The effects of tuition fees on the decision for higher education: Evidence from a German policy experiment

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Abstract

Applying difference-in-differences models on representative Germany survey data empirical evidence shows that the introduction of tuition fees in some German States reduced high school graduates propensity to enroll at University and favored the vocational training option. The mere announcement of tuition fees was sufficient to modify the individuals' decision regarding education; the modification did not depend on the actual implementation. The empirical determination of the effects relied on the fact that only some States introduced tuition fees.

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1. Introduction

On January 26th 2005, the Federal Constitutional Court of Germany terminated an intensive political debate that had raged during 2004 and conceded the federal States the right to introduce tuition fees for education at academic universities and universities of applied sciences. In consequence, seven of the sixteen German States introduced mandatory tuition fees at their universities and started to raise tuition fees between the winter term 2006/2007 and the winter term 2007/2008 (see Table 1 for more details). As nine States did not introduce tuition fees, the German situation delivers a kind of natural (policy) experiment, at least from the perspective of the upper secondary graduates (in the following called Abiturienten)[1]. Thus, we are interested in identifying the effect of tuition fees on the educational decision of the German Abiturienten, compared to those Abiturienten who are not affected by tuition fees due to their regional background (Meyer 1995). With an average tuition fee of 500 € for one semester, the amount of tuition fees is fairly moderate in an international comparison (Vossenstein 2009). And, due to mobility costs, moving from region that introduced tuition fees to a region without fees seems not to be a relevant option to lower the increasing costs for an education at universities.

Tuition fees ceteris paribus increase the cost of an academic education and hence reduce its present value compared to the vocational training option, i.e. participating in a vocational training program. On the other hand, tuition fees may improve the quality of study, but we assume that such a change would accrue over a longer term than we observed with our data. Thus, we expect that tuition fees will have a negative effect on the educational decision of Abiturienten starting a university study compared to a vocational training decision.

Table 1 about here: Introduction of tuition fees by state and year

2. Data

[1] Due to early and strict school tracking at the age of 10, the German upper secondary level graduation is highly selective and not comparable to a high school graduation in the U.S. Only about 30% of a German age cohort graduate from upper secondary education as Abiturienten.

Our analysis used data from the ALWA survey. The ALWA survey is a representative and retrospective survey and supplies current data for approximately 10,400 persons of the birth cohorts 1956 to 1988 living in Germany at the time of the interviews between September 2007 and April 2008 (see: Antoni et al 2011). In detail, we employed data from 686 individuals who graduated from general upper secondary education (the German "Abitur") between 2000 and 2006. In order to avoid censoring problems at the right side, we employed only data from Abiturienten who made their first educational decisions within 18 months after graduation. However, both within the Abiturienten subsample that we used and the whole sample, 93% of all Abiturienten started a first vocational education or training within 18 months after graduation with Abitur. Within the remaining group of 7% points, a minor group of only 2% points delayed the educational decision for more than 18 months after graduation. The majority (5% points) did not start a vocational training, even 10 years and longer after graduation. Individuals without a first vocational education or training are excluded from subsequent analysis.

3. Empirical Analysis

In this section, we model the time trends of the proportion of individuals going to university within a multivariate framework. In order to identify respective differences between the regions that introduced tuition fees and those that did not, we adopt a simple difference-in-differences approach based on the following linear expression:

$$(1)\quad y_{it} = \beta_L L_i + \beta_T T_t + \beta_{LT} L_i T_t + x'\gamma + \varepsilon_{it},$$

where y_{it} equals one if Abiturient i decides to go to university in year t. If the Abiturient decides to attend a vocational training program, this dummy takes on the value zero. The group indicator L_i equals one if Abiturient i made his or her upper secondary level graduation in a German Federal State that introduced tuition fees. Theoretically, the definition of L_i may result in identification problems,

i.e. simultaneity, and therefore, biased estimates since the Abiturient may decide simultaneously to move to a region that did not introduce tuition fees and to start an academic education. This would not harm our model, if the "mover" would have gone to university even if every region introduced tuition fees or would have moved even if no region had introduced tuition fees. However, our results would be biased, if the mover would have not studied without the opportunity to move to a region that has not introduced tuition fees. If the introduction of tuition fees has a negative impact on the Abiturient's decision to start an academic education, this simultaneity problem would yield an underestimated (less negative) effect. Hence, if we identify a negative effect, our simultaneity problem means that the "real" negative effect may be even stronger.

For the definition of the time indicator T_t we use three distinct scenarios: The first scenario is represented by a dummy variable which is one for the period from 2004 till 2007, which captures the effect of the increasing political debate about the introduction of tuition fees in 2004. A second dummy variable represents the decision of the German Federal Constitutional Court which confirmed that the States have the right to introduce tuition fees at universities. A third dummy variable reflects the years 2006 and 2007, when seven States started to introduce tuition fees (see Table 1). Ad hoc it is not possible to decide which time indicator is the most appropriate one. In order to "let the data speak", we therefore estimate three different specifications, 1) with a time indicator being one from 2004, 2) a time indicator being one from 2005 and 3) a time indicator being one from 2006. We furthermore include a vector of interaction terms between the respective time indicator and the group indicator L_i.

Vector x contains control variables, including gender, type of Abitur (academic versus vocational oriented [Fachoberschule]), the average grades reached in the Abitur, type of school tracking, socioeconomic status of father (laborer versus white collar) and the GDP development by the regions . Finally, we included interactions of all control variables with the group dummy L_i. Since the error terms of a linear probability model are heteroscedastic by construction (Maddala 1983), we are adjusting the standard errors post hoc by applying robust standard errors (White 1980). Finally, in order to account for correlated outcomes within German Federal State, we are introducing random

effects to our linear estimating equation (Hardin and Hilbe 2003), i.e. (1) is estimated by generalized least squares.

Here about Table 2 descriptives

Given the common time trend assumption, a difference-in-differences estimator yields the causal effect of the treatment (Angrist and Pischke 2009). To motivate this crucial assumption, we furthermore adopt appropriate "placebo" tests, i.e. we inspect the time trends of the "treatment" and the "control" group before the treatment took place.

4. Results

Table 3 reports the difference-in-differences estimates according to equation (1) for the three alternative definitions of "treatment". Column 1 shows the difference-in-differences estimates with a time indicator being equal to one for 2004 and later (the beginning of the overheated political debate about the introduction of tuition fees in Germany). Obviously, based on this specification we are not able to identify a significant effect. Column 2 presents the difference-in-differences estimates with the time indicator equal to one from 2005 (the year the German Constitutional Court decided to give the right to introduce tuition fees to the German regions). Within this setting, we find a significant negative effect, i.e. the difference in the development of the share of Abiturienten going to university from 2005 compared to the time before (2001 to 2004) is significantly negative (-0.146 percentage points).

Here about Table 3

The last specification reported in column 3 again yields no significant "treatment effect". Placebo tests finally (see Table 4 in the Appendix) indicate that there were no significant differences in the time trends between the treatment and the control group before 2005. The overall time trend identified in our data thereby, corresponds with official German statistics (Isserstedt 2010). In order to check the

robustness of our results, we aggregated our data at the regional level in a next step by group year level ending up with proportions of Abiturienten going to university for different States in different years. This fairly conservative approach (the degrees of freedom are reduced dramatically) is applied since the number of groups is relatively small (Donald & Lang, 2007). Our results remain robust in this instance, i.e. the decline in the proportion of Abiturienten going to university is significantly stronger from 2005 for those regions that decided to introduce tuition fees or at least that signaled to do so, respectively. Finally, it should be stressed, however, that we do not always find significant differences in the development of the proportion of Abiturienten going to university. For example, if we restrict our time window from 2003 to 2007, the difference in the development of the proportion of Abiturienten going to university is still negative (between regions that decided to introduce tuition fees and those that did not) but becomes insignificant. The main reason for the instability might be the low number of observations. Furthermore, the simultaneity problem discussed above may result downward biased estimates and therefore, in combination with the low number of observations, lead to less significant results. However, further difference-in-differences estimates with a time indicator equal to one for the period after 2005 indicate that there was no significant increase in the proportion of Abiturienten moving between regions. In sum, we therefore tend to conclude that our paper is the first one for Germany which gives some evidence for a negative effect of tuition fees on decision by Abiturienten to go to university.

Here about Table 4

5. Conclusions

Our results support our hypothesis, namely that increasing the costs of university study by tuition fees will reduce the likelihood of German Abiturienten to choose an academic study instead of vocational training at least in the short turn. We found that the decision of the German Federal Constitutional Court in 2005 was sufficient to affect the educational decision. This seems to be reasonable, because States that were willing to introduce tuition fees asked the Federal Constitutional Court to clarify the legal situation. However, our findings also suggest that this may be a temporary effect, which becomes

weakened over time. This short term hypothesis may be supported by two arguments: adaption to the new structure and improvement of the quality of study.

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Table 1: Introduction of tuition fees by state and year

German States	Tuition fees/ semester	Time of introduction / withdrawal
Baden-Württemberg	500 €	summer term 2007
Bavaria	300–500 €	summer term 2007
Berlin	no fees	
Brandenburg	no fees	
Bremen	no fees	
Hamburg	500 €	summer term 2007 / winter term 2008/09 (reduced)
Hessen	500 €	winter term 2007/08 / winter term 2008/2009
Mecklenburg-Vorpommern	no fees	
Lower Saxony	500 €	winter term 2006/07
Nord Rhine-Westphalia	0–500 €	winter term 2006/07 / winter term 2011/12 (announced)
Rhineland Palatinate	no fees	
Saarland	500 €	winter term 2007/08 / summer term 2010
Saxony	no fees	
Saxony-Anhalt	no fees	
Schleswig-Holstein	no fees	
Thuringia	no fees	

Source: Hetze & Winde 2010: 18pp.

Table 2: Descriptives

Variable		Mean
Dependant variable		
Educational choice	Dummy=1, if individual opts for a university education. Dummy=0, if individual opts for an apprenticeship training program	.5882353
Explanatory variables		
Male	Dummy=1, if individual is male	.508744
ΔGDP (in%)	Development of GDP by state, from one year to the other.	-.0002554
Grades	Grade in upper secondary level education, ranges from 1 (very good) to 4 (just sufficient)	2.422099
Year of educational decision	Year Dummies	
2002		.1351351
2003		.136725
2004		.1494436
2005		.1939587
2006		.190779
2007		.1939587
Father	Dummy=1, if individual's father is a blue-collar worker, Dummy=0 otherwise.	.163752
Pattern of school tracking	Abitur as first general degree versus Abitur as a second general degree	1.6407
Academic Abitur	Dummy=1, if individual received an academic Abitur, Dummy=0 otherwise (e.g.vocational abitur).	.8314785
Abitur in fee introducing state	Dummy=1, if individual received the Abitur in a fee introducing state.	.6534181

N= 692; Own calculations based on ALWA data 2001-2007.

Table 3: Conditional difference-in-differences estimates (coefficients), probability for ULGs going to university, linear probability model, generalized least squares

	Time indicator T_t=1 from 2004	Time indicator T_t=1 from 2005	Time indicator T_t=1 from 2006
Group indicator, L_i	0.185	0.193	-0.186
Time indicator, T_t	-0.066	-0.015	-0.036
L_iT_t *(interaction term)*	-0.116	-0.146**	-0.107
Male	0.202***	0.205***	0.204***
L_iMale	-0.082	-0.095	-0.096
Grade	-0.141***	-0.141***	-0.141***
L_iGrade	0.036	0.041	0.029
ΔGDP (in%)	0.412	0.872	-1.014
L_iΔGDP (in%)	0.005	0.013	0.247
Father	-0.258***	-0.261***	-0.262***
L_iFather	0.221**	0.218**	0.223***
Pattern of school tracking	-0.014	-0.014	-0.013
L_i(Pattern of school tracking)	-0.062	-0.065	-0.068
Academic Abitur	0.283***	0.278***	0.282***
Li(Academic Abitur)	-0.002	-0.005	-0.003
Constant	0.648***	0.613***	0.613***
Number of observations	686		
R^2	0.186	0.181	0.177

Own calculations based on ALWA data 2001-2007.
****/**/* indicate significance at the 1/5/10 % level (based on Huber-White Standard Errors).*

Table 4: Conditional time trends in the proportion of Abiturienten going to university

	Treatment group (1)	Control group (2)	Difference (1)-(2)
Year 02	-0.062	0.138	-0.201
Year 03	0.021	0.231*	-0.210
Year 04	-0.148	0.024	-0.172
Year 05	-0.180*	0.111	-0.291*
Year 06	-0.236***	0.071	-0.307**
Year 07	-0.212**	0.057	-0.269*
Constant	0.853***	0.511***	0.342
Number of observations		686	
R^2		0.194	

Own calculations based on ALWA data 2001-2007.
****/**/* indicate significance at the 1/5/10 % level (based on Huber-White Standard Errors). Also included: Control variables from Table 3*