Economics Bulletin

Volume 32, Issue 3

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

Hans Dietrich
Institute for Employment Research (IAB)

Hans-Dieter Gerner
Institute for Employment Research (IAB)

Abstract

Applying difference-in-differences models on representative German survey data empirical evidence is given that the introduction of tuition fees in some German States reduced the propensity of high school graduates to enroll at a university and favored the vocational training option. The empirical determination of the effects relies on the fact that only some States introduced tuition fees.

We would like to thank Gesine Stephan and the participants of the conference participants TIY 2010 and AIEL 2011 for valuable suggestions and Donna Ginther for helpful comments.
Citation: Hans Dietrich and Hans-Dieter Gerner, (2012) "The effects of tuition fees on the decision for higher education: evidence from a german policy experiment", *Economics Bulletin*, Vol. 32 No. 3 pp. 2407-2413.
Contact: Hans Dietrich - hans.dietrich@iab.de, Hans-Dieter Gerner - hans-dieter.gerner@iab.de.
Submitted: June 13, 2012. **Published:** September 05, 2012.

1. Introduction

On January 26th 2005, the Federal Constitutional Court of Germany terminated an intensive political debate on tuition fees that ran high in 2004 and conceded the right to introduce tuition fees at academic universities and universities of applied sciences to the German States. Subsequently, 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 I). As nine States did not introduce tuition fees, a kind of natural (policy) experiment was created, 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 German Abiturienten who graduated in States that introduced tuition fees, compared to Abiturienten not affected by tuition fees due to their regional background (Meyer 1995).

Table I: Introduction of tuition fees by State and year

German States	Tuition fees / semester	Time of introduction / withdrawal
Baden-Wuerttemberg	€ 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)
Hesse	€ 500	winter term 2007/08 / winter term 2008/09
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).

Ceteris paribus, tuition fees increase the cost of academic education and hence reduce its present value compared to the vocational training option, i.e. participating in the German apprenticeship training. On the other hand, tuition fees may improve the quality of study. But improving the quality of study may take time and will not be observable within our observation window. Furthermore, € 500 per semester is a fairly moderate amount for tuition fees from an international perspective, and mobility costs for moving from a region

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

introducing tuition fees to a region without fees will hardly be covered by this lack of tuition fees. Thus, regional mobility is no real option to lower costs for university study and weak empirical evidence is given for tuition fee-motivated mobility of German students (Dwengler et al. 2012).

Due to our short-term observation window, we expect a negative cost effect of tuition fees on the educational decision of Abiturienten to enroll at a German university.

2. Data

We 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 who lived in Germany at the time of the interviews between September 2007 and April 2008 (see: Antoni et al 2011). In detail, we employed data for 630 individuals who graduated from general upper secondary education (the German "Abitur") between 2000 and 2006. The overall pattern of university enrollment in the 2000s reported in the ALWA data conforms to official German statistics (Issersted 2010). In order to avoid censoring problems at the right side of our observation window we employed only data from Abiturienten who made their first educational decisions (enrollment at a university or vocational training) within 18 months after graduation. However, both within the Abiturienten subsample from 2000 to 2006 and the Abiturienten population in the ALWA data from the 1970s onwards, 93% of all Abiturienten make a first educational decision within 18 months after graduation, whereas 2% are late deciders and make a first educational decision more than 18 months after graduation. The remaining 5% did not start a vocational training or a university study at all. We excluded all individuals that failed to start training or studies within 18 months of graduation.

3. Empirical Analysis

In this section, we attempt to identify the effects of tuition fees on an individual's probability to enroll at a university. In detail, we applied a difference-in-differences approach within the following nonlinear framework:

$$(1)\quad P(y_{it}=1)=\Phi(\beta_L L_i+\beta_T T_t+\beta_{LT} L_i T_t+x_{it}'\gamma+\alpha_L),$$

where y_{it} is set to 1 if Abiturient i enrolls at university in year t. If Abiturient i attends vocational training the dummy is set to zero. The group indicator (group-specific fixed effect) L_i equals 1 if Abiturient i graduated in a 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" went to university even if every region introduced tuition fees or moved even if no region had introduced tuition fees. However, our results would be biased if the mover had not studied without the opportunity to move to a region that did not introduce tuition fees. If the introduction of tuition fees has a negative impact on the Abiturient's decision to enroll at a university, this simultaneity problem would yield an underestimated (less negative) effect. Hence, if we identified a negative effect, our simultaneity problem means that the "real" negative effect might be even stronger.

For the modeling of the time indicator (time-specific fixed effects) T_t we assumed three scenarios: scenario one is represented by a dummy variable set to 1 for the period between 2004 and 2007. This dummy includes the period shortly before the treatment took place, i.e. the period of the increased political debate about the introduction of tuition fees in 2004. A second time dummy represents the time from the decision of the German Federal Constitutional Court in 2005, which conceded the right to introduce tuition fees at universities to the German States, until 2007. A third dummy identifies the period from 2006 to 2007, when seven States introduced tuition fees. A priori, it is not possible to decide which time indicator is the most appropriate one. In order to "let the data speak", we tested for the three specifications separately. Furthermore, we included a vector of interaction terms between the respective time indicator and the group indicator L_i.

Table II: Descriptives

Variable		Mean
Dependent variable		
Educational choice		.5882353
	Dummy = 1 if Abiturient enrolls at a university. Dummy = 0 if Abiturient starts apprenticeship training.	
Explanatory variables		
Male	Dummy = 1 if individual is male	.508744
ΔGDP (in %)	Development of GDP by State from one year to the next.	-.0002554
Grades	Grade point average 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
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= 630; own calculations based on ALWA data 2001-2007.

Vector X contains control variables (see Table II). Φ is the standard normal distribution function and α_L are random intercepts (with $\alpha_L \sim N(0,\sigma_\alpha)$) in order to account for correlated outcomes within German Federal States (Gelman and Hill 2007, Moulton 1990)[2].

Given the common time trend assumption, a difference-in-differences estimator yields the causal effect of the treatment (Heckman et al 1998). To support this crucial assumption, we furthermore adopted appropriate "placebo" tests, i.e. we applied further difference-in-differences estimations before the treatment took place (i.e. from 2001 to 2004).

4. Results

Table III: Conditional difference-in-differences estimates, probability for Abiturienten going to university, probit model with random effects, marginal effects

	Time indicator T_t=1 for 2004 - 2007	Time indicator T_t=1 for 2005 - 2007	Time indicator T_t=1 for 2006 - 2007
Group indicator, L_i	0.130***	0.106***	0.099***
	(0.019)	(0.019)	(0.019)
Time indicator, T_t	-0.064	-0.006	0.002
	(0.068)	(0.049)	(0.052)
L_iT_t *(interaction term), DiD estimate*[+]	-0.136	-0.145**	-0.157**
	(0.072)	(0.061)	(0.069)
Male	0.118***	0.095***	0.099***
	(0.046)	(0.036)	(0.036)
Grade	-0.132***	-0.114***	-0.130***
	(0.039)	(0.037)	(0.037)
ΔGDP (in %)	0.717	1.102	0.717
	(1.755)	(1.521)	(1.755)
Father	-0.128**	-0.118**	-0.113**
	(0.061)	(0.057)	(0.056)
Academic Abitur	0.164***	0.133**	0.140***
	(0.068)	(0.053)	(0.051)
Number of observations		630	

Own calculations based on ALWA data 2001-2007.
****/**/* indicate significance at the 1/5/10 % level. Standard errors in parentheses.*
[+] *DiD estimates are calculated at the mean vector for the explanatory variables using the approach by Puhani (2012). Standard errors for the DiD estimates are calculated by applying the delta method.*

[2] In order to check the robustness of our results we also estimated a probit model models with state fixed effects and clustered standard errors at the state time cell level (Mullainathan et al (2004). The "tuition fees effect" based on this specifications thereby, remains significant (at the 5 % level) and does not differ significantly from the point estimates presented here. The respective tables are available for readers upon request.

Table III reports the regression results as well as the difference-in-differences estimates according to equation (1) for the three alternative definitions of "treatment". There is an ongoing discussion about how to interpret difference-in-differences estimates within a nonlinear framework (Ai and Norton 2003, Puhani 2012). Since our regressions do not exhibit significant time trends for the comparison group, the interpretations according to Ai and Norton (2003) and Puhani (2012) coincide. We therefore implemented the approach by Puhani (2012), which relies solely on the incremental effect of the interaction term coefficient.

Column 1 of Table III presents results from the regression with a time indicator set to 1 from 2004 (including the beginning of the overheated political debate about the introduction of tuition fees in Germany). Based on this specification, we are not able to identify a significant difference-in-differences estimate (-0.136). Column 2 presents results from the regression with the time indicator set to 1 from 2005 to 2007 (starting with the year the German Constitutional Court conceded the right to introduce tuition fees to German States). Within this setting, we find a significant negative effect (-0.145), i.e. the difference in the share of Abiturienten going to a university as of 2005 compared to the time before (2001 to 2004) is significantly negative. Finally, Column 3 shows the results from a regression using a time indicator set to 1 from 2006 to 2007. Here we are able to identify a significant negative effect (-0.157) which is even stronger. This indicates that the introduction itself had the most important effect on the decision of the Abiturienten.

In order to check the very crucial identifying assumptions within difference-in-differences settings, we adopted placebo tests for the time period from 2001 to 2004. Table IV shows the respective results. As can be seen, no placebo effects can be detected within our data.

Table IV: Placebo tests, conditional difference-in-differences estimates, probability for Abiturienten going to a university, probit model with random effects

	Time indicator T_t=1 from 2002	Time indicator T_t=1 from 2003	Time indicator T_t=1 from 2004
DiD estimate	-0.018	-0.049	-0.035
	(0.066)	(0.047)	(0.108)

Own calculations based on ALWA data 2001-2004.
****/**/* indicate significance at the 1/5/10 % level. Standard errors in parentheses.*
DiD estimates are calculated at the mean vector for the explanatory variables using the approach by Puhani (2012). Standard errors are calculated by applying the delta method.

5. Conclusions

The results support our hypothesis that an increase of costs for university study by tuition fees reduces the likelihood of German Abiturienten to choose an academic study instead of vocational training in the short run. The political debates as well as the decision of the German Federal Constitutional Court in 2005 were of minor importance compared to the introduction of the fees itself. Concerning the magnitude of the tuition fees effect, two arguments are to be taken into account: upper secondary graduates (the German Abiturienten) have the option to decide between university study (at an academic university or a university for applied sciences) on the one hand and vocational training in the German apprenticeship training on the other hand. In contrast to most other countries graduating from German apprenticeship training offers both a smoothed access to the labor market and the option to enroll at university subsequently. Therefore, in Germany there exists a close substitute for a university education. Secondly, access to education had been free of any charges or tuition

fees for German citizens for decades. Thus the introduction of tuition fees at German universities was a fundamental change in German policy which affected graduates from the fee-introducing German States. However moving to States without tuition fess is not a real alternative as tuition fees tend to be lower compared to comparative costs of moving out. In a mid-term perspective, an adjustment process may take place, where Abiturienten will adapt to the new costs structure and might experience improvements in the quality of study. However, the observation window of the data we used for our analysis has – up to now – not been able to test this adaption process hypothesis.

References

Ai, C., Norton, E. (2003) "Interaction terms logit and probit models" Economics Letters **80**, 123-129.

Antoni, M., Drasch, K., Kleinert, C., Matthes, B., Ruland, M. Trahms, A. (2010) "Working and Learning in a Changing World Part I: Overview of the Study March 2011 (Second, updated version)" FDZ Methodenbericht 5/2010

Dwenger, N., Storck, J., Wrohlich, K. (2012) "Do tuition fees affect the mobility of university applicants? Evidence from a natural experiment" Economics of Education Review **31**, 155-167.

Gelman, A., Hill, J. (2007) Data analysis using regression and multilevel/hierarchical models, Cambridge University Press: New York.

Heckman, J., Ichimura, H., Smith, J., Todd, P. (1998) "Characterizing Selection Bias Using Experimental Data" Econometrica **66**, 1017-1098.

Hetze, P. & Winde, M. (2010) "Auswirkungen von Studiengebühren. Ein Vergleich der Bundesländer nach Studierendenzahlen und ihrer sozialen Zusammensetzung" in Ländercheck Lehre und Forschung im föderalen Wettbewerb by Stifterverband für die Deutsche Wissenschaft: Essen, 1-24

Isserstedt, W., Middendorff, E., Kandulla, M., Borchert, L. Leszczensky, M. (2010) Die wirtschaftliche und soziale Lage der Studierenden in der Bundesrepublik Deutschland, BMBF: Berlin.

Meyer, B. D. (1995) "Natural and Quasi-Experiments in Economics" Journal of Business and Economic Statistics **13**, 151-161.

Mullainathan, S, Bertrand M, Duflo E. (2004) "How Much Should We Trust Differences-in-Differences Estimates?" Quarterly Journal of Economics **119**, 249-275.

Moulton, B. R. (1990) "An illustration of a pitfall in estimating the effects of aggregate variables on micro units" Review of Economics and Statistics **72**, 334-338.

Puhani, P. (2012) "The treatment effect, the cross difference, and the interaction term in nonlinear "difference-in-differences" models" Economics Letters **115**, 85-87.