited the introduction of university tuition fees. In January 2005, the German Federal Constitutional Court decided in favor of the plaintiffs. Ending an over 35-year tradition of tuition-free access to public higher education, seven federal states introduced tuition fees in the wake of the court decision. Yet, only a few years later, several federal states abolished the fees again.

Table 1 documents the timing of the introduction and elimination of tuition fees in Germany. The first two German states to introduce tuition fees were Lower Saxony and North Rhine-Westphalia in October 2006. One year later, seven of Germany’s sixteen states (Baden-Wuerttemberg, Bavaria, Hamburg, Hesse, Lower Saxony, North Rhine-Westphalia, and Saarland) had introduced tuition fees. The other nine states never introduced tuition fees. In the remainder of this article, we use the term “tuition states” for the seven federal states that introduced tuition fees and the term “non-tuition states” for the states that never introduced tuition fees.

In Germany, the introduction and subsequent elimination of tuition fees was decided by the state governments and not by the universities and was therefore a political decision. The conservative Christian democratic parties (CDU/CSU) supported the introduction of tuition fees, and the social democrats (SPD) opposed it.⁶ Consequently, most states that were governed by the CDU/CSU between 2005 and 2007 introduced tuition fees, with the exception of Saxony and Thuringia.⁷ The tuition states set the fee almost uniformly at

⁶We discuss potential problems of policy endogeneity in the robustness section below.

⁷At the beginning of 2006, Saxony was governed by the CDU and from April 2006 by a coalition of the CDU and the SPD. In contrast, Thuringia was governed by the CDU in 2006 and 2007 but did not introduce tuition fees. In 2006, the former prime minister of Thuringia announced in the press

500 euros per semester, i.e., 1,000 euros per academic year.⁸ Thus, the amount of fees was quite similar across tuition states.

In October 2008, one year after the introduction of tuition fees, Hesse became the first state to eliminate tuition fees. This was triggered by the conservative (CDU) and liberal (FDP) parties losing the majority of seats in the state parliament. In the subsequent years, other states followed suit, and by the end of 2012, tuition fees were only still in place in two states. Note that students enrolled in private institutions were not affected by the introduction and elimination of university tuition fees. However, there are very few private higher education institutions in Germany. In the winter term 2016, less than ten percent of all students were enrolled at a private university in Germany (Statistisches Bundesamt 2017).

Student support system. The introduction of tuition fees was accompanied by a financial aid scheme offering tuition fee loans (*Studienbeitragsdarlehen*). The tuition fee loans serve to support the financing of tuition fees. They were granted irrespective of both family income and, in most federal states, the creditworthiness of the applicant. If individuals earned less than a specified minimum income after completing their studies, the loan debt was deferred or cancelled. Furthermore, students did not have to repay the full amount of their student debt if the sum exceeded a certain threshold.⁹ Scholarships played only a minor role in Germany. In a survey in 2008, only two percent of individuals who had to pay tuition fees stated that they used a scholarship to pay the fees (Heine and Quast 2011).

Irrespective of the financial aid scheme that was implemented together with the introduction of tuition fees, the most relevant source of public financial support in Germany comes from the Federal Education and Training Assistance Act—what is known as BAföG (*Bundesausbildungsförderungsgesetz*)—which was introduced in 1971. BAföG is a monthly, means-tested government stipend set up to help students from low-income families, with the overall aim of improving educational justice and equality of opportunity.¹⁰ There are three crucial steps that decide whether a student is eligible to receive BAföG (Glocker 2011). First, the student’s income and assets are determined. Second, the earnings and financial capacity of the student’s parents are calculated. Here parental

that Thuringia would also introduce tuition fees in the next legislative period (Thüringer Allgemeine 23.05.2006), but this ultimately did not happen.

⁸Although institutions of higher education in Bavaria and North Rhine-Westphalia could set their own tuition fees up to a maximum of 500 euros per semester, most of the universities in these two states chose to introduce fees of 500 euros per semester. Hamburg reduced its tuition fees to 375 euros per semester three semesters after their introduction.

⁹See, for example, <http://www.bafoeg-aktuell.de/studium/studiengebuehren/studienbeitragsdarlehen.html>.

¹⁰Half of the BAföG is usually awarded as a grant and the other half as an interest-free loan. Repayment begins five years after the end of the maximum funding period and is limited to a maximum of 10,000 euros.

income, assets, and expenses (e.g., number of children in education) are taken into account. For both amounts, a minimum allowance (*Freibetrag*) is calculated and deducted.¹¹ In a third step, a pre-defined amount required to meet basic financial needs (*Bedarfssatz*) is compared with the sum of the amounts from the first two steps, net of the respective minimum allowances.¹² If the sum required to meet basic financial needs is higher than the student's (and parents') financial capacity, the applicant is entitled to BAföG. The amount of BAföG corresponds to the difference between the amount of money needed to cover basic financial needs and the student's financial capacity.¹³ Irrespective of the BAföG amount received, students receiving this form of support can earn a maximum of 450 euros per month without impacting their BAföG stipend. In 2017, 556,573 students (20 percent of all students) received BAföG, with an average monthly BAföG grant per student of 499 euros (Statistisches Bundesamt 2018).

The type and amount of financial support available to students in Germany thus differ considerably from the resources provided within the United States or United Kingdom support system. In the UK, for example, students can apply for Income Contingent Loans. The loan contract is with the Secretary of State for the Department for Education (DfE) and run by the Student Loans Company (SLC). The most common loans are Tuition Fee Loans and Maintenance Loans. In 2017/18, for example, full-time tuition fees for British and EU domiciled students studying in England are subject to a maximum tuition fee of 9,250 pounds per academic year. Students can borrow up to this amount in the form of a Tuition Fee Loan. In the 2016/17 academic year, around one million of full time undergraduate Tuition Fee Loans and Maintenance Loans were awarded (The Students Loan Company 2018). Students who receive a loan must repay it as well as the interest that has accrued up until they start making repayments.¹⁴ The repayment plans depend on when students started their studies, whether they studied part-time or full-time, and whether they were undergraduate or post-graduate students.

When examining the consequences of tuition fees in Germany, it is important to keep in mind that students could try to avoid fees by moving or commuting to a non-tuition state. Moving implies direct costs (search costs for new accommodation, moving costs,

¹¹For example, assets of up to 7,500 euros are not included in the BAföG calculation.

¹²The amount required to meet financial needs is based on how much money students typically need for their living expenses (food, accommodation, clothing, etc.) and their education (textbooks, travel costs, etc.). This is stipulated by the relevant legislation. For example, in 2018, the pre-defined amount required to meet basic financial needs is 451 euros for students living with their parents and 649 euros for students not living with their parents (Bundesministerium für Bildung und Forschung 2018).

¹³Applicants with children under the age of ten may be granted a childcare supplement of 130 euros per month for each child. The maximum BAföG rate for students no longer living with their parents is currently 735 euros per month (Bundesministerium für Bildung und Forschung 2018).

¹⁴Repayments are made through the UK tax system by employers deducting the monthly payments directly from graduates' salaries.

rental costs, costs of furnishing the apartment, etc.), indirect costs (forgoing potential economies of scale enjoyed when living with parents), as well as social costs (less contact with family and friends) (Spiess and Wrohlich 2010). Alecke and Mitze (2012) study the relationship between tuition fees and students’ migration decisions in Germany. The authors report an increase (decrease) in the number of freshmen coming from other federal states to non-tuition (tuition) states.¹⁵ These findings might be (partly) driven by the fact that moving costs are more of a constraint for students from lower socio-economic backgrounds.¹⁶ Hence, in addition to the possibility that students from lower socio-economic backgrounds might be more likely to lower their intentions to acquire a higher education degree because they overestimate (underestimate) the costs (benefits) of attending university, moving costs might be another relevant factor. In section VI, we therefore study potential heterogeneous effects by parents’ socio-economic background.

IV. Data

This study uses data from the Youth Questionnaire of the German Socio-Economic Panel (SOEP). The SOEP surveys young people in households that are part of the SOEP with a special youth questionnaire the year they turn 17 (SOEP Group 2012). This questionnaire asks detailed questions about past and current school achievements and about young people’s educational intentions. Those who state that they intend to complete occupational training or attain a university degree in the future are asked: “Which of the following degrees do you plan to attain?”¹⁷ Our main dichotomous dependent variable “aiming at a higher educational degree” is equal to one if a young person aims to earn a degree from a technical college or university, and zero otherwise. Overall, around 70 percent of those surveyed intend to pursue higher education in the future. In addition, we examine the following dichotomous outcome variables: (1) apprenticeship; (2) full-time vocational school (*Berufsfachschule*) or health sector school (*Schule des Gesundheitswesens*); (3) higher-level trade or technical school (*Meisterschule*, *Technikerschule*); (4) training for civil servants (*Beamtenausbildung*) and (5) college of advanced vocational studies (*Berufsakademie*). These additional outcome variables are equal to one if a young person intends to acquire one of the respective degrees, and zero otherwise.¹⁸ Finally, we

¹⁵The authors report a decrease in the number of freshmen of 1.6 percent among tuition states.

¹⁶This is something the authors could not investigate with the administrative data at their disposal.

¹⁷Respondents can choose one of the following answer categories: apprenticeship; full-time vocational school (*Berufsfachschule*) or health sector school (*Schule des Gesundheitswesens*); higher-level trade or technical school (*Meisterschule*, *Technikerschule*); training for civil servants (*Beamtenausbildung*); college of advanced vocational studies (*Berufsakademie*); technical or professional college (*Fachhochschule*); university.

¹⁸Note that the various outcome variables are not mutually exclusive as an individual can, for example, aim at doing an apprenticeship first, followed by an university degree thereafter.

also shed some light at the actual behaviour by studying young people’s attendance at a higher education institution at the ages 21-22 years.

Using the self-reported intention to pursue higher education at the age of 17 as an outcome has several advantages. First, in contrast to individuals who have already finished secondary schooling, 17-years-olds might be more likely to change their secondary schooling choices and investments. Cameron and Heckman (2001), for example, argue for the US that educational choices made prior to the time when students decide whether to attend college should be considered. Second, studying students’ intentions helps us to understand how young people make their educational plans and what role educational institutions can play in their career choices. Third, tuition fees should have no impact on where 17-years-olds live or on their probability to participate in the survey since the overwhelming majority of 17-years-olds still live with their parents (Iacovou 2002; Francesconi et al. 2010) and it is very unlikely that families move due to the introduction of tuition fees.

Although the information about 17-year olds’ intentions cannot predict actual enrollment in higher education perfectly, intentions are a meaningful measure of actual behaviour. Table 2 displays the share of individuals who enroll in higher education over time, separately for individuals with and without a reported intention to acquire a higher degree as adolescents. Four years after the first interview (i.e., at the age of 17), 53 percent of the individuals who intended to pursue higher education are actually enrolled in higher education, compared to 23 percent who did not intend to pursue higher education at the age of 17. These differences increase over time, and six years after the first interview, 80 percent of those who intended and 45 percent of those who did not intend to pursue higher education at the age of 17 are actually enrolled in an institution of higher education. Overall, the share is around 30 to 40 percentage points higher for individuals who did intend to pursue higher education as adolescents than for individuals who did not.

Our sample covers all individuals who state in the Youth Questionnaire that they (i) attend an upper secondary school, (ii) intend to acquire an upper secondary leaving certificate or (iii) have already an upper secondary leaving certificate. An upper secondary leaving certificate allows individuals to enter higher education in Germany.¹⁹ We supplement the sample with individuals who did not receive the Youth Questionnaire at the age of 17 years, because they did not belong to a SOEP household at that time because they entered the SOEP afterwards. When participating in the SOEP for the first time, they receive the questions of the youth questionnaire. We restrict the sample to individuals

¹⁹To rule out endogenous selection, we test whether the introduction of tuition fees has an effect on whether students belong to our sample. The result of the test shows no support for endogenous selection.

who were at most 20 years old and were still going to school at the time of the interview. Using pooled cross-sections from 2004 to 2012, the sample comprises 1,430 young individuals.

Table 3 displays mean values and standard deviations of key variables separately for individuals living in tuition states and non-tuition states. The first two columns show summary statistics only for respondents who answered the youth questionnaire before October 2006, i.e., before any tuition fees were introduced. Columns (3) and (4) report summary statistics of the pooled cross-sections for the entire period (2004-2012). Overall, the table shows that individuals living in tuition states and non-tuition states differ somehow. The share of individuals who state that they intend to pursue higher education is about twelve percentage points higher in tuition states (at 80.1%, column (1)). Furthermore, the proportion of young people with highly educated parents (i.e., with at least one parent having a university degree) and with a migration background is higher in the tuition states. Finally, the household equivalent income (measured in 2010 prices) is approximately 21% higher in tuition states. These differences are not surprising because none of the federal states of the former German Democratic Republic (GDR) introduced tuition fees. The former GDR is less affluent and has a different social structure than the former West Germany, as reflected in Table 3.

Figure 1 illustrates how the share of individuals who state that they aim to pursue higher education develops over time separately for tuition and non-tuition states. The bottom part of the figure displays the number of states with tuition fees in place by the end of the year. In the top part of the figure, the solid blue line depicts the share of individuals from tuition states and the dashed red line displays the share of individuals from non-tuition states who state that they intend to pursue a higher degree as adolescents. Before 2007, the share of individuals who stated that they intended to pursue higher education was slightly higher in the tuition states. After 2007, however, when all seven tuition states had introduced a fee, the lines began moving in different directions. First, the share increased for the non-tuition states but decreased for the tuition states. The diverging trends between treatment and comparison groups following the policy change suggests that tuition fees might have a negative impact on young people’s educational intentions. After 2009, the gap closed somewhat and in 2012—when most states had already eliminated university tuition fees—the share is again higher in tuition than in non-tuition states.

V. Empirical strategy

Using the introduction and elimination of tuition fees in Germany as quasi-experimental evidence, we apply a difference-in-differences (DiD) research design to identify the effect

of tuition fees on young people’s educational plans. Here, tuition states serve as treatment and non-tuition states as a control group. We assign the treatment status according to the state of residence at the age of 17, when young people are still in secondary school.²⁰

We start the empirical analysis by estimating the following model:

$$y_{ist} = \beta_0 + \theta_1 Tuition_{ist} + X_{ist}\beta + \lambda_s + \gamma_t + u_{ist}. \quad (1)$$

Subscript i denotes the individual, s the federal state of residence, and t the time of the interview (month-year). The dependent variable is equal to one if adolescents answer that they intend to pursue higher education and zero otherwise. The dummy variable $Tuition_{ist}$ is equal to one if tuition fees are implemented in the individual’s state of residence at the time of the interview, and zero otherwise. λ_s and γ_t are federal state and time fixed effects, respectively. X_{ist} is a $(1 \times k)$ vector with further control variables. In the main regressions, the vector consists of a gender dummy, a dummy for whether a person has a migration background, for whether at least one parent has a university degree, the household equivalent income (measured in 2010 prices), and the ratio of unemployed individuals and number of open vacancies at the state level. θ_1 captures the effect of tuition fees on the intention to acquire a higher educational degree. Standard errors are clustered at the state level.

Thereafter, we study potential heterogeneous effects such as:

$$y_{ist} = \beta_0 + \theta_1 Tuition_{ist} + \beta_2 Char_{ist} + \theta_2 Tuition_{ist} \times Char_{ist} + X_{ist}\beta + \lambda_s + \gamma_t + u_{ist} \quad (2)$$

Equation (2) extends equation (1) by adding a dummy $Char_{ist}$ and an interaction term between $Char_{ist}$ and the dummy $Tuition_{ist}$. The dummy $Char_{ist}$ is one if individuals belong to a specific group according to their characteristics, and zero otherwise. We distinguish between the following different individuals’ characteristics: gender, household income, and whether parents have a university degree.

The interpretation of θ_1 now changes compared to equation (1). θ_1 now measures the effect of the tuition fees on the intention to pursue higher education for the reference group. The parameters $\theta_1 + \theta_2$ instead capture the effect of tuition fees on the intention to pursue higher education for individuals who do not belong to the particular reference group. If tuition fees have a negative impact on the intention to pursue higher education, and if the effect is stronger for the reference group, θ_2 would be positive.

²⁰Since tuition fees provide individuals who are still in school with no financial incentive to move, they should not influence the state of residence.

VI. Results

Table 4 reports the estimation results from four different specifications of equation (1). The first regression includes only the dummy $Tuition_{ist}$, together with a maximum set of time and state fixed effects as regressors. The DiD estimate reveals a decrease of approximately 8.6 percentage points in the intention to pursue higher education due to the introduction of tuition fees. This corresponds to a decrease of around 11 percent, since around 80 percent of 17-year-old high school students from tuition states planned to pursue higher education before any tuition fee was introduced. The next specifications in Table 4 successively add the following control variables: gender and migration background (column 2), household equivalent income and whether parents have a university degree (column 3), and labor market conditions (column 4). The estimated impact and the precision of the tuition fees effect on adolescents' educational intentions remain very stable across the different specifications. Overall, the results suggest that young people's intention to pursue higher education decreases by around eight percentage points (10 percent). This effect appears fairly large. For example, the educational intentions of those coming from an academic background, i.e., having at least one parent with a university degree, are around 20 percentage points higher than for those whose parents do not have a university degree. The introduction of university tuition fees therefore corresponds to nearly 40 percent of the differences in educational intentions between adolescents from academic and non-academic households.

Next, we estimate equation (2) with varying reference groups to test for effect heterogeneity. The results are shown in Table 5. As a benchmark, the first column in the table reports the DiD point estimate from our preferred specification as in Table 4. The regressions in columns (2)-(4) in Table 5 use the poorest 10, 20, and 30 percent (according to the household equivalent income) as reference groups, respectively. The results in column (2) predict an about 33 percentage point (43 percent) reduction in the intention to pursue higher education for the individuals from the poorest 10 percent of households. Therefore, the estimated impact of the fees is much higher (more negative) for low-income individuals than for the average individual. The effect is highly significant and differs from the tuition effect for individuals from higher-income families at the 5 percent significance level. Column (3) in Table 5 shows that the tuition effect differs considerably between the poorest 10 and 20 percent. The point estimate of the tuition effect for the poorest 20 percent is -16 percentage points (24 percent) and is statistically significant at the 5 percent level. The effect still differs from the tuition effect of individuals from higher income groups. For the poorest 30 percent, the estimated tuition effect drops further to about -13 percentage points (-19 percent) and is still statistically significant. The results

show that individuals from low-income households, especially individuals from the poorest 10 percent, mainly drive the results. Possible explanations for these differences are that lower-income students and/or their parents have distorted views of the costs and benefits of higher education, that they are not well informed about the available financial aid, and they are more responsive to the moving and commuting costs to non-tuition fee states.²¹ Testing whether the effect also depends on the gender of a person or on the university education of the parents in the last two columns of Table 5, we do not find evidence of additional effect heterogeneity.²²

We now investigate whether the heterogeneous effects with respect to household income might be driven by the fact that children from poorer households are less successful in school or have lower educated parents, which might not be adequately controlled for in our main specification. Table 6 adds further explanatory variables when differentiating between the reference groups of the poorest 10, 20 and 30 percent. Panel A adds a dummy variable for whether the parents completed upper secondary school and variables for adolescents' test scores in mathematics and German; test scores are measured on a six-point scale on which a score of 1 represents the highest mark and a score of 6 is the lowest mark. We distinguish between three different groups (scores 1 and 2, scores 3 and 4, scores 5 and 6). Panel B also includes interaction terms between the tuition dummy and school grades in math and German; and Panel C additionally covers interactions between the tuition dummy and the educational background of the parents, i.e., whether they completed upper secondary school but have no university (technical college) degree or a university degree. For the poorest 10 percent, the estimated impact of tuition is about 27 percentage points higher than the tuition effect for individuals from higher-income families in all three panels. Thus, the difference is basically the same or even slightly higher than the results in Table 5. Adding additional control variables also changes the results for the other two income groups (columns (2) and (3) in Table 6) only slightly. Overall, the results in Table 6 show that the DiD estimates for low-income individuals are unlikely to be driven by differences in school performance or by parents' educational background.

²¹Moreover, students from high-income families might be more likely to attend private higher education institutions, which could be an alternative explanation for the heterogeneity pattern observed. Although we cannot completely rule out this possibility, we do not believe that this explanation is likely to play a major role in Germany as the proportion of students in private universities is low. For example, in the winter term 2016, less than ten percent of all students were enrolled at a private university in Germany (Statistisches Bundesamt 2017).

²²In non-reported regressions, we also found no evidence for heterogeneous effects by migration background.

VII. Robustness

Studies have shown that a small number of clusters might lead to an over-rejection of the null-hypothesis (see, e.g., Donald and Lang 2007). Since we use only 16 clusters, over-rejection of the null hypothesis is also a concern. One method to address this potential problem is the wild cluster bootstrap procedure suggested by Cameron et al. (2008), who show in a simulation exercise that their method can cope with a small cluster size. Table 7 displays p-values from the wild cluster bootstrap procedure for the four different model specifications as in Table 4. In the second regression in Table 7, the p-value for the tuition fees effect is slightly higher than 1 percent, and in the other regressions, the p-value is always below the 1 percent significance level. Thus, the statistical significance of the tuition effect does not change compared to the main results in Table 4. Also, the significance of the other covariates does not change considerably. The results from the wild cluster bootstrap procedure suggest that the small number of clusters is unlikely to be a problem in our application.

Another concern is that unobserved events/reforms/shocks occurred during the observation period and affected educational intentions of adolescents from tuition and non-tuition states differently. Especially, the figure displays a sharp increase in the intention to pursue higher education for tuition states in 2012, with a decrease for non-tuition states in the same year. As a benchmark, the first column of Table 8 reports the DiD estimates from our preferred model (Table 4, column 4). The second and third columns of Table 8 display the regression results of our preferred specification without the observations from particular pre-treatment years, i.e., deleting observations from the year 2004 in column (2), and excluding observations from the year 2005 in column (3). The last column of the table shows the result without observations from the year 2012. The point estimates of the tuition fees in columns (2)-(4) in Table 8 vary between -5.4 and -8.2 percentage points, and are always significantly different from zero at the 5 percent level. These results provide first suggestive evidence that it is unlikely that specific shocks or policy events in particular years are driving the results.

An alternative way to check whether unaccounted factors might bias the findings is to include potential relevant variables directly into the regressions, if they are observable. The introduction of tuition fees in Germany was mainly a political decision and therefore our estimated tuition effect might partly capture differences in attitudes, preferences and norms that might systematically vary between tuition and non-tuition states, and over time. In section III above, we discussed that the majority of conservative state governments introduced tuition fees. The regression in Table 9, column (2) therefore also controls for a dummy variable CDU/CSU to check whether political changes might drive

the results. The variable is equal to one if the CDU/CSU is part of the government in the federal state of the respondent at the time of the interview, and zero otherwise.²³ This expansion of the model has only a negligible effect on the point estimates and shows that the tuition effect does not just capture a ‘ruling party’ effect.²⁴ Moreover, different developments in educational spending and differences in the relative size of high school graduates between tuition and non-tuition states might bias the estimates. The specifications in columns (2) and (3) in Table 9 therefore also control for educational expenditure divided by the Gross Domestic Product, and the number of high school graduates divided by the size of the population at the federal state level. None of these variables turns out to be significant and the estimated impact of tuition fees on educational intentions hardly changes.

Our main specification implicitly assumes that the announcement of tuition fees does not affect individuals’ educational intentions. We now test whether this assumption is reasonable. The last column of Table 9 adds the dummy *Announced Tuition* to the main model. This variable is equal to one if, at an individual’s federal state of residence, a tuition fee is officially announced, but not yet introduced at the time of the interview.²⁵ The estimated announcement effect is negative, but statistically insignificant. Further, the estimated tuition effect increases by about one percentage point to approximately -9.9 percentage points. Thus, the point estimate of -7.8 in the main regression is rather conservative and could be interpreted as a lower bound. In non-reported regressions, we also estimated weighted DiD regressions using the cross-sectional weights provided by the SOEP Group. The point estimate of tuition fees on educational intentions in the weighted regressions is more negative (and precisely estimated at the 5 percent significance level) than in our preferred specification.

A linear probability model (LPM) has the disadvantages that it does not restrict predictions to lie between zero and one and, in absence of interaction terms, the marginal effects are constant. Table 10 reports results from probit estimates. The first column replicates the main specification and shows that the tuition fee effect is significant at the 5 percent level and the average marginal effect (AME) is only a bit lower compared to the result of the LPM with -6.6 percentage-point decrease in adolescents’ educational intentions. The next three models estimate the tuition effect for individuals from different income households. Again, the tuition effect is always significant at least at the 5 percent level and negative for the poorest 10, 20 and 30 percent. The AMEs for these three poor

²³Overall, in 60 percent of all cases the CDU/CSU was part of a state government.

²⁴In non-reported regressions, we also included lagged values (up to four lags) of the CDU/CSU variable. None of these lagged variables had a significant impact on young people’s educational intentions (individually and jointly) and the DiD point estimate remained very stable.

²⁵See Table 1 for the timing of announcement in the different states.

income groups are very similar to the results of the LPM. The last two columns in Table 10 test whether the tuition effect depends on gender and the educational background of the parents. Again, the results do not provide evidence that the effects vary with respect to these characteristics. Overall, using probit models instead of LPMs does not change the main findings.

VIII. Further Evidence: Other Educational Intentions, Actual Behaviour, and Abolition of Tuition Fees

What is the general equilibrium impact of the reform on young people’s educational plans? Do tuition fees shift the type of education individuals plan to acquire? Are the findings for young people’s intentions to acquire a higher educational degree consistent with observed behaviour? Are there asymmetries between the introduction and abolition of tuition fees?

To study the first two questions, we estimate linear probability models for outcomes measuring the intentions to proceed with alternative educational paths and to acquire one of the following degrees: (1) apprenticeship; (2) full-time vocational school; (3) higher-level trade or technical school; (4) training for civil servants, and (5) college of advanced vocational studies. Table 11 presents the results.²⁶ The key coefficient of interest on university tuition fees in column (1) suggests a significant and considerable increase in the intention to acquire an apprenticeship of around 11 percentage points (53 percent).²⁷ In contrast, we do not find evidence of changes for the other outcome measures. None of the estimates in Table 11, columns (2)-(5), are statistically significant at conventional levels and the magnitude of the effects in columns (4) and (5) are close to zero. Overall, the findings suggest that the decrease in the intention to acquire a higher educational degree is mirrored by a significant and considerable increase in the intention to acquire an apprenticeship. The findings in Table 4 suggest a certain shift from higher education to vocational education in terms of aiming to complete an apprenticeship.

The longitudinal data also allow an exploration of whether the main findings for young people’s intention to acquire a higher educational degree are consistent with actual behaviour. Table 12 reports findings for individuals’ observed enrolment in higher education. We present estimates from linear probability models for actually attending a technical college or university at the ages of 21 and 22 years (i.e., four and five years after the first SOEP interview took place). While the richness of the SOEP allows us to study educational intentions in terms of acquiring higher education and actual behaviour, one limitation is the relatively small sample size for young people’s observed behaviour.²⁸ In

²⁶We present estimates for our main specification as in Table 4, column 4.

²⁷Means of outcomes are reported at the bottom of the table.

²⁸There is considerable attrition in the SOEP among young people around the time when they leave

line with our main findings, the estimates in Table 12 point to a decline in the likelihood of actually attending an institution of higher education by around 5-9 percentage points (11-14 percent). However, the confidence intervals are broad and the estimates are not precisely estimated. We therefore interpret the results in Table 12 cautiously as suggestive and supportive evidence for our main findings on the negative effect of tuition fees on the intention to acquire a higher educational degree.

Finally, Table 13 reports the findings for our main specification when also controlling for (1) the date the legislation abolishing tuition fees was passed, and (2) the date when tuition fees were actually abolished. Similar to the introduction of tuition fees, the legislation and the actual abolition of tuition fees varies over time and across federal states. For example, Hesse was the first state to terminate its university fees in October 2008 and the legislation for termination was passed in the state parliament in June 2008 (see Table 3). Column (2) in Table 13 reports the findings when we also control for time-varying dummy variables capturing legislation and actual abolition in fees, and column (1) displays the main estimates from Table 4 as a benchmark. The results show that the main estimate on the introduction of tuition fees on educational intentions becomes slightly more negative with a reduction of nine percentage points when controlling for the abolition of the fees. However, the estimates on the dummy variable “Legislation for abolition passed” shows a positive, albeit insignificant, effect on educational intentions. The estimated coefficient on the variable “Tuition fees abolished” is negative, small in magnitude, and not statistically significant. Overall, the findings in Table 13 suggest that the effects on students’ intentions seem to reverse to the initial level as there are no significant differences between students’ intentions in states that abolished the fees compared to non-tuition fee states.²⁹

IX. Conclusions

This article analyzes the impact of higher education tuition fees on adolescents’ educational intentions. Using data from the Youth Questionnaire of the German Socio-Economic Panel (SOEP), the results suggest that tuition fees considerably decrease the likelihood that adolescents plan to acquire a higher educational degree. This finding is in line with previous studies that analyze the short-term effect of tuition fees on university enrollment in Germany (see, e.g., Tecu 2009 and Hübner 2012). The empirical results demonstrate that even relatively low fees of 1,000 euros per academic year can have large adverse effects on young people’s educational intentions, especially for individuals from low-income families. Overall, the results show a eight percentage points decrease in the

the parental home.

²⁹We are grateful to a referee for pointing this out to us.

intention to acquire a higher degree, and a 33 percentage points decrease for individuals from the poorest 10 percent income households. Although the intention of 17-years-olds do not predict actual behaviour perfectly, the intention and the actual decision are closely related. Thus, changes in individuals' stated intentions are likely to also impact on actual behaviour.

Different possible mechanisms exist why tuition fees might especially affect educational intentions of individuals from low-income households. One is that low-income individuals perform worse in school. Therefore, tuition fees would not deter individuals from poor income households, per se, but rather lower performing pupils. We find no empirical evidence for this potential explanation since differences in school performance cannot explain the effect heterogeneity. Another possible mechanism is the existence of borrowing constraints. Further potential mechanisms are differences in financial literacy, educational preferences and discount factors between income groups. The impact of tuition fees on perceived net benefits from higher education might vary between individuals according to family income, because of these differences.

The results of this study are informative for policy debates. They show that even modest tuition fees of 1,000 euros per academic year can have huge adverse effects on the educational plans of high school students. The provision of loan schemes alone is unlikely to prevent low-income individuals from changing their educational intentions. Different institutional factors might contribute to these results. One factor could be that the financial net gains of higher education are relatively low in Germany compared to other OECD countries (OECD 2013). Another explanation might be that the federal states did not promote scholarships widely enough when introducing tuition fees. Both institutional features might have amplified the effect of tuition fees on adolescents' educational intentions.

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Figure 1: Common trend, number of states with tuition fees and share of students affected by tuition fees

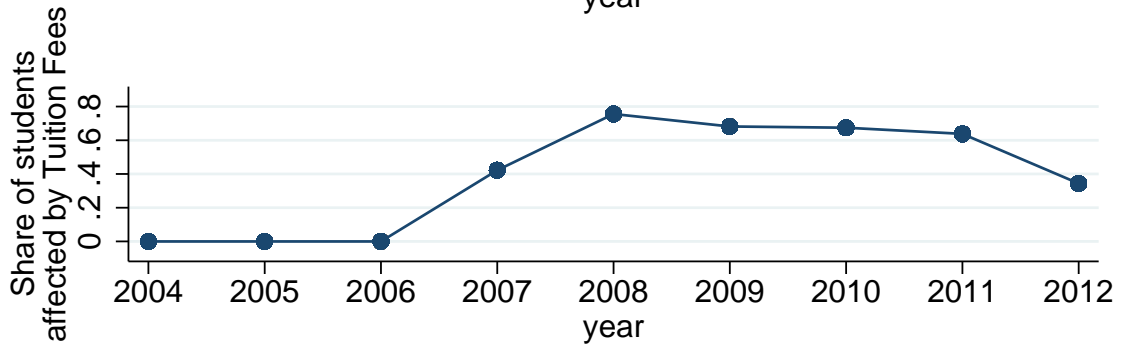
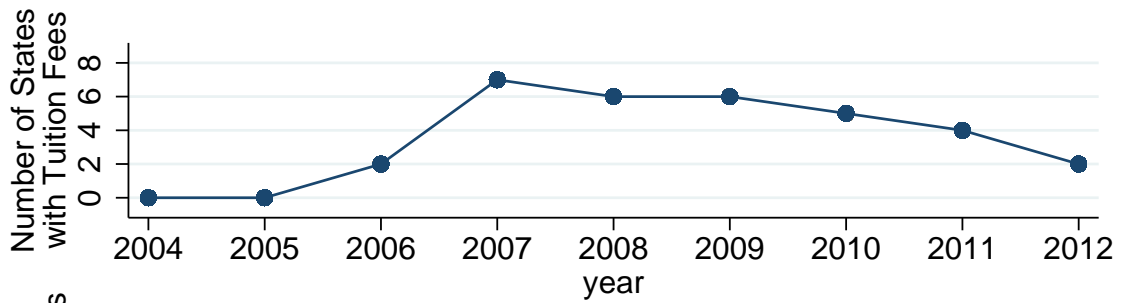
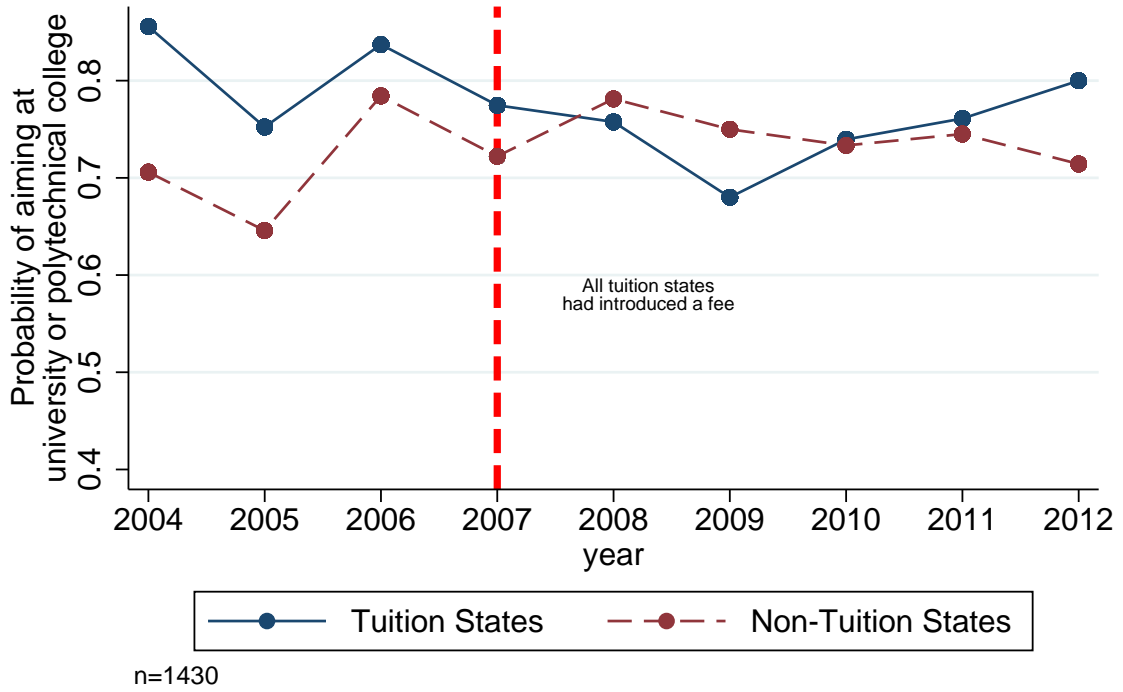


Table 1: Tuition fees legislation in Germany

State	Legislation passed	Fee introduced	Legislation for termination passed	Fee terminated
Baden-Württemberg	12/2005	4/2007	4/2011	4/2012
Bavaria	5/2006	4/2007	5/2013	10/2013
Hamburg	7/2006	4/2007	4/2011	10/2012
Hesse	10/2006	10/2007	6/2008	10/2008
Lower Saxony	12/2005	10/2006	7/2013	10/2014
North Rhine-Westphalia	3/2006	10/2006	4/2011	10/2011
Saarland	7/2006	10/2007	2/2010	4/2010

Federal states without tuition fees: Berlin, Brandenburg, Bremen, Mecklenburg-West Pomerania,

Rhineland-Palatinate, Saxony, Saxony Anhalt, Schleswig Holstein and Thuringia.

Table 2: Share of high-school students being enrolled in higher education

After	3 years	4 years	5 years	6 years
Aiming at a higher educational degree as adolescent	0.042 (498)	0.531 (435)	0.728 (268)	0.804 (158)
Not aiming at a higher educational degree as adolescent	0.058 (154)	0.232 (138)	0.329 (85)	0.447 (47)

Number of individuals in parentheses. Note that the number of individuals differs from the sample size in Table 3 because we do not have longitudinal information for all first-time respondents (e.g., those first interviewed in 2011 and 2012) and because of dropout from the panel.

Table 3: Descriptive statistics

	Before October 2006		Full Time Period (2004-2012)	
	Tuition States	Non-Tuition States	Tuition States	Non-Tuition States
Aiming at a higher educational degree	0.801 (0.400)	0.677 (0.470)	0.772 (0.420)	0.728 (0.445)
Tuition	0.000 (0.000)	0.000 (0.000)	0.558 (0.497)	0.000 (0.000)
Male	0.432 (0.497)	0.475 (0.502)	0.471 (0.499)	0.487 (0.500)
Migration background	0.233 (0.424)	0.030 (0.172)	0.230 (0.421)	0.110 (0.313)
Parents with a university degree	0.403 (0.492)	0.263 (0.442)	0.358 (0.480)	0.276 (0.448)
Household equivalent income	1.787 (0.867)	1.477 (0.779)	1.741 (1.129)	1.450 (0.752)
Unemployment/vancancies	11.861 (3.215)	23.732 (10.285)	7.269 (3.254)	13.131 (8.237)
Number of individuals	206	99	1003	427

Figures are means with standard deviations in parentheses.

Equivalent household income is household income in 1,000 euros and in 2010 prices divided by adjusted household size.

Household member who are older than 14 years receive a weight of 0.5 and other household member a weight of 0.3.

Table 4: Average effects on intention to acquire a higher educational degree

Outcome:	Intention to acquire a higher educational degree			
	(1)	(2)	(3)	(4)
Tuition	-0.086** (0.029)	-0.086** (0.030)	-0.080** (0.029)	-0.078** (0.028)
Male		0.000 (0.016)	-0.011 (0.015)	-0.011 (0.015)
Migration		-0.040 (0.035)	-0.008 (0.037)	-0.008 (0.037)
Parents with a university degree			0.161*** (0.022)	0.161*** (0.022)
Household equivalent income			0.048*** (0.014)	0.048*** (0.014)
Unemployment/vacancies				-0.001 (0.003)
Time Fixed Effects	YES	YES	YES	YES
State Fixed Effects	YES	YES	YES	YES
Number of individuals	1430	1430	1430	1430

Clustered standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Heterogenous effects of tuition fees on the intention to acquire a higher educational degree

	(1)	(2)	(3)	(4)	(5)	(6)
		Reference group:				
	Full Sample	Poorest 10%	Poorest 20%	Poorest 30%	Female	Parents without a uni. degree
Tuition	-0.078** (0.028)	-0.329*** (0.105)	-0.158** (0.060)	-0.134** (0.050)	-0.066** (0.030)	-0.093** (0.034)
Male	-0.011 (0.015)	-0.009 (0.015)	-0.012 (0.015)	-0.011 (0.015)	-0.002 (0.024)	-0.011 (0.015)
Parents with a university degree	0.161*** (0.022)	0.159*** (0.022)	0.156*** (0.021)	0.158*** (0.021)	0.178*** (0.027)	0.145*** (0.033)
Higher income		0.013 (0.048)	0.098*** (0.030)	0.067** (0.026)		
Tuition*Higher income		0.273** (0.095)	0.100* (0.050)	0.087** (0.039)		
Male*Tuition					-0.021 (0.033)	
Parents with a university degree* Tuition						0.039 (0.034)
Time Fixed Effects	YES	YES	YES	YES	YES	YES
State Fixed Effects	YES	YES	YES	YES	YES	YES
Number of individuals	1430	1430	1430	1430	1430	1430

Further covariates in all models: Female, migration background, parents with a university degree, household equivalent income and unemployment/vacancies.

Clustered standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Incorporate ability and education of parents

	(1)	(2)	(3)
	Reference group:		
	Poorest 10%	Poorest 20%	Poorest 30%
Panel A: Baseline			
Tuition	-0.303** (0.109)	-0.136* (0.067)	-0.116** (0.052)
Higher income	-0.002 (0.048)	0.085** (0.030)	0.048* (0.025)
Tuition*Higher income	0.270** (0.096)	0.101* (0.056)	0.092** (0.041)
Panel B: Ability (proxied by scores)			
Tuition	-0.258*** (0.086)	-0.078 (0.052)	-0.061 (0.048)
Higher income	-0.010 (0.048)	0.080** (0.030)	0.041 (0.026)
Tuition*Higher income	0.290** (0.100)	0.114* (0.055)	0.106** (0.042)
Panel C: Ability (proxied by scores) & education parents			
Tuition	-0.240*** (0.076)	-0.053 (0.058)	-0.035 (0.061)
Higher income	-0.008 (0.045)	0.082** (0.028)	0.044* (0.025)
Tuition*Higher income	0.285*** (0.096)	0.106* (0.055)	0.099** (0.045)
Time Fixed Effects	YES	YES	YES
State Fixed Effects	YES	YES	YES
Number of observations	1430	1430	1430

Further covariates in all panels: Female, migration background, parents with a university degree, parents with a upper secondary leaving certificate, test scores, household equivalent income, unemployment/vacancies, higher income.

Clustered standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: Wild clustered bootstrap (p-values)

	(1)	(2)	(3)	(4)
	Full Sample	Full Sample	Full Sample	Full Sample
Tuition	0.008	0.012	0.008	0.004
Male		0.626	0.214	0.220
Migration		.032	0.146	0.146
Parents university			0.000	0.000
Household equivalent income			0.012	0.012
Unemployment/vancancies				0.546
Time Fixed Effects	YES	YES	YES	YES
State Fixed Effects	YES	YES	YES	YES
Number of individuals	1430	1430	1430	1430

p-values are displayed.

Table 8: Robustness: excluding certain years

	(1)	(2)	(3)	(4)
		Without the year:		
	Full Sample	2004	2005	2012
Tuition	-0.078** (0.028)	-0.054** (0.022)	-0.082** (0.034)	-0.077** (0.030)
Male	-0.011 (0.015)	-0.026 (0.017)	-0.021 (0.013)	-0.003 (0.018)
Migration background	-0.008 (0.037)	-0.020 (0.037)	0.009 (0.044)	-0.017 (0.040)
Parents with a university degree	0.161*** (0.022)	0.178*** (0.020)	0.164*** (0.022)	0.156*** (0.023)
Household equivalent income	0.048*** (0.014)	0.046*** (0.015)	0.050*** (0.013)	0.049*** (0.015)
Unemployment/vacancies	-0.001 (0.003)	0.003 (0.008)	-0.002 (0.003)	-0.002 (0.003)
Time Fixed Effects	YES	YES	YES	YES
State Fixed Effects	YES	YES	YES	YES
Number of individuals	1430	1282	1273	1273

Clustered standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 9: Robustness: further covariates

Outcome:	(1)	(2)	(3)	(4)	(5)
	Intention to acquire a higher educational degree				
Tuition	-0.078** (0.028)	-0.080*** (0.027)	-0.080*** (0.027)	-0.085*** (0.028)	-0.099** (0.043)
Male	-0.011 (0.015)	-0.011 (0.015)	-0.011 (0.015)	-0.010 (0.016)	-0.009 (0.016)
Migration background	-0.008 (0.037)	-0.006 (0.037)	-0.006 (0.037)	-0.006 (0.037)	-0.007 (0.036)
Parents with a university degree	0.161*** (0.022)	0.162*** (0.022)	0.162*** (0.022)	0.162*** (0.021)	0.162*** (0.021)
Household equivalent income	0.048*** (0.014)	0.048*** (0.014)	0.048*** (0.014)	0.048*** (0.014)	0.048*** (0.014)
Unemployment/vacancies	-0.001 (0.003)	-0.001 (0.002)	-0.001 (0.003)	-0.001 (0.003)	-0.000 (0.002)
CDU/CSU		-0.070 (0.053)	-0.070 (0.053)	-0.067 (0.053)	-0.068 (0.053)
Educational expenditure/gdp			0.004 (0.095)	-0.004 (0.094)	-0.004 (0.093)
High school graduates/population				14.57 (28.28)	13.22 (28.23)
Announced tuition fees					-0.041 (0.062)
Time Fixed Effects	YES	YES	YES	YES	YES
State Fixed Effects	YES	YES	YES	YES	YES
Number of individuals	1430	1430	1430	1430	1430

Clustered standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 10: Probit estimation

	(1)	(2)	(3)	(4)	(5)	(6)
		Reference group:				
	Full Sample	Poorest 10%	Poorest 20%	Poorest 30%	Male	Parents without a uni. degree
Probit estimation: coefficients						
Tuition	-0.242** (0.094)	-0.903*** (0.306)	-0.446** (0.186)	-0.398** (0.161)	-0.197* (0.106)	-0.286*** (0.109)
Male	-0.033 (0.044)	-0.028 (0.044)	-0.040 (0.045)	-0.037 (0.045)	0.001 (0.073)	-0.033 (0.044)
Parents with a university degree	0.598*** (0.106)	0.606*** (0.109)	0.612*** (0.106)	0.613*** (0.108)	0.599*** (0.106)	0.529*** (0.133)
Higher income		-0.080 (0.134)	0.203** (0.091)	0.109 (0.093)		
Tuition*Higher income		0.742*** (0.277)	0.259* (0.153)	0.240* (0.125)		
Male*Tuition					-0.087 (0.114)	
Parents with a university degree* Tuition						0.174 (0.183)
Probit estimation: average marginal tuition effect						
Reference Group	-0.066	-0.321	-0.160	-0.138	-0.054	-0.093
Non-Reference Group		-0.042	-0.047	-0.038	-0.079	-0.019
Time Fixed Effects	YES	YES	YES	YES	YES	YES
State Fixed Effects	YES	YES	YES	YES	YES	YES
Number of individuals	1430	1430	1430	1430	1430	1430

Clustered standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

For unreported covariates see notes to Table 5.

Table 11: Average effects on intention to acquire other degrees

	(1)	(2)	(3)	(4)	(5)
Outcome: Intention to acquire ...	Apprenticeship	Vocational school	Trade/ Technical School	Degree as civil servant	Adv. vocational school
Tuition	0.113*** (0.036)	-0.030 (0.021)	0.018 (0.011)	-0.004 (0.028)	-0.000 (0.019)
Male	-0.000 (0.018)	-0.009 (0.013)	0.023** (0.009)	0.020 (0.012)	-0.023* (0.012)
Migration background	-0.029 (0.025)	-0.006 (0.014)	0.001 (0.009)	-0.021 (0.014)	-0.001 (0.024)
Parents with a university degree	-0.138*** (0.018)	-0.033*** (0.009)	-0.020* (0.010)	-0.007 (0.015)	-0.005 (0.013)
Household equivalent income	-0.030*** (0.010)	-0.011** (0.005)	0.003 (0.003)	-0.011** (0.004)	0.001 (0.005)
Unemployment/vancancies	-0.006 (0.004)	0.002 (0.001)	-0.002 (0.002)	0.001 (0.002)	0.002 (0.003)
Time Fixed Effects	YES	YES	YES	YES	YES
State Fixed Effects	YES	YES	YES	YES	YES
Mean intention	0.211	0.041	0.028	0.052	0.035
Number of individuals	1430	1430	1430	1430	1430

Clustered standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 12: Average effects on enrollment in higher education

Outcome:	(1)	(2)
	Enrollment in higher education: At age 21	At age 22
Tuition	-0.053 (0.047)	-0.086 (0.108)
Male	-0.035 (0.044)	-0.007 (0.056)
Migration background	-0.064* (0.032)	-0.046 (0.040)
Parents with a university degree	0.191*** (0.054)	0.249*** (0.059)
Household equivalent income	0.023 (0.036)	0.053 (0.032)
Unemployment/vacancies	0.000 (0.009)	-0.003 (0.006)
Time Fixed Effects	YES	YES
State Fixed Effects	YES	YES
Mean enrollment	0.461	0.635
Number of individuals	558	345

Clustered standard errors in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 13: Average effects of the introduction and abolition of tuition fees on intention to acquire a higher educational degree

Outcome:	Intention to acquire a higher educational degree	
	(1)	(2)
Tuition	-0.078** (0.028)	-0.089*** (0.030)
Male	-0.011 (0.015)	-0.013 (0.016)
Migration background	-0.008 (0.037)	-0.008 (0.037)
Parents with a university degree	0.161*** (0.022)	0.162*** (0.021)
Household equivalent income	0.048*** (0.014)	0.047*** (0.014)
Unemployment/vancancies	-0.001 (0.003)	-0.001 (0.002)
Legislation for abolition passed		0.054 (0.052)
Tuition fees abolished		-0.020 (0.045)
Time Fixed Effects	YES	YES
State Fixed Effects	YES	YES
Number of individuals	1430	1430

Clustered standard errors in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.