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Student Aid, Repayment Obligations and Enrolment in Higher Education in Germany – Evidence from a "Natural Experiment"

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Abstract

We evaluate the effect of the German Federal Educational Assistance Act (BAfoeG) on enrolment rates in higher education by exploiting the exogenous variation introduced through a discrete shift in the repayment regulations. Supported students had to repay the full loan until 1990. Thereafter, 50 percent of the student aid has been offered as a non-repayable grant. Our results from simple difference-in-difference estimates suggest that student aid is ineffective in raising enrolment rates. Our findings may have important implications for the current debate on the reform of financing higher education in Germany and elsewhere.

JEL Classifications: I28, I22, J24

1. Introduction

In Germany, students from low-income families are eligible for financial aid under the Federal Educational Assistance Act (*Berufsausbildungsfoerderungsgesetz,* BAfoeG). This subsidy covers a substantial share of the monthly living costs of students enrolled at universities or technical colleges (*Fachhochschulen*). There are both efficiency and income distribution arguments justifying subsidies to higher education (see, e.g., Poterba 1996, Barr 2004). First, there may be positive external effects in the sense that social returns may exceed private returns to higher education. These may arise from progressive taxation and the reduced welfare dependency of highly educated people, or through spillover effects from a highly educated and trained workforce to innovation and economic growth. Second, there may be too little investment into the education of young people from low-income families. Governments may therefore want to provide subsidised loans or grants to students to foster "equal opportunities" for otherwise disadvantaged youth.

These arguments also dominate the current discussion on the financing of higher education in Germany. In this paper, we evaluate the effect of BAfoeG

on enrolment rates by exploiting an exogenous variation induced by a change in the BAfoeG repayment regulations in 1990. Before this reform, the full amount of financial aid obtained during university education had to be repaid (without interest) after graduation; since the reform only half this amount has to be repaid, the other half being offered as a non-repayable grant to eligible students. This implies that the debt burden of a fully supported student was on average reduced by some 23,500 deutschmarks (12,000 euros) from 47,000 deutschmarks (24,000 euros). Given this substantial subsidy, the reform was expected to induce more students from low-income families to enrol in higher education.

Using data from the German Socio-Economic Panel (SOEP), our estimation results from simple difference-in-difference estimations show that the 1990 BAfoeG reform seems to have been ineffective in raising enrolment rates in higher education. This somewhat surprising result may have important implications for the current policy debate on how to finance and secure access to higher education in Germany and elsewhere.

The remainder of this paper proceeds as follows. In the next section, we summarize empirical studies on the effects of student aid on enrolment decisions. In Section 3, we present our empirical method of estimating these effects. Estimation results are summarized and discussed in Section 4, and Section 5 concludes.

2. Previous Empirical Evidence

Basic human capital theory suggests that student financial aid, by reducing the private costs of higher education, will induce more students – especially from low-income families – to enrol in higher education. Most of the recent empirical research on the effects of student aid on decisions to enrol in higher education has focused on the United States, while little has focused on Germany.[1]

For the U.S., this hypothesis was confirmed in an early study by McPherson and Schapiro (1991). Based on time series data on enrolment rates for three income groups, they found that reducing net costs of studying by 1,000 dollars would increase the enrolment rate of low-income students by about 6.8 percentage points on average. In several recent related papers, Dynarski analysed the effect of various policy changes related to financial aid on college enrolment decisions in the United States. Dynarski (2002a) finds that the introduction of the Georgia HOPE scholarship, which allows free attendance at the state's public colleges for residents with a certain minimum scholarly attain-

[1] There are only very few empirical studies on this topic for other European countries, see Winter-Ebmer and Wirz (2002).

ment in high school, increased college attendance by 7.9 percentage points. Dynarski (2003) analyses the impact of the elimination of the U.S. Social Security Student Benefit Program in 1982 and finds that this policy change has increased enrolment rates by about 18 percentage points on average. This relatively large effect is, however, not comparable to the effect of the HOPE scholarship program because it affected different groups of people. In another paper, Dynarksi (2002b) investigates the effect of the removal of home equity from the assets taken into account for the assessment in federal financial aid formula by the U.S. Higher Education Amendment of 1992 on enrolment rates in higher education. On the basis of simple difference-in-difference estimates, she finds a significant positive effect of this policy shift, which she views as a "natural experiment", on the average enrolment rate in a sub-sample of home-owners, arguably the group of people most affected by the policy change. In a frequently cited paper, Kane (1995) also applies the difference-in-difference method to evaluate the introduction of the U.S. Pell Grant program, which is similar to the German BAfoeG by providing means-tested financial support to students from low-income families. According to his estimates, the introduction of the Pell Grant program had no significant effects on enrolment rates into higher education.

For Germany, there is, to the best of our knowledge, only one econometric study that relates student aid to enrolment in higher education. Lauer (2000) includes some indicators for the provision of BAfoeG as explanatory variables in a discrete choice model. Her empirical results suggest that increasing student aid by 1,000 deutschmarks (about 500 euros) increases the enrolment rate by 0.8 percentage points on average. This relatively low estimate might be related to the other two BAfoeG indicator variables included as explanatory variables. Moreover, her estimation results may be biased because of potential endogeneity of the BAfoeG indicator variables included in her enrolment equations.

3. Empirical Methodology

The BAfoeG reform of 1990 affected only one group of students: those who had already been granted the subsidy before the reform. The reform can thus be interpreted as a "natural experiment" which introduces an exogenous variation that may be used to identify the effect of the reform on enrolment rates in higher education in the group affected by the reform, i.e., the "treatment group". Whether an individual is eligible for the subsidy depends mainly on his or her parents' financial resources. However, whether or not an individual is eligible can only be directly observed for the students in our database, and not for those who decided not to enrol in higher education, even though the latter individuals might have been eligible for the subsidy if they had decided to do so. Potential eligibility thus has to be inferred from parents' income and

other relevant information contained in our database, the German Socio-Economic Panel Study (SOEP).[2]

The BAfoeG regulations determine students' maintenance needs based on their living situation, i.e., whether they live with parents or on their own. From these maintenance needs, the financial resources of the student and his or her husband / wife and parents are substracted. Using the detailed information contained in the SOEP, we simulate BAfoeG eligibility for all individuals and for each year within the observation period.[3]

We employ a simple difference-in-difference estimator to examine the effects of BAfoeG eligibility on enrolment in higher education. That is, we simply compare the enrolment rates of two groups (first difference): a treatment group – eligible students – and a comparison group that is not affected by the policy shift – ineligible students. This difference is then compared between the two time periods, before and after the discrete policy change (second difference). Thus, the simple difference-in-difference estimator is:

$$\alpha = \Big\{ \big[S(EB=1, D=1) - S(EB=0, D=1)\big] - \big[S(EB=1, D=0) - S(EB=0, D=0)\big] \Big\} \tag{1}$$

where $S(EB, D)$: = share of people enrolled at a university with $(EB = 1)$ / without $(EB = 0)$ BAfoeG eligibility, after $(D = 1)$ / before $(D = 0)$ the reform.

The coefficient α measures the average effect of the reform on the enrolment rate in the group of people affected by the reform, which is also known as the *"average treatment effect on the treated"* in the empirical policy evaluation literature (cf. Meyer 1995, or Blundell / Costa Dias 2000). The key identifying assumption is that the causal effect would be zero in the absence of the policy change.

The simple difference-in-difference estimator from equation (1) is equivalent to the α coefficient on the interaction term in the following simple pooled regression model estimated on individual data:

$$S_{it} = \beta_0 + \beta_1 EB_{it} + \beta_2 D_{it} + \alpha(EB \times D)_{it} + \varepsilon_{it} \ , \tag{2}$$

[2] The SOEP is a longitudinal survey of individuals living in private households in Germany covering each year since 1984. We use all waves up to the year 2001. Since we obtain the income information from the calendar data, which refers to the previous calendar year, our observation period ends in 2000. Haisken-DeNew and Frick (2003) provide detailed information on the SOEP data.

[3] A detailed description of the simulation procedure can be found in Baumgartner and Steiner (2004).

where S_{it} is a dummy variable indicating whether person i is enrolled at a university in period t, $(S_{it} = 1)$, or not $(S_{it} = 0)$; EB_{it} and D_{it} are dummy variables as defined above, ε_{it} is an error term and α and $\beta_j (j = 0, 1, 2)$ are parameters to be estimated. In order to get unbiased estimates of the parameters in regression (2), the key identifying assumption mentioned above has to hold. This implies that the expectation of the difference of the error terms after and before the policy change is the same for the two groups, i.e.: $E(\varepsilon_{i1} - \varepsilon_{i0}|EB = 1) = E(\varepsilon_{i1} - \varepsilon_{i0}|EB = 0)$.

Since the BAfoeG repayment regulation was changed in 1990 (the year of German reunification), we have to restrict our sample to West Germany. We also restrict the sample to people who completed upper secondary schooling, since only these people are allowed to enrol in higher education. There was another change in the BAfoeG rules in 2001 that made the subsidy more generous, but this does not affect our analysis since we do not include observations from more recent SOEP waves.

Our sample includes 735 school leavers with an entrance qualification for higher education. Given that a substantial share of school leavers enrols in higher education after completion of military service, an intermittent working period, or an extended spell of holidays, we allow for a transition period of up to four years to decide whether a school leaver eventually enrols into higher education or not. Dropping right-censored observations[4] and those with missing values for explanatory variables leaves us with 561 observations for the estimation. Of these, about 59 percent enrolled within four years after completing upper secondary schooling (see Table 1). About 78 percent of our sample qualified for higher education by obtaining their *Abitur* upon completion of a Gymnasium (academic-track upper secondary school), while 22 percent attended a specialised Gymnasium (and thus obtained a *Fachabitur*). About two-thirds of all observations were made in the post-BAfoeG-reform period, and about 22 percent were eligible for the financial subsidy.[5]

Table 1 also contains summary statistics on some other potential determinants of students' enrolment in higher education for the treatment and the control group, respectively. The income of parents of eligible students is, on average, only one-third the income level of parents of students not entitled to BAfoeG. The two groups also differ markedly in their parents' educational background.

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[4] Estimating a discrete time hazard rate model accounting for right-censored observations does not alter the basic results of this paper.

[5] This corresponds to the share of students of roughly 20 percent who received BAfoeG in the period between 1985 and 2001 according to official figures (AG Hochschulforschung, 2001, Table 105a).

Table 1

Descriptive Statistics

Variable	Full Sample	Eligible for BafoeG (treatment group)	Ineligible for BafoeG (control group)
Higher education	0.588	0.694	0.559
After	0.665	0.636	0.673
Eligible for BAfoeG	0.216	1.000	0.000
Father self-employed	0.098	0.091	0.100
Father white-collar	0.342	0.174	0.389
Father civil servant	0.196	0.099	0.223
Father out of labour force	0.037	0.083	0.025
Male	0.558	0.479	0.580
Abitur	0.777	0.777	0.777
Father completed upper secondary schooling	0.267	0.099	0.314
Mother completed upper secondary schooling	0.103	0.033	0.123
Parents' income/ 1,000	6.222 (3.612)	2.795 (1.436)	7.164 (3.458)
School leaving age	19.615 (1.114)	19.810 (1.240)	19.561 (1.072)
Observations	561	121	440

Notes: a) Standard errors, where applicable, are in parentheses. b) The base category for father's occupational status is blue-collar worker.

Source: SOEP 1994 – 2001.

4. Estimation Results

Given the validity of the identifying assumptions mentioned in the previous section, it is straightforward to calculate the simple difference-in-difference estimator of the effect of the BAfoeG reform on the average enrolment rate of eligible students from Table 2. The table shows average enrolment rates for four groups: the treatment group of low-income youth eligible for BAfoeG and the control group of non-eligible youth, both after and before the policy reform. The third column shows the first differences. Enrolment rates of eligible students rose by 28.8 percentage points, while enrolment of the control group increased by only 21.3 percentage points. As shown in the table, the difference-in-difference in mean enrolment rates amounts to 7.6 percentage points, which is the average treatment effect for those affected by the BAfoeG reform.

Table 2

Difference-in-Difference of Mean Enrolment Rates

	After	Before	Difference
Eligible for BAfoeG	0.840	0.552	0.288
Ineligible for BAfoeG	0.644	0.431	0.213
Difference-in-difference			*0.076*

Note: Means of the school leaver cohorts 1984 – 1986 and 1990 – 1992.
Source: SOEP 1994 – 2001.

This treatment effect can also be obtained from a linear probability model estimated on individual data as given by equation (2) in the previous section. The first two columns of Table 3 report estimation results for the selected sample of school leavers in two periods of equal length before and after the policy change, which corresponds to the sample used for the simple difference-in-difference estimate derived above. Hence, the coefficient on the interaction between the group dummy and the time dummy in column (1) of Table 3 is numerically identical to the difference-in-difference estimate in Table 2. However, as the estimated standard error of the coefficient estimate in Table 3 shows, the estimated treatment effect is not statistically significantly different from zero.

Estimation results in column (2) of Table 3 refer to the full sample of freshmen. Thus, we do not restrict the observation period to be of equal length before and after the policy change. This increases the sample size substantially and may also avoid some potential selectivity effects associated with the sample selection in the previous estimation. Estimation results in column (2) show that the estimated coefficient on the relevant interaction term is markedly reduced in size and also remains statistically insignificant.

To account for the inherent non-linearity of the dichotomous dependent variable, in columns (3) and (4) of Table 3 we present logit estimates for the simple model and for the model with addition control variables. Estimation of this model is based on all observations within the observation period and should therefore be compared to estimation results in column (2). As expected, the WLS and logit coefficient estimates in columns (2) and (3) are virtually identical after normalization. Other things being equal, enrolment rates are higher if the father completed upper secondary schooling, if students obtained their entrance qualification for a higher education institution through a degree from a general gymnasium rather than a specialised gymnasium, and the higher the school leaving age. Controlling for these covariates does not change the insignificance of the estimated treatment effect. We note, however, that the marginal effect of model (4) lies, with 6.2 percentage points, in the expected range. It is hence statistically possible that the insignificance of the estimated treatment effect is due to the small sample size.

Table 3

Enrolment Probability in Higher Education

	Linear Probability Models		Logit Models	
	(1)	(2)	(3)	(4)
Constant	0.431 (0.048)**	0.597 (0.041)**	0.394 (0.170)*	–8.984 (1.815)**
After	0.212 (0.071)**	-0.057 (0.050)	–0.231 (0.206)	–0.130 (0.225)
Eligible for BAfoeG	0.120 (0.103)	0.107 (0.080)	0.475 (0.372)	0.712 (0.413)+
After × eligible for BAfoeG	0.076 (0.143)	0.040 (0.100)	0.155 (0.461)	0.266 (0.504)
Father self-employed	–	–	–	0.499 (0.352)
Father white-collar	–	–	–	0.250 (0.250)
Father civil servant	–	–	–	0.750 (0.318)*
Father out of labour force	–	–	–	–0.460 (0.506)
Male	–	–	–	0.217 (0.192)
Abitur	–	–	–	1.188 (0.233)**
School leaving age	–	–	–	0.400 (0.091)**
Father completed upper secondary schooling	–	–	–	0.467 (0.259)+
Mother completed upper secondary schooling	–	–	–	–0.050 (0.335)
R^2	0.08	0.02	–	–
Log-likelihood	–	–	–375.75	–335.63
χ^2	–	–	8.65	88.88
Observations	243	561	561	561

Notes: a) Estimation results in column (1) refer to a selected sample of school leavers in two periods of equal length before and after the BafoeG reform, i.e., school leaver cohorts 1984 – 1986 and 1990 – 1992.

b) Estimation of the linear probability model in columns (1) and (2) is based on weighted least squares to account for heteroscedasticity.

c) Standard errors are in parentheses. + significant at 10 percent; * significant at 5 percent; ** significant at 1 percent.

d) The base category for father's occupational status is blue-collar worker.

Source: SOEP 1994 – 2001.

We have also tested for homogeneity of coefficients of explanatory variables for the treatment and the control group. Although the null hypothesis of equality of coefficients was rejected for almost all explanatory variables, allowing the coefficient of these variables to differ between the two groups has essentially no effect on the estimated treatment effect.

5. Summary and Conclusion

We have analysed the effect of a change in federal student aid introduced by the BAfoeG reform in 1990 on enrolment rates in higher education in Germany. Before the reform, the full loan had to be repaid after graduation; since the reform, only half of the amount received as student aid has to be repaid, and the other half has been transformed into a non-repayable grant. An important aim of this reform was to induce more young people from low-income households to pursue higher education. We have used the supposedly exogenous variation in student aid induced by this "natural experiment" to test whether this political aim has been achieved and to identify the causal effect of more generous student aid on enrolment rates in higher education.

Our estimation results show that the substantial reduction of the debt burden due to the BAfoeG reform was ineffective in raising the enrolment rates of young people eligible for the subsidy. Interpreted at face value, this result would imply a substantial deadweight loss of the study subsidy. However, an alternative explanation for this somewhat surprising result is that our basic identifying assumption of a common time trend for the treatment and control groups is invalid. We cannot directly test this hypothesis, of course, nor can we rule out this possibility on *a priori* grounds. For example, it is possible that the decline in the private returns to education documented for Germany by Boockmann and Steiner (2000) and Lauer and Steiner (2001) has had different effects on enrolment decisions of young people from low-income households and those not entitled to BAfoeG. This seems theoretically plausible because young people from low-income households may, due to credit constraints and / or a higher rate of time preference, seek a higher private return to education to pursue higher education. There seems, however, to be currently no conclusive evidence supporting this view. Hence, for the time being, we interpret our empirical results as indicative of the ineffectiveness of more generous student aid in raising enrolment rates in higher education in Germany. Nevertheless, it may be that student aid has other beneficial effects. The duration of study, for instance, might be positively influenced by student aid, since students have less of a need to work part-time while attending college and may thus be more likely to concentrate on their courses. But this is a separate question that remains to be answered through further research.

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