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Did Tuition Fees in Germany Constrain Students' Budgets? New Evidence from a Natural Experiment

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November 2014

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ABSTRACT

Did Tuition Fees in Germany Constrain Students' Budgets? New Evidence from a Natural Experiment

Less than a decade ago, several German states introduced tuition fees for university education. Despite their comparatively low level, fees were perceived by the public to increase social injustice, and have been abolished. Whereas other studies have shown no effect on enrollment, we analyze the effects on students' budgets. To identify causal effects, we exploited the natural experiment established by the introduction of fees. They did not affect students' spending behavior independently of social background, but females experienced a small negative effect. Effects on other outcomes indicate that students increased their budgets only marginally; fees did not increase social inequality.

NON-TECHNICAL SUMMARY

Tuition fees are a common method of (co-)financing university education in many countries with the aim of improving the quality of university teaching and studying conditions. In Germany, university studies were free from 1971 (with only a low lump-sum subscription fee being charged for administrative and other purposes), but after a change in law seven of the 16 federal states (re)introduced tuition fees of up to €500 per semester in 2007. Despite their comparatively low level, the introduction was accompanied by highly controversial discussions, and after just a few years, the federal states re-abolished the fees, with the last state passing the resolution in 2013. Whereas other studies have shown no effect on enrollment, we analyze the effects on students' budgets. To identify causal effects, we exploited the natural experiment established by the introduction of fees. They did not affect students' spending behavior independently of social background, but females experienced a small negative effect. Effects on other outcomes indicate that students increased their budgets only marginally. These findings indicate that tuition fees in Germany did not worsen students' financial situation. Hence, the arguments involving financial considerations put forward in the political debate for abolishing tuition fees do not seem appropriate.

JEL Classification: I22, I28, H75

Keywords: tuition fees, student spending, natural experiment, Germany

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1. Introduction

Tuition fees are a common method of (co-)financing university education in many countries and their importance for financing higher education systems has increased in recent times. In Germany, students had to pay tuition fees until 1971, when they were abolished in response to the student movement of the 1960s. University studies were then free for more than 30 years, with only a low lump-sum subscription fee being charged for administrative and other purposes (Hetzze and Winde, 2010). After a change in law, however, federal states were allowed to grant permission to universities to charge tuition fees. Subsequently, seven of the 16 federal states (re)introduced tuition fees of up to €500 per semester in 2007 with the aim of improving the quality of university teaching and studying conditions. This introduction was accompanied by highly controversial discussions, and after just a few years, the federal states re-abolished the fees, with the last state (Lower Saxony) passing the resolution in 2013.

The main arguments put forward against tuition fees were the threat to equal opportunities and the possible deterrent effects on future students. However, reliable empirical studies did not find a negative effect of tuition fees on student enrollment in Germany (e.g. Helbig et al. 2012, Bruckmeier and Wigger, 2013a). Nevertheless, although enrollment behavior was not affected, the imposition of tuition fees still meant an additional financial burden. Tuition fees may affect disposable funds available for consumption or saving. If students' expenditure matched their individual budget (constraint) previously, they would have had to increase their amount of disposable funds, for example by increasing working hours. This may have had adverse effects on study duration or study performance. Obviously, if students were not that financially constrained, the imposition of the comparatively low tuition fees in Germany may not have affected spending behavior at all.

Based on nationally representative and comprehensive survey data for the years 2003, 2006 and 2009, we evaluate the effects of tuition fees on students' expenditure. Exploiting the natural experiment induced by the selective introduction of university tuition fees across federal states, we can identify causal effects. The empirical results indicate that tuition fees did not change students' spending behavior overall. Further consideration of subgroups also shows that students with adverse socioeconomic backgrounds were not particularly affected, but some minor negative effects were found for females. To examine potential reasons for these effects, we estimate the effects of tuition fees on a number of additional outcome variables, namely the probability of taking out a loan, the probability of receiving financial support from parents, and the probability of having a job to earn a living. Tuition fees did not affect the probability of taking out a loan, but slightly increased the probability of receiving financial support from parents. The probability of having a job did not change overall; however, students who were working for at least one hour per week expanded their working

time on average. By and large, the empirical findings therefore indicate that tuition fees in Germany did not worsen students' financial situation. Hence, the arguments involving financial considerations put forward in the political debate for abolishing tuition fees do not seem appropriate.

2. Institutional Background and Related Literature

In 2002, the German government enacted a law that guaranteed a free first course of studies for all students in Germany (*gebührenfreies Erststudium*). Subsequently, several states filed a constitutional law suit against this, because education is administered by the federal states in Germany. By January 2005, the Federal Constitutional Court (*Bundesverfassungsgericht*) decided that federal states are free to grant permission to universities to charge tuition fees. Starting in the summer term of 2007, Baden-Wuerttemberg, Bavaria, Hamburg, Lower Saxony, and North Rhine-Westphalia introduced tuition fees, and the Saarland and Hesse followed in the winter term 2007/2008 (see Table A.1 in the appendix for an overview). Although universities were not obliged to charge a uniform fee, most universities decided to charge the legal maximum of €500 (Hübner, 2012).¹ Fees were earmarked and had to be used for improving studying conditions and teaching.

Nevertheless, the introduction of tuition fees led to a controversial debate in Germany. The major concern was that tuition fees could discourage potential students, leading to a decrease in enrollment rates. A high proportion of individuals with a tertiary education is desirable, because they have higher wages on average (thus increasing tax and social security revenues) and a lower unemployment probability than individuals with less education. On the individual level, the imposition of tuition fees increases the costs of studying, which may have adverse effects on university enrollment. However, the corresponding increase of available resources at universities may improve studying conditions and thus the probability of study success, mitigating potential adverse effects of higher costs.

The results from the available empirical literature for Germany are ambiguous. Without consideration of any further control variables (i.e. ignoring potential composition differences of the student body across states or the effects of other state-specific reforms in the German schooling and education system), Hübner (2012) estimated a slight decrease of student enrollment probability by 2.7 percentage points. Bruckmeier and Wigger (2013) used the same administrative data and estimation strategy but took compositional effects into account. Their findings indicated that tuition fees did not have a significant negative effect on enrollment. Similar results were established by Helbig et al. (2012) analyzing the willingness of high-school graduates between 2002 and 2008 to start studying. Their estimates showed that tuition fees had no effect on the probability of studying. Since tuition

¹ Only in North Rhine-Westphalia and Bavaria did tuition fees vary between €300 and €500 at universities; in Hamburg tuition fees were reduced from €500 to €375 in the winter term 2008/2009.

fees were only introduced in seven out of 16 federal states, students could have avoided paying fees by starting their studies in a non-fee state. Dwenger et al. (2012) investigated whether tuition fees systematically changed students' mobility for applicants at medical schools in Germany. Their results indicated that students from federal states with tuition fees were 2 percentage points (-3%) less likely to apply in their home state after the introduction of fees.²

In addition, several authors have analyzed the financial burden of student loans (e.g. Schwartz and Finnie, 2002) and related issues such as the determinants of the student loan take-up rate (e.g. Johnes, 1994 and Gayle, 1996, for the UK, Booij et al., 2012, Oosterbeek and van den Broek, 2009), attitudes towards student debt (Davies and Lea, 1995, Baum and O'Mally, 2003, Haultain et al., 2010), or the optimal amount of student loans and their respective repayments (Avery and Turner, 2012, Baum and Schwartz, 2006). Further studies describe different loan and cost-sharing systems between government and students (e.g. Chapman, 2006, Greenaway and Haynes, 2003, Barr, 1993, Johnstone, 2004), and the implications of different loan schemes for student enrollment (Ionescu, 2009). Studies that look at tuition fees explicitly concentrate mainly on the consequences of increasing tuition fees for enrollment (e.g. Berger and Kostal, 2002, Neill, 2009).

To the best of our knowledge, no study thus far has examined the effects of tuition fees on students' actual financial situation. There are only a few, mostly descriptive reports that analyze students' financial situation in general (e.g. Vossenstyn, 1999, for the Netherlands, Callender and Kemp, 2000, for the UK, James et al., 2007, for Australia, or Middendorff et al., 2013, for Germany). Therefore, evaluating the effect of tuition fees on students' financial situation reveals new insights on the effects on students' living situation; especially in the light of an increasing private share of funding for higher education.

3. Identification Strategy and Data

3.1. Identification of Causal Effects

The empirical analysis is based on the 17th, 18th, and 19th wave of the Social Survey, a representative longitudinal data set, conducted in the summer terms 2003, 2006, and 2009.³ Alongside rich data related to the course of studies and socio-demographic characteristics, it contains detailed information on the students' financial situation, income and expenditure, time use, and living situation.

² Men reacted more strongly than women. Mitze et al. (2013) confirmed this stronger reaction of male students and showed further that the migration effects were mostly driven by short-distance migration over state borders.

³ The Social Survey is collected by the Higher Education Information System (*Deutsches Zentrum für Hochschul- und Wissenschaftsforschung, DZHW*) on behalf of the German student union (*Studentenwerk*) and funded and released by the German Federal Ministry of Education and Research (*Bundesministerium für Bildung und Forschung, BMBF*). Data have been collected regularly since 1951. For further information see www.sozialerhebung.de.

To identify causal effects of tuition fees on students' financial situation, we use the variation resulting from the fact that tuition fees were introduced only in some federal states. This implementation provides a natural experiment, where paying tuition fees can be assumed to be an exogenous treatment. Students are assigned into a treatment and a control group according to the university location. Those who studied in federal states that charged tuition fees in the summer term 2009 (Baden-Wuerttemberg, Bavaria, Hamburg, Lower-Saxony, North Rhine-Westphalia, or Saarland, see Figure 1) formed the treatment group; students who studied in states that did not charge fees formed the control group.⁴

Figure 1: German Federal States Charging Tuition Fees in 2009



Since our data provide information about the treatment and control group before and after the reform, a difference-in-differences approach can be applied. A number of empirical studies have used the same identification strategy for the evaluation of the effects of tuition fees on other outcomes, and have proven that the introduction of tuition fees in some of the German federal states provides a reasonable institutional setting for this estimation approach (e.g. Dwenger et al., 2012, Hübner, 2012, Bruckmeier and Wigger, 2013, Helbig et al., 2012). However, although the change in

⁴ Since Hesse had already abolished tuition fees before the summer term 2009, Hessian students are part of the control group.

law can be clearly considered as an exogenous treatment, students may have avoided the treatment by starting their studies in a federal state that did not charge tuition fees. In that case, the allocation of treatment and control group would be not completely exogenous.

Table 1: Comparison of Shares of High-School Graduation State and State of Studying

| | 2003 | 2006 | 2009 |
|--|------|------|------|
| Pooled | | | |
| Higher education entrance qualification obtained in fee-state | | | |
| Studying in fee-state | 86% | 83% | 82% |
| Studying in fee-free state | 14% | 17% | 18% |
| Higher education entrance qualification obtained in fee-free state | | | |
| Studying in fee-free state | 81% | 81% | 84% |
| Studying in fee-state | 19% | 19% | 16% |
| Men | | | |
| Higher education entrance qualification obtained in fee-state | | | |
| Studying in fee-state | 86% | 83% | 84% |
| Studying in fee-free state | 14% | 17% | 16% |
| Higher education entrance qualification obtained in fee-free state | | | |
| Studying in fee-free state | 82% | 83% | 86% |
| Studying in fee-state | 18% | 17% | 14% |
| Women | | | |
| Higher education entrance qualification obtained in fee-state | | | |
| Studying in fee-state | 86% | 83% | 80% |
| Studying in fee-free state | 14% | 17% | 20% |
| Higher education entrance qualification obtained in fee-free state | | | |
| Studying in fee-free state | 80% | 79% | 83% |
| Studying in fee-state | 20% | 21% | 17% |

Source: 17th, 18th, and 19th Social Survey of the DZHW, own calculations.

Empirical studies indicate some changes in first-year student's mobility behavior, but reactions are only marginal (Dwenger et al., 2012). Table 1 reports the shares of students in our sample (pooled and according to gender) who graduated from high schools in a (non-)fee-state and also studied in a (non-)fee state. If students wished to avoid paying fees, the share of those who obtained their qualification in a fee state and studied in a fee state would have decreased considerably from 2006 to 2009, while the share of those who studied in a non-fee state would have increased. Hardly any changes can be observed between 2006 and 2009, which supports our assumption that the treatment can be seen as exogenous. Moreover, given that students had to pay tuition fees of €500 per semester at most universities in fee-states, the second assumption of the difference-in-differences strategy representing a homogeneous treatment is quite obviously accurate.

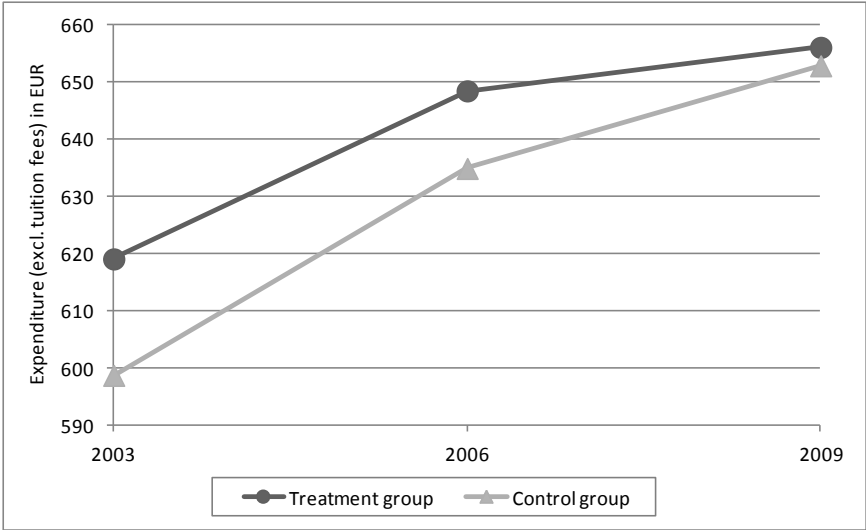
In order to ensure a homogeneous treatment, we excluded students of private universities and those who stated paying unusually high tuition fees (tuition fees of more than €800 or studying sub-

scriptions of more than €300). Those who were exempted from paying fees were not considered either. Furthermore, we left out students aged 35 years or older and PhD students. In Germany, PhD students are often employed at the university and receive a salary. Students who are older are either long-term students with mandatory tuition fees or have worked before starting to study and may therefore have a different spending behavior than younger students. Overall, we thus used data on 37,800 students.⁵

3.2. Descriptive Statistics

Since we are interested in the effect of tuition fees on students’ financial situation, we examine whether and to what extent paying tuition fees changed students’ monthly expenditure. Expenditure includes all individual spending for rent, food, learning material, leisure, etc. excluding any tuition fees. Support from parents is included for comparability reasons. For example, some students receive greater financial support in cash from their parents but have to pay the rent themselves, while other students receive less support in cash but their parents pay the rent directly to a third party.

Figure 2: Development of Mean Expenditure (Excluding Tuition Fees) in EUR (by Groups)



Source: 17th, 18th, and 19th Social Survey of the DZHW, own calculations.

Figure 2 illustrates the development of monthly mean expenditure for the treatment and control groups over time. Expenditure increases in both groups, and is higher in the treatment group in all years. A likely reason for this is that most of the federal states of the control group are Eastern German states (Berlin, Brandenburg, Mecklenburg-Western Pomerania, Saxony, Saxony-Anhalt, and Thuringia), where living costs are lower on average than in the Western states (Kawka, 2010). However, between 2006 and 2009, expenditure increased less in the treatment group and the spending tends to converge across groups.

⁵ See Table A.2 in the appendix for the number of observations according to year and groups.

Table 2: Means of Selected Variables (by Year and Groups)

| | 2006 | | | 2009 | | |
|--|---------------|-----------------|---------|---------------|-----------------|---------|
| | Means | | p-value | Means | | p-value |
| | Control group | Treatment group | | Control group | Treatment group | |
| <i>Outcome variables:</i> | | | | | | |
| Expenditure (in EUR) | 634.95 | 648.52 | 0.011 | 652.91 | 656.13 | 0.557 |
| Taking out a loan | 0.02 | 0.02 | 0.935 | 0.03 | 0.04 | 0.036 |
| Financial support by parents / partner | 0.89 | 0.90 | 0.026 | 0.87 | 0.89 | 0.000 |
| Weekly working hours | 7.03 | 6.81 | 0.251 | 8.24 | 8.08 | 0.398 |
| Weekly working hours of students who work | 14.29 | 12.76 | 0.000 | 13.77 | 12.50 | 0.000 |
| Expenditure for the rent | 217.58 | 222.54 | 0.070 | 238.66 | 228.91 | 0.001 |
| Expenditure for food | 134.11 | 137.08 | 0.059 | 145.82 | 143.74 | 0.206 |
| Expenditure for clothes | 47.28 | 51.55 | 0.000 | 47.64 | 52.73 | 0.000 |
| Expenditure for learning materials | 33.00 | 34.14 | 0.063 | 30.74 | 32.93 | 0.001 |
| Expenditure for a car | 58.25 | 56.27 | 0.226 | 43.32 | 46.93 | 0.019 |
| Expenditure for public transport | 20.00 | 21.88 | 0.002 | 23.18 | 24.33 | 0.092 |
| Expenditure for medical insurance, medical fees | 32.81 | 29.42 | 0.000 | 37.97 | 37.23 | 0.468 |
| Fees for telephone, internet | 38.56 | 37.55 | 0.061 | 30.99 | 30.26 | 0.128 |
| Expenditure for leisure, culture and sports | 53.36 | 58.09 | 0.000 | 54.59 | 59.08 | 0.000 |
| <i>Control variables:</i> | | | | | | |
| Income (incl. Payments of parents / partner to third parties (in EUR)) | 730.29 | 749.90 | 0.002 | 775.23 | 785.93 | 0.097 |
| Age (in years) | 23.97 | 23.66 | 0.000 | 23.96 | 23.65 | 0.000 |
| Male | 0.41 | 0.40 | 0.558 | 0.41 | 0.42 | 0.294 |
| Having siblings | 0.85 | 0.87 | 0.001 | 0.85 | 0.86 | 0.205 |
| Foreign citizenship | 0.98 | 0.97 | 0.001 | 0.98 | 0.97 | 0.119 |
| Living at the parents' house | 0.21 | 0.24 | | 0.19 | 0.26 | |
| Living alone | 0.18 | 0.17 | 0.000 | 0.21 | 0.15 | 0.000 |
| Living in a shared flat | 0.49 | 0.45 | | 0.52 | 0.43 | |
| Living in a student dormitory | 0.11 | 0.12 | | 0.11 | 0.13 | |
| Apprenticeship before studying | 0.24 | 0.21 | 0.004 | 0.19 | 0.19 | 0.773 |
| Working during the semester | 0.60 | 0.63 | 0.000 | 0.63 | 0.67 | 0.000 |
| Working in the semester-break | 0.60 | 0.63 | 0.001 | 0.62 | 0.66 | 0.000 |
| Father university degree | 0.44 | 0.44 | 0.799 | 0.43 | 0.45 | 0.091 |
| Mother university degree | 0.34 | 0.29 | 0.000 | 0.35 | 0.30 | 0.000 |

Note: means and *p*-values of the *t*-test for outcome and selected control variables are shown according to year and treatment group. Expenditure and income are measured in Euro, working hours in hours, and age in years. Remaining variables are dummy variables. A *p*-value ≤ 0.001 indicates that the means between treatment and control group differ significantly to the 1% level. Results of chi-squared-tests indicate that the distribution of treatment group and living situation is independent neither in 2006, nor in 2009 (error probability 1%). Source: 18th and 19th Social Survey of the DZHW, own calculations.

To characterize the analysis' groups further, Table 2 shows sample means of treatment and control groups before and after the reform for a selection of variables. Starting with the outcomes of interest, in addition to (i) expenditure, we also analyze (ii) taking out a loan (dummy), (iii) receiving financial support from parents or partner (dummy), and (iv) working time. Before the reform, 2% of students in the treatment and control groups took out a loan. Although the share increased slightly in both groups, the increase was larger within the treatment group (4%), and the group difference became significant in 2009. The share of students who received financial support from their parents or partner was marginally higher in the treatment group but decreased over time in both groups. In addition, more students were working in the treatment group than in the control group. However, students in the treatment group before and after the reform worked significantly fewer hours than students in the control group.

Table 2 further shows descriptive statistics for other selected characteristics. It reveals that students' income was higher in the treatment group, but that the difference declined over time. If tuition fees increased social injustice, the share of students whose parents have a university degree should have increased in the treatment group after the reform. However, descriptive results do not confirm this concern.⁶ Significant differences are also observable concerning the living situation. Results of a rank test suggest that the distribution of treatment group and living situation was independent neither in 2006 nor in 2009. While the share of students living with their parents (presumably the cheapest form of living) decreased in the control group, it increased among the treatment group. The share of students living in student dormitories increased in the treatment group as well. In contrast, the share of students living alone – probably the most expensive form of living – decreased in the treatment group but increased slightly in the control group. This pattern may be an indication of a worsening of the financial situation after the reform.

3.3. Estimation Approach

To estimate the effects of tuition fees on the outcomes of interest, we specified a number of difference-in-differences models of the following form (suppressing i for the individual):

$$Y = \beta_0 + \beta_1 TG + \beta_2 year + \delta_1 TG \cdot year + \beta x + u. \quad (1)$$

Y is the respective outcome of interest (expenditure, taking out a loan, receiving financial support from parents or partners, weekly working hours), TG is the treatment group dummy variable indicating that the student studied in Baden-Wuerttemberg, Bavaria, Hamburg, Lower Saxony, North Rhine-Westphalia, or in the Saarland, $year$ is a dummy variable for the time period after the reform (2009), and $TG \cdot year$ is the interaction term. The parameter of interest is δ , the difference-in-differences es-

⁶ This is also in line with the findings of Hetze and Wilde (2010).

timator that measures the effect of the introduction of tuition fees. The error term u contains unobserved factors which affect the dependent variable.

The matrix x denotes further control variables that we added to the model. These variables should account for the possibility that random samples within the treatment or control group have systematically different characteristics in the sample periods 2006 and 2009. Starting with the estimation of the model in equation (1) without any covariates, we subsequently added further control variables to specify the final model (see Tables A.3 and A.4 in the appendix for estimation results). In a first step, we included a number of socio-demographic characteristics (age, gender, being married or having a partner, foreign citizenship, having children, having siblings, and the living situation) and the place of studying (regional controls for federal states, reference for treatment group is North Rhine-Westphalia, reference for the control group is Saxony). In a second step, we additionally augmented the model according to area of studies and a dummy variable that indicates whether the student has completed an apprenticeship before studying. In a third step, further controls for the parents' background (dummy variables for having a father or mother with university degree and dummy variables for the father's or mother's position in the job) were taken into account. The full (and chosen) model contains all these variables.

All estimations were carried out for the pooled sample and for gender separated samples. Moreover, to explore potential heterogeneity in the effects with respect to socio-economic status or background of the individuals, we considered six subgroups as well. First, we estimated the effects of tuition fees for students with an income below the median, subsequently making the restriction more binding, for those below the 25% quartile. Being aware of strong intergenerational patterns of university attendance, we further split our sample into students with parents possessing tertiary education and those without. Finally, we took into account parents' position in their job (as an indicator of potential financial supporting ability) and distinguished between high and low positions.

4. Empirical Results

4.1. Effects on Expenditure

Table 3 shows the difference-in-differences estimators on the natural logarithm of total expenditure (excluding tuition fees). Each row contains the results of the "raw" difference-in-differences estimator (without further covariates) and the result of the full specification with covariates. Although the estimator is significant but small in the pooled sample in the raw specification, significance vanishes when control variables are included. The results of the six subgroups considered in order to analyze potential effect heterogeneity, shows that the finding of the total sample is robust regardless of the underlying definition of worse economic situation or prospects. Hence, the results clearly indi-

cate that paying tuitions fees in Germany did not lower expenditure of students, and that tuition fees did not even change the spending behavior of presumably more vulnerable students.

**Table 3: Difference-in-Differences Estimators for Different Subsamples
(Log. of Total Expenditure, 2006 and 2009)**

| Sample | | | Pooled | Men | Women |
|---|-----------------|--------|----------|---------|-----------|
| (1) Total | Raw | Coeff. | -0.029** | 0.005 | -0.054*** |
| | | S.E. | (0.014) | (0.022) | (0.018) |
| | With covariates | Coeff. | -0.004 | 0.023 | -0.024 |
| | | S.E. | (0.012) | (0.019) | (0.015) |
| (2) Income below the median | Raw | Coeff. | -0.041** | 0.001 | -0.069*** |
| | | S.E. | (0.018) | (0.028) | (0.022) |
| | With covariates | Coeff. | -0.021 | 0.000 | -0.037** |
| | | S.E. | (0.014) | (0.023) | (0.018) |
| (3) Income below the 25%-quantile | Raw | Coeff. | -0.038 | 0.009 | -0.072** |
| | | S.E. | (0.024) | (0.038) | (0.030) |
| | With covariates | Coeff. | -0.010 | 0.027 | -0.036 |
| | | S.E. | (0.021) | (0.034) | (0.026) |
| (4) Parents have tertiary education | Raw | Coeff. | -0.039** | -0.029 | -0.048** |
| | | S.E. | (0.019) | (0.031) | (0.024) |
| | With covariates | Coeff. | -0.019 | -0.001 | -0.032 |
| | | S.E. | (0.016) | (0.027) | (0.020) |
| (5) Parents have no tertiary education | Raw | Coeff. | -0.015 | 0.038 | -0.053** |
| | | S.E. | (0.021) | (0.032) | (0.027) |
| | With covariates | Coeff. | 0.015 | 0.046* | -0.005 |
| | | S.E. | (0.017) | (0.028) | (0.023) |
| (6) Parents with high position in the job | Raw | Coeff. | -0.041** | -0.022 | -0.056** |
| | | S.E. | (0.020) | (0.032) | (0.026) |
| | With covariates | Coeff. | -0.012 | 0.011 | -0.034 |
| | | S.E. | (0.016) | (0.027) | (0.021) |
| (7) Parents with low position in the job | Raw | Coeff. | -0.076* | -0.037 | -0.105* |
| | | S.E. | (0.042) | (0.067) | (0.054) |
| | With covariates | Coeff. | -0.038 | -0.011 | -0.052 |
| | | S.E. | (0.036) | (0.059) | (0.046) |

Note: difference-in-differences estimators are displayed (obtained from ordinary least square estimations with the logarithm of expenditure as dependent variable). Specification 1 includes only the difference-in-differences estimator, a dummy variable for the treatment group, and a dummy variable for 2009 (after the reform). Specification 2 controls for socio-demographic background variables (age, gender, marital status, partnership, citizenship, children, siblings, living situation (with parents, student dormitory, flat share)), a dummy variable that indicates whether the student has completed an apprenticeship before studying, dummy variables for the area of studies, and dummy variables for federal states. Furthermore, we control for the parental background by including dummy variables that indicate whether the mother / father has a university degree, and dummy variables for the parents' position in their job. See text for further details. Source: 18th and 19th Social Survey of the DZHW, own calculations.

Estimating the effect of tuition fees on mean expenditure according to gender reveals that there is no significant negative effect for males or for any subsample of males. For females, however, we find economically small but statistically significant effects. Considering all women in the sample, expenditure decreased on average by 2.5%.⁷ This finding remains stable for most of the subsamples. As expected, tuition fees decreased expenditure more for females with less disposable income. For those, whose income is below the median (€720), tuition fees decreased expenditure by 4.1%. Although there is also a significant negative effect for women whose parents had a university degree or a high position in the job, for women whose parents had a low position in their job or no university degree the effect is not statistically significant.

4.2. Effects on Further Outcomes

The results on expenditure showed that tuition fees had no or only a small effect. One possible explanation might be that the additional average monthly cost of €83.33 due to tuition fees is too low to affect the students' budget constraints. An alternative explanation may be that students increased their disposable income, for example by taking out a loan, receiving more financial support from parents or partners or increasing working hours. To check this, we estimated the effect of tuition fees on these outcomes.

The corresponding results in Table 4 show that the introduction of tuition fees did not change the probability of taking out a loan. In contrast, tuition fees increased the share of students who receive financial support from parents or partners significantly by 2%.⁸ The share of students who are financially supported by their parents is high anyway (between 87% and 90%), thus, this increase is relatively small. Moreover, weekly working hours were not affected by the introduction of tuition fees. However, if the sample is restricted to those students who worked at least one hour per week, results indicate that the introduction of tuition fees led to a significant increase in working time by 5%.

Estimating the effects by genders shows that tuition fees increased the probability of receiving financial support for male students (+ 2%). Among women, only working hours of those who worked at least one hour per week were affected (+ 6%). The empirical results thus indicate that students only increased their disposable budgets marginally.

⁷ The estimated coefficient $\hat{\beta}$ indicates the expected increase in $\log Y$ after a one-unit increase in x . Since we are rather interested in the exact expected increase of Y itself, the coefficient has to be transformed according to following equation: $\% \Delta \hat{y} = 100 \cdot [\exp(\hat{\beta}_i \Delta x_i) - 1]$.

⁸ Parents' payments for tuition fees are not included in this measure. Although the data contains information whether parents pay part of the tuition fees, it not known how much they actually pay.

Table 4: Difference-in-Differences Estimators (Further Outcomes, 2006 and 2009)

| Dependent variable | | | Pooled | Men | Women |
|---|-----------------|--------|---------|---------|---------|
| (1) Taking out a loan | Raw | Coeff. | 0.007 | 0.008 | 0.007 |
| | | S.E. | (0.005) | (0.008) | (0.006) |
| | With covariates | Coeff. | 0.007 | 0.008 | 0.007 |
| | | S.E. | (0.005) | (0.008) | (0.006) |
| (2) Financial support from parents / partner | Raw | Coeff. | 0.017* | 0.021 | 0.014 |
| | | S.E. | (0.009) | (0.014) | (0.011) |
| | With covariates | Coeff. | 0.018** | 0.023* | 0.014 |
| | | S.E. | (0.008) | (0.014) | (0.011) |
| (3) Weekly working hours | Raw | Coeff. | 0.087 | -0.258 | 0.331 |
| | | S.E. | (0.259) | (0.428) | (0.324) |
| | With covariates | Coeff. | 0.014 | -0.317 | 0.243 |
| | | S.E. | (0.246) | (0.407) | (0.307) |
| (4) Weekly working hours (ln) of students who work at least one hour per week | Raw | Coeff. | 0.051* | 0.038 | 0.057 |
| | | S.E. | (0.028) | (0.044) | (0.035) |
| | With covariates | Coeff. | 0.050* | 0.034 | 0.059* |
| | | S.E. | (0.026) | (0.042) | (0.034) |

Note: difference-in-differences estimators are displayed obtained from ordinary least squares estimations for the following outcome variables: taking out a loan (yes/no), receiving financial support from the parents/partner (yes/no), weekly working hours, logarithm of weekly working hours for students who work at least one hour per week. Specification 1 includes only the difference-in-differences estimator, a dummy variable for the treatment group, and a dummy variable for 2009 (after the reform). Specification 2 controls for socio-demographic background variables (age, gender, marital status, partnership, citizenship, children, siblings, living situation (with parents, student dormitory, flat share)), a dummy variable that indicates whether the student has completed an apprenticeship before studying, dummy variables for the area of studies, and dummy variables for federal states. Furthermore, we control for the parental background by including dummy variables that indicate whether the mother / father has a university degree, and dummy variables for the parents' position in their job. See text for further details. Source: 18th and 19th Social Survey of the DZHW, own calculations.

4.3. Robustness Checks

In order to confirm the reliability of the results presented so far, we have conducted a number of robustness checks. These cover the influence of possible anticipation effects, the plausibility of the common trend assumption, sensitivity of the results with respect to alternative definitions of control groups and treatment groups, and deviating gender effects.

a. Anticipation Effects

Students may have anticipated the introduction of tuition fees and changed their behavior in advance, because the law that allowed the charging of tuition fees was passed as early as 2005. Hence, this may bias the results when the years 2006 and 2009 are compared. To rule out these potential anticipation effects, we have re-estimated equation (1) for the years 2003 and 2009. For the pooled sample, results concerning student expenditure are similar, indicating no anticipation effects in the 2006 to 2009 analysis sample (Table 5). However, while we observed significant negative effects of

tuition fees on expenditure of female students in the 2006 and 2009 sample, these findings cannot be confirmed when taking 2003 as the reference year. In addition, when comparing 2003 to 2009, there are even significant positive effects for male students (+4 to +8%).

Table 5: Difference-in-Differences Estimators (Log. of Total Expenditure, 2003 and 2009)

| Sample | | | Pooled | Men | Women |
|---|-----------------|--------|-----------|---------|-----------|
| (1) Total | Raw | Coeff. | -0.041*** | 0.004 | -0.072*** |
| | | S.E. | (0.014) | (0.021) | (0.018) |
| | With covariates | Coeff. | 0.016 | 0.042** | 0.001 |
| | | S.E. | (0.012) | (0.018) | (0.015) |
| (2) Income below the median | Raw | Coeff. | -0.037** | 0.014 | -0.075*** |
| | | S.E. | (0.017) | (0.027) | (0.023) |
| | With covariates | Coeff. | 0.020 | 0.051** | 0.002 |
| | | S.E. | (0.015) | (0.024) | (0.020) |
| (3) Income below the 25%-quantile | Raw | Coeff. | -0.005 | 0.072** | -0.060* |
| | | S.E. | (0.024) | (0.036) | (0.032) |
| | With covariates | Coeff. | 0.040* | 0.077** | 0.022 |
| | | S.E. | (0.021) | (0.034) | (0.028) |
| (4) Parents have tertiary education | Raw | Coeff. | -0.050*** | 0.005 | -0.091*** |
| | | S.E. | (0.019) | (0.029) | (0.025) |
| | With covariates | Coeff. | 0.005 | 0.032 | -0.014 |
| | | S.E. | (0.016) | (0.025) | (0.021) |
| (5) Parents have no tertiary education | Raw | Coeff. | -0.029 | 0.004 | -0.050* |
| | | S.E. | (0.020) | (0.031) | (0.026) |
| | With covariates | Coeff. | 0.030* | 0.056** | 0.018 |
| | | S.E. | (0.017) | (0.026) | (0.022) |
| (6) Parents with high position in the job | Raw | Coeff. | -0.049** | 0.018 | -0.098*** |
| | | S.E. | (0.019) | (0.029) | (0.025) |
| | With covariates | Coeff. | 0.002 | 0.037 | -0.023 |
| | | S.E. | (0.016) | (0.025) | (0.021) |
| (7) Parents with low position in the job | Raw | Coeff. | -0.098** | -0.068 | -0.119** |
| | | S.E. | (0.042) | (0.065) | (0.055) |
| | With covariates | Coeff. | -0.025 | -0.011 | -0.037 |
| | | S.E. | (0.036) | (0.055) | (0.048) |

Note: difference-in-differences estimators are displayed obtained from ordinary least squares estimations. The dependent variable is the logarithm of expenditure. Specification 1 includes only the difference-in-differences estimator, a dummy variable for the treatment group, and a dummy variable for 2009 (after the reform). Specification 2 controls for socio-demographic background variables (age, gender, marital status, partnership, citizenship, children, siblings, living situation (with parents, student dormitory, flat share)), a dummy variable that indicates whether the student has completed an apprenticeship before studying, dummy variables for the area of studies, and dummy variables for federal states. Furthermore, we control for the parental background by including dummy variables that indicate whether the mother / father has a university degree, and dummy variables for the parents' position in their job. Effects are calculated for different subgroups. See text for further details. Source: 17th and 19th Social Survey of the DZHW, own calculations.

With regard to the other outcomes, tuition fees increased the probability of taking out a loan significantly by 0.9 percentage points (Table 6). Given that only 1.4% students of the treatment group took out a loan in 2003, this is equivalent to an increase of 64%. Obviously, this effect has to be interpreted carefully since special student loans were not introduced before 2006 in Germany. The probability of receiving financial support from parents or partners did not increase significantly between 2003 and 2009 either.

b. Common Trend Assumption

To check the plausibility of the identification assumption, namely whether the treatment and control groups followed a common trend before the introduction of tuition fees, we estimated a placebo difference-in-differences regression. Using the same specification as in equation (1), we refer to the years 2003 and 2006, i.e. for periods before tuition fees were introduced. Results are provided in Tables A.5 and A.6 in the appendix. The results of the difference-in-differences estimators without further controls are not statistically significant (except one). When additional covariates are considered, there are a few significant effects. However, no systematic pattern can be established overall. Hence, we interpret this evidence in favor of the necessary assumption of a common trend to hold true.

c. Alternative Control and Treatment Group Definitions

In some federal states, the allocation of students to the treatment group and the control group is ambiguous. Students in Hesse, for example, were assigned to the control group because they were not required to pay tuition fees in the summer term 2009. In the previous term (winter term 2008/2009), however, they still had to pay tuition fees. To check the robustness of the results, we estimated the models excluding students from Hesse. The corresponding estimation results (not displayed) are comparable and strongly robust.

Moreover, the treatment group in the city state of Hamburg differs from other states. Tuition fees were reduced from €500 to €375 in the winter term 2008/2009. Furthermore, students in Hamburg were offered the possibility of paying tuition fees after their studies. Redoing our analysis excluding students from Hamburg, however, did not alter the results. Finally, Bavaria offered a number of exceptions under which students were exempted from paying fees. For example, students with siblings studying in a fee-state received a tuition waiver. Again, re-estimation excluding Bavarian students indicated that results were similar to those presented in Table 3.

Table 6: Difference-in-Differences Estimators (Further Outcomes, 2003 and 2009)

| Dependent variable | | | Pooled | Men | Women |
|---|-----------------|--------|---------|---------|---------|
| (1) Taking out a loan | Raw | Coeff. | 0.007* | 0.006 | 0.007 |
| | | S.E. | (0.004) | (0.006) | (0.005) |
| | With covariates | Coeff. | 0.009** | 0.008 | 0.010** |
| | | S.E. | (0.004) | (0.006) | (0.005) |
| (2) Financial support from parents / partner | Raw | Coeff. | 0.017** | 0.023* | 0.013 |
| | | S.E. | (0.008) | (0.013) | (0.010) |
| | With covariates | Coeff. | 0.007 | 0.012 | 0.005 |
| | | S.E. | (0.008) | (0.013) | (0.010) |
| (3) Weekly working hours | Raw | Coeff. | -0.028 | -0.517 | 0.319 |
| | | S.E. | (0.240) | (0.388) | (0.304) |
| | With covariates | Coeff. | 0.363 | -0.005 | 0.601** |
| | | S.E. | (0.224) | (0.360) | (0.283) |
| (4) Weekly working hours (ln) of students who work at least one hour per week | Raw | Coeff. | 0.030 | 0.058 | 0.015 |
| | | S.E. | (0.024) | (0.038) | (0.031) |
| | With covariates | Coeff. | 0.052** | 0.068* | 0.042 |
| | | S.E. | (0.023) | (0.036) | (0.029) |

Note: difference-in-differences estimators are displayed obtained from ordinary least squares estimations for the following outcome variables: taking out a loan (yes/no), receiving financial support from the parents/partner (yes/no), weekly working hours, logarithm of weekly working hours for students who work at least one hour per week. Specification 1 includes only the difference-in-differences estimator, a dummy variable for the treatment group, and a dummy variable for 2009 (after the reform). Specification 2 controls for socio-demographic background variables (age, gender, marital status, partnership, citizenship, children, siblings, living situation (with parents, student dormitory, flat share)), a dummy variable that indicates whether the student has completed an apprenticeship before studying, dummy variables for the area of studies, and dummy variables for federal states. Furthermore, we control for the parental background by including dummy variables that indicate whether the mother / father has a university degree, and dummy variables for the parents' position in their job. See text for further details. Source: 17th and 19th Social Survey of the DZHW, own calculations.

d. Different types of expenditure

In order to find out whether heterogeneous effects with respect to different types of expenditure exist, we divide total expenditure in several subcategories and estimate difference-in-differences models with different types of expenditure as dependent variables (Table 7). Results indicate that tuition fees have a significant negative effect (to the 10%-level) on expenditure for the rent. In particular, paying tuition fees decreases expenditure for rent by 6%. This is in line with changes in the living situation described above. In the treatment group the share of students living with their parents increases more, while the share of students living alone decreases more compared to the control group between 2006 and 2009. There are no significant effects of tuition fees on spending for food, clothes, learning material, car, public transport, fees for telephone or internet or for leisure, culture or sports. This is consistent with the insignificant effect of tuition fees on total expenditure. However, results indicate that paying tuition fees is associated with increases expenditure for medical insurance and medical fees.

Table 7: Difference-in-Differences Estimators (Log. of Different Types of Expenditure, 2006 and 2009)

| Dependent variable: Expenditure for | DiD-Estimator |
|-------------------------------------|--------------------|
| Total | -0.004 (0.012) |
| Rent | -0.060* (0.035) |
| Food | -0.026 (0.029) |
| Clothes | 0.043 (0.032) |
| Learning materials | -0.019 -0.031 |
| Car | 0.078 (0.058) |
| Public transport | 0.001 (0.045) |
| Medical insurance, medical fees | 0.077* (0.047) |
| Fees for telephone, internet | 0.007 (0.032) |
| Leisure, culture, sports | -0.035 (0.038) |

Note: difference-in-differences estimators are displayed (obtained from ordinary least square estimations with the logarithm of different expenditure as dependent variable). Next to the difference-in-differences estimator the model includes a dummy variable for the treatment group, and a dummy variable for 2009 (after the reform) as well as controls for socio-demographic background variables (age, gender, marital status, partnership, citizenship, children, siblings, living situation (with parents, student dormitory, flat share)), a dummy variable that indicates whether the student has completed an apprenticeship before studying, dummy variables for the area of studies, and dummy variables for federal states. Furthermore, we control for the parental background by including dummy variables that indicate whether the mother / father has a university degree, and dummy variables for the parents' position in their job. See text for further details. Source: 18th and 19th Social Survey of the DZHW, own calculations.

e. Gender Effects

The results above indicate that tuition fees had no significant effect on men's financial situation, but decreased expenditure and increased working hours of female students. There are several possible explanations for these gender differences. Firstly, men and women may have responded differently to tuition fees because they are differently selected with respect to their migration behavior. Dwenger et al. (2012) and Mitze et al. (2013) showed that tuition fees affected the decision of the place of studying among men but not among women. If we assume that men who changed their mobility behavior were more financially restricted than those who did not, the selection of students in

fee-states was less financially restricted. Then, tuition fees may have had no effect on males' spending behavior. Furthermore, the results of the literature imply that women were not self-selected. This may explain the significant effects of tuition fees on female spending behavior.

However, our data do not support the finding of the literature that men reacted more to tuition fees. On the contrary, Table 2 above showed that the share of men who graduated high school in a fee state and studied in a fee state stayed nearly constant over time, while the share of women decreased moderately over time.

5. Conclusion

Politicians have justified the abolishment of tuition fees in Germany as a measure removing financial hurdles that prevent individuals from studying and improving equal opportunities. This paper has analyzed to what extent paying tuition fees of €500 per semester changed the financial situation of students. The empirical results indicate that the introduction of tuition fees did not change students' spending behavior overall. However, tuition fees did decrease expenditure of female students. As expected, expenditure decreased slightly more for female students with low income (below the median). Nevertheless, the magnitude of the decrease was relatively low given that women of the treatment group spent on average €648 per month, with a decrease of 4% thus amounting to €26.

More importantly from a political perspective, tuition fees did not affect students with lower education backgrounds differently. We found effects neither for students whose parents have no tertiary education nor for those whose parents have a low position in their job. Tuition fees, therefore, did not increase inequality across students in Germany. Social and education inequality rather result from selections earlier in life, for example because differences between children due to the parents' background already develop in early childhood and at school age (e.g. Hillmert and Jakob 2010, Cunha et al. 2006). In Germany, students are tracked into secondary school types typically at the age of ten. Schneider (2008), for example, finds that the social origin has a strong influence on this tracking decision. However, parental background has a smaller influence on dropping out of the high education track. This indicates that the importance of students' social origin decreases with age.

Obviously, the most plausible reason for the zero or only small effect of tuition fees on students' expenditure may be the amount. A tuition fee of €500 per semester is equal to about 10% of monthly living costs (own calculation, in line with Helbig et al. 2012). Compared to other countries, tuition fees in Germany were therefore relatively low. In the academic year 2010/2011, U.S. students had to pay a mean tuition fee of USD 13,297 at public universities in the U.S. (*U.S. Department of Education, National Center for Education Statistics*). In Great Britain, first-year students had to pay a mean fee of 8,385 pounds per year in autumn 2012 (*University and College Union*).

Moreover, tuition fees did not increase the probability of taking out a loan, even though special student loans were introduced in Germany. Students' main income sources are usually financial support from parents. As expected, tuition fees thus increased the share of students receiving financial support from parents or partners, but only to a small extent (+2%). Although this indicates that the additional financial burden intensified the required support from the parents slightly, empirical studies showed that this did not correspond to a change in university enrollment. As tuition fees affected working time of those students who worked at least one hour per week, this indicates that students increased their budget constraints marginally.

By and large, we found no or only minor significant negative effects on students' financial situation. Therefore, the arguments of increased social inequality and strong financial reasons for abolishing tuition fees in Germany do not seem appropriate. This is particularly relevant in the light of the world-wide trend of increasing private contributions to the funding of higher education.

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Appendix

Table A.1: Overview of Tuition Fees in Germany

| Federal state | Level of fees (in EUR) | Date of Decision | Introduced | Abolished |
|------------------------|---------------------------|---------------------|-----------------------|-----------------------|
| Baden-Wuerttemberg | 500 | 15.12.2005 | Summer term 2007 | Summer term 2012 |
| Bavaria | up to 500 | 18.05.2006 | Summer term 2007 | Winter term 2013/2014 |
| Hamburg | 375 | 28.06.2006 | Summer term 2007 | Winter term 2012/2013 |
| Hessen | 500 | 05.10.2006 | Winter term 2007/2008 | Winter term 2008/2009 |
| Lower Saxony | 500 | 09.12.2005 | Winter term 2006/2007 | Winter term 2014/2015 |
| North Rhine-Westphalia | up to 500 | 16.03.2006 | Winter term 2006/2007 | Winter term 2011/2012 |
| Saarland | 500 | 12.07.2006 | Winter term 2007/2008 | Summer term 2010 |

Note: In Lower-Saxony and North Rhine-Westphalia only first year students had to pay tuition fees from the winter term 2006/2007, while older students had to pay from the summer term 2007. No tuition fees were charged in Berlin, Brandenburg, Bremen (only once in the winter term 2006/2007 for students who did not have their main residence in Bremen and for students who had studied for longer than 15 semesters), Mecklenburg-Western Pomerania, Rhineland-Palatinate, Saxony-Anhalt, Schleswig-Holstein, and Thuringia. "Date of Decision": Date on which the parliament of the federal state passed the law that says that tuition fees have to be charged. "Introduced": first term in which students had to pay tuition fees, "Abolished": first term in which students did not have to pay tuition fees anymore.

Table A.2: Number of Observations (by Year and Group)

| | Year | | | Sum |
|-----------------|--------|--------|--------|--------|
| | 2003 | 2006 | 2009 | |
| Control group | 6,305 | 5,078 | 4,847 | 16,230 |
| Treatment group | 9,172 | 6,659 | 5,760 | 21,591 |
| Sum | 15,477 | 11,737 | 10,607 | 37,821 |

Source: 17th, 18th and 19th Social Survey of the DZHW, own calculations.

Table A.3: OLS Estimates (Log. of Total Expenditure)

| | (1) | (2) | (3) | (4) |
|---|---------------------|----------------------|----------------------|----------------------|
| Treatment Group | 0.016 (0.016) | 0.104*** (0.023) | 0.095*** (0.023) | 0.097*** (0.023) |
| 2009 | 0.021 (0.017) | 0.012 (0.014) | 0.011 (0.014) | 0.012 (0.014) |
| DiD estimator | 0.005 (0.022) | 0.018 (0.019) | 0.023 (0.019) | 0.023 (0.019) |
| Age | | 0.032*** (0.002) | 0.030*** (0.002) | 0.031*** (0.002) |
| Married | | 0.266*** (0.032) | 0.265*** (0.032) | 0.267*** (0.032) |
| Partnership | | 0.065*** (0.010) | 0.062*** (0.010) | 0.062*** (0.010) |
| Foreign citizenship | | -0.034 (0.030) | -0.032 (0.030) | -0.041 (0.030) |
| Children (dummy variable) | | 0.092*** (0.032) | 0.095*** (0.031) | 0.098*** (0.031) |
| Siblings (dummy variable) | | -0.054*** (0.014) | -0.054*** (0.014) | -0.054*** (0.014) |
| Living situation (Reference: Living alone) | | | | |
| At the parent's house | | -0.619*** (0.015) | -0.612*** (0.015) | -0.610*** (0.015) |
| Student dormitory | | -0.223*** (0.018) | -0.214*** (0.018) | -0.215*** (0.018) |
| Flat share / together with partner | | -0.138*** (0.014) | -0.130*** (0.014) | -0.131*** (0.014) |
| Apprenticeship before studying | | | 0.009 (0.012) | 0.015 (0.013) |
| Area of studies (Reference: Social sciences) | | | | |
| Engineering | | | -0.004 (0.018) | -0.003 (0.018) |
| Language and cultural studies | | | -0.016 (0.020) | -0.016 (0.020) |
| Maths and natural sciences | | | -0.051*** (0.018) | -0.050*** (0.018) |
| Medicine | | | 0.063** (0.026) | 0.058** (0.026) |
| Law and Economics | | | 0.065*** (0.018) | 0.065*** (0.018) |
| Parent's background | | | | |
| Father university degree | | | | 0.019 (0.012) |
| Mother university degree | | | | -0.012 (0.014) |
| Parents' position in the job (Reference: low) | | | | |
| Father medium | | | | 0.013 (0.018) |
| Father high | | | | 0.006 (0.020) |
| Mother medium | | | | 0.024 (0.016) |
| Mother high | | | | 0.054*** (0.020) |
| Dummy variables for federal states | No | Yes | Yes | Yes |
| Constant | 6.344*** (0.012) | 5.769*** (0.057) | 5.792*** (0.062) | 5.751*** (0.064) |
| R square adjusted | 0.000 | 0.276 | 0.282 | 0.283 |
| Number of observations | 9,119 | 9,119 | 9,119 | 9,119 |

Note: displayed coefficients were obtained from ordinary least squares estimations. The dependent variable is the logarithm of expenditure. Source: 18th and 19th Social Survey of the DZHW, own calculations.

Table A.4: OLS Estimates by Gender (Log. of Total Expenditure)

| | MEN | | | | WOMEN | | | |
|---|---------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| Treatment Group | 0.016 (0.016) | 0.104*** (0.023) | 0.095*** (0.023) | 0.097*** (0.023) | 0.011 (0.012) | 0.141*** (0.018) | 0.145*** (0.018) | 0.149*** (0.018) |
| 2009 | 0.021 (0.017) | 0.012 (0.014) | 0.011 (0.014) | 0.012 (0.014) | 0.043*** (0.013) | 0.048*** (0.011) | 0.050*** (0.011) | 0.052*** (0.011) |
| DiD estimator | 0.005 (0.022) | 0.018 (0.019) | 0.023 (0.019) | 0.023 (0.019) | -0.054*** (0.018) | -0.022 (0.015) | -0.022 (0.015) | -0.024 (0.015) |
| Age | | 0.032*** (0.002) | 0.030*** (0.002) | 0.031*** (0.002) | | 0.039*** (0.001) | 0.036*** (0.002) | 0.037*** (0.002) |
| Married | | 0.266*** (0.032) | 0.265*** (0.032) | 0.267*** (0.032) | | 0.172*** (0.023) | 0.173*** (0.022) | 0.175*** (0.022) |
| Partnership | | 0.065*** (0.010) | 0.062*** (0.010) | 0.062*** (0.010) | | 0.012 (0.008) | 0.012 (0.008) | 0.012 (0.008) |
| Foreign citizenship | | -0.034 (0.030) | -0.032 (0.030) | -0.041 (0.030) | | -0.085*** (0.024) | -0.081*** (0.024) | -0.084*** (0.025) |
| Children (dummy variable) | | 0.092*** (0.032) | 0.095*** (0.031) | 0.098*** (0.031) | | 0.159*** (0.022) | 0.162*** (0.022) | 0.162*** (0.022) |
| Siblings (dummy variable) | | -0.054*** (0.014) | -0.054*** (0.014) | -0.054*** (0.014) | | -0.047*** (0.011) | -0.048*** (0.011) | -0.049*** (0.011) |
| Living situation (Reference: Living alone) | | | | | | | | |
| At the parent's house | | -0.619*** (0.015) | -0.612*** (0.015) | -0.610*** (0.015) | | -0.693*** (0.012) | -0.690*** (0.012) | -0.687*** (0.012) |
| Student dormitory | | -0.223*** (0.018) | -0.214*** (0.018) | -0.215*** (0.018) | | -0.240*** (0.014) | -0.234*** (0.014) | -0.234*** (0.014) |
| Flat share / together with partner | | -0.138*** (0.014) | -0.130*** (0.014) | -0.131*** (0.014) | | -0.128*** (0.010) | -0.122*** (0.010) | -0.122*** (0.010) |
| Apprenticeship before studying | | | 0.009 (0.012) | 0.015 (0.013) | | | 0.023** (0.011) | 0.029*** (0.011) |
| Area of studies (Reference: Social sciences) | | | | | | | | |
| Engineering | | | -0.004 (0.018) | -0.003 (0.018) | | | -0.035** (0.016) | -0.036** (0.016) |
| Language and cultural studies | | | -0.016 (0.020) | -0.016 (0.020) | | | -0.015 (0.011) | -0.017 (0.011) |
| Maths and natural sciences | | | -0.051*** (0.018) | -0.050*** (0.018) | | | -0.061*** (0.012) | -0.062*** (0.012) |
| Medicine | | | 0.063** (0.026) | 0.058** (0.026) | | | 0.048*** (0.015) | 0.041*** (0.015) |
| Law and Economics | | | 0.065*** (0.018) | 0.065*** (0.018) | | | 0.051*** (0.012) | 0.050*** (0.012) |
| Parent's background | | | | | | | | |
| Father university degree | | | | 0.019 (0.012) | | | | 0.019** (0.009) |
| Mother university degree | | | | -0.012 (0.014) | | | | 0.005 (0.010) |
| Parents' position in the job (Reference: low) | | | | | | | | |
| Father medium | | | | 0.013 (0.018) | | | | -0.019 (0.014) |
| Father high | | | | 0.006 (0.020) | | | | -0.016 (0.016) |
| Mother medium | | | | 0.024 (0.016) | | | | 0.018 (0.013) |
| Mother high | | | | 0.054*** (0.020) | | | | 0.033** (0.016) |
| Dummy variables for federal states | No | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Constant | 6.344*** (0.012) | 5.769*** (0.057) | 5.792*** (0.062) | 5.751*** (0.064) | 6.351*** (0.009) | 5.647*** (0.046) | 5.688*** (0.049) | 5.673*** (0.051) |
| R square adjusted | 0.000 | 0.276 | 0.282 | 0.283 | 0.001 | 0.325 | 0.330 | 0.331 |
| Number of observations | 9,119 | 9,119 | 9,119 | 9,119 | 13,225 | 13,225 | 13,225 | 13,225 |

Note: displayed coefficients were obtained from ordinary least squares estimations. The dependent variable is the logarithm of expenditure. Source: 18th and 19th Social Survey of the DZHW, own calculations.

Table A.5: Placebo Tests: Dif-in-Dif Estimators (Log. of Total Expenditure, 2003 and 2006)

| Sample | | | Pooled | Men | Women |
|---|-----------------|--------|---------|---------|---------|
| (1) Total | Raw | Coeff. | -0.008 | 0.008 | -0.020 |
| | | S.E. | (0.013) | (0.020) | (0.017) |
| | With covariates | Coeff. | 0.019* | 0.019 | 0.019 |
| | | S.E. | (0.011) | (0.017) | (0.014) |
| (2) Income below the median | Raw | Coeff. | 0.010 | 0.027 | -0.002 |
| | | S.E. | (0.017) | (0.026) | (0.022) |
| | With covariates | Coeff. | 0.032** | 0.028 | 0.037** |
| | | S.E. | (0.015) | (0.023) | (0.019) |
| (3) Income below the 25%-quantile | Raw | Coeff. | 0.034 | 0.063* | 0.013 |
| | | S.E. | (0.022) | (0.034) | (0.029) |
| | With covariates | Coeff. | 0.049** | 0.048 | 0.055** |
| | | S.E. | (0.019) | (0.031) | (0.025) |
| (4) Parents have tertiary education | Raw | Coeff. | -0.008 | 0.041 | -0.043* |
| | | S.E. | (0.018) | (0.028) | (0.023) |
| | With covariates | Coeff. | 0.020 | 0.034 | 0.013 |
| | | S.E. | (0.015) | (0.024) | (0.019) |
| (5) Parents have no tertiary education | Raw | Coeff. | -0.008 | -0.025 | 0.007 |
| | | S.E. | (0.019) | (0.029) | (0.025) |
| | With covariates | Coeff. | 0.017 | 0.008 | 0.025 |
| | | S.E. | (0.016) | (0.025) | (0.021) |
| (6) Parents with high position in the job | Raw | Coeff. | -0.003 | 0.046 | -0.038 |
| | | S.E. | (0.018) | (0.028) | (0.024) |
| | With covariates | Coeff. | 0.016 | 0.029 | 0.012 |
| | | S.E. | (0.015) | (0.024) | (0.019) |
| (7) Parents with low position in the job | Raw | Coeff. | -0.015 | -0.016 | -0.013 |
| | | S.E. | (0.041) | (0.063) | (0.053) |
| | With covariates | Coeff. | 0.016 | 0.001 | 0.020 |
| | | S.E. | (0.034) | (0.054) | (0.044) |

Note: difference-in-differences estimators are displayed obtained from ordinary least squares estimations. The dependent variable is the logarithm of expenditure. Specification 1 includes only the difference-in-differences estimator, a dummy variable for the treatment group, and a dummy variable for 2006 (placebo for after the reform). Specification 2 controls for socio-demographic background variables (age, gender, marital status, partnership, citizenship, children, siblings, living situation (with parents, student dormitory, flat share)), a dummy variables that indicates whether the student has completed apprenticeship before studying, dummy variables for the area of studies, and dummy variables for federal states. Furthermore, we control for the parental background by including dummy variables that indicate whether the mother / father has a university degree, and dummy variables for the parents' position in their job. Effects are calculated for different subgroups. See text for further details. Source: 17th and 18th Social Survey of the DZHW, own calculations.

Table A.6: Placebo Tests: Dif-in-Dif Estimators (Further Outcomes, 2003 and 2006)

| Dependent variable | | | Pooled | Men | Women |
|---|-----------------|--------|---------|---------|---------|
| (1) Taking out a loan | Raw | Coeff. | -0.001 | -0.001 | -0.001 |
| | | S.E. | (0.003) | (0.006) | (0.004) |
| | With covariates | Coeff. | 0.001 | 0.001 | 0.001 |
| | | S.E. | (0.003) | (0.006) | (0.004) |
| (2) Financial support from parents / partner | Raw | Coeff. | -0.003 | -0.003 | -0.003 |
| | | S.E. | (0.008) | (0.013) | (0.010) |
| | With covariates | Coeff. | 0.013* | -0.012 | -0.012 |
| | | S.E. | (0.007) | (0.012) | (0.009) |
| (3) Weekly working hours | Raw | Coeff. | -0.054 | -0.171 | 0.032 |
| | | S.E. | (0.237) | (0.388) | (0.297) |
| | With covariates | Coeff. | 0.297 | 0.244 | 0.346 |
| | | S.E. | (0.222) | (0.361) | (0.278) |
| (4) Weekly working hours (ln) of students who work at least one hour per week | Raw | Coeff. | -0.017 | 0.030 | -0.043 |
| | | S.E. | (0.026) | (0.041) | (0.033) |
| | With covariates | Coeff. | -0.006 | 0.031 | -0.025 |
| | | S.E. | (0.024) | (0.038) | (0.031) |

Note: difference-in-differences estimators are displayed obtained from ordinary least squares estimations for the following outcome variables: taking out a loan (yes/no), receiving financial support from parents/partner (yes/no), weekly working hours, logarithm of weekly working hours for students who work at least one hour per week. Specification 1 includes only the difference-in-differences estimator, a dummy variable for the treatment group, and a dummy variable for 2006 (placebo for after the reform). Specification 2 controls for socio-demographic background variables (age, gender, marital status, partnership, citizenship, children, siblings, living situation (with parents, student dormitory, flat share)), a dummy variable that indicates whether the student has completed an apprenticeship before studying, dummy variables for the area of studies, and dummy variables for federal states. Furthermore, we control for the parental background by including dummy variables that indicate whether the mother / father has a university degree, and dummy variables for the parents' position in their job. See text for further details. Source: 17th and 18th Social Survey of the DZHW, own calculations.