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The Impact of the Bologna Reform on Student Outcomes – Evidence from Exogenous Variation in Regional Supply of Bachelor Programs in Germany

Bernhard Enzi
Benedikt Siegler

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The Impact of the Bologna Reform on Student Outcomes

Evidence from Exogenous Variation in Regional Supply of Bachelor Programs in Germany

Bernhard Enzi [a]
ifo Institute

Benedikt Siegler
ifo Institute

Abstract

How did the introduction of the Bachelor-degree system affect students in Germany? Combining rich data on university students with administrative data on universities' study programs, we exploit variation in the timing of Bachelor-degree implementation across departments. To account for endogeneity in students' enrollment decisions, we apply an instrumental-variable approach based on the distance differential between an individual's nearest universities with a Bachelor's and a traditional degree program. Overall, we do not find reform effects on students' mobility, dropout, and internship participation, although there is indication that the reform reduced dropout for females and for high-achieving students and increased study satisfaction.

Keywords: Bologna Reform; Bachelor introduction; student outcomes; instrumental variables

JEL Classification: I28, I21, H75

[a]Corresponding author: Ifo Institute - Leibniz Institute for Economic Research at the University of Munich, Center for the Economics of Education, Poschingerstr. 5, 81679 Munich, Germany; e-mail: enzi@ifo.de; phone: +49.89.9224-1696; fax: +49.89.9224-1460.

1 Introduction

Higher education is generally perceived as becoming increasingly relevant in today's knowledge economies (Vandenbussche et al., 2006). In this regard, a country's future competitiveness relates to the productivity of its tertiary education system. The Bologna Reform was aimed at increasing the efficiency and attractiveness of higher education within European countries. In particular, policy-makers wanted to increase the mobility and employability of university students by introducing a homogeneous degree system based on two main cycles, the Bachelor/Master system (European Ministers of Education, 1999). In Germany, this led to the abandoning of the hitherto single degree system. Since the Bachelor degree (the first cycle degree) can be obtained in less time than a traditional degree, the new degree system reduces the costs of earning a first tertiary education degree. This reduction in costs could be expected to increase enrollment and reduce dropout rates. Policy-makers also hoped that the harmonization of the degree structure across European countries would increase in particular international student mobility.

This paper investigates to what extend the restructuring of the higher education degree system in Germany had the intended effects on students' mobility and employability. In particular, we analyze the effects of the reform on international and national student mobility as one of the major policy goals. While any direct measures of labor market outcomes are not yet available, we also analyze the effects on outcomes which are potentially related to employability, such as dropout and internship participation: Dropping out of university may reduce an individual's employment opportunities, participating in internships may increase them. In addition, we investigate whether the reform had a negative impact on the study atmosphere as perceived by students to evaluate the concern of unintended side effects.

We exploit exogenous variation in the local availability of Bachelor programs to estimate causal effects of the reform on student outcomes in Germany. Due to the decentralized implementation of Bachelor degree programs in Germany, both old and new degree programs coexisted for several years leading, on the one hand, to the possibility to evaluate reform effects without confounding changes over time, but, on the other hand, to potentially endogenous sorting of students into old and new degree programs. To solve this endogeneity problem, we employ an instrumental variables approach by instrumenting enrollment into a Bachelor's program with the distance differential between an individual's nearest university with a Bachelor's and the nearest university with a traditional degree program.

We use a unique micro-level dataset on German high-school graduates of 2006 whom we observe in 2009. This dataset contains information on the place of high school of the individual which enables us to link these data to rich administrative data on university study programs in 2006 to employ our instrumental variables approach.

Our estimation results do not provide evidence that the reform had a significant effect on student mobility, dropout, and internship participation on average. However, we find a statistically significant negative effect on dropout for higher achieving students of about 10 percent and a borderline significant negative effect on dropout for females of about 9 percent. Furthermore, we find evidence that the reform had a positive impact on the study atmosphere as perceived by students.

We are not aware of any study that evaluates the effect of the Bologna Reform on student mobility, although this was one of the major policy goals. In a related study, Parey and Waldinger (2011) analyze the introduction of the ERASMUS program, which provides financial aid to students when going abroad, and find a significantly positive effect on international student mobility.

Existing research has mainly focused on the impact of the reform on enrollment and dropout rates with different findings across countries. Positive enrollment effects have been reported for Italy and Portugal (e.g. Cappellari and Lucifora, 2009; Di Pietro, 2012; Cardoso, 2008), whereas no significant effect was found for Germany (Horstschräer and Sprietsma, 2015). The evidence for dropout appears to be mixed even within a country.

The remainder of the paper is structured as follows. Section 2 describes the Bologna Process and the changes it induced in the German higher education system in more detail. In Section 3, we discuss related literature. In Section 4, we describe the data and present our estimation strategy for the identification of causal effects. Section 5 contains our results. Section 6 concludes.

2 The Bologna Process

On June 19, 1999 the Ministers of Education of 29 European countries met in the Italian city of Bologna to discuss a common strategy to promote the European higher education area. Set forth in the Bologna Declaration, the main objectives of the so-called Bologna Reform are to improve international competitiveness of the European higher education area, foster (international) mobility of students, teachers and researchers, and to strengthen the employability of the European university graduates. In particular, the latter goal gained much momentum in Germany triggered by a broad discussion about the efficiency of the German higher education system in the late 1990s and early 2000s.[1] Many scientists as well as politicians and employers criticized that the average German university student took too long to finish a degree, dropped out too frequently and was lacking important soft skills.

The universities of each member state were requested to introduce a "system of easily readable and comparable degrees" based upon "two main cycles" (see European Ministers of Education, 1999, p. 3) together with a unitary credit point system. In Germany, this led to the abandoning of the single-tier study programs and the respective degrees (called "Diplom" in some subjects and "Magister" in others) and the introduction of the two-tier Bachelor/Master system. Theoretically, the new two-tier system may offer some important advantages compared to the old single-tier system, but there may also be some disadvantages.

The Bachelor degree was thought of as a first academic degree which qualifies for direct labor market entry whereas the consecutive Master degree should provide a profound academic education for a scientific career. Since the Bachelor degree can be earned in less time compared to one of the traditional degrees, this should lower

[1] For example, see Kultusministerkonferenz (1997) and Wissenschaftsrat (2000) for suggestions on how to improve the German higher education system.

the costs of investing in tertiary education for individuals interested in acquiring basic academic skills and quickly entering the labor market. On the other hand, the Master degree, which requires the successful completion of a Bachelor's degree, offers a more specialized education, but students typically have to commit themselves to an overall longer duration of study than before.[2]

A two-tier system also makes it possible to offer Master programs which do not require a Bachelor's degree in the same subject which increases the options for students within the new system and, therefore, its attractiveness.[3] However, it is not clear to what extend Bachelor and Master degrees qualify for distinct employment positions. In practice, both Bachelor and Master graduates might compete for the same job offer. This may reduce the value of the Bachelor degree, since Bachelor graduates obtained less human capital than Master graduates. In fact, there is evidence that more than 72 percent of the students choose to obtain a Master's degree upon successful completion of the Bachelor's degree (Heine, 2012).

The adoption process varied substantially across European countries: England, for instance, already had a two-tier Bachelor/Master system in place and had to carry out only minor adjustments. In Italy, the new system was introduced simultaneously at all universities in 2001. Portugal opted for a decentralized introduction of the new degrees and required its universities to switch to the new system at some point between 2006 and 2008. In Germany, universities were free to choose any point in time between 2000 and 2010 to introduce the new degree system. It was agreed upon that the introduction process should be completed by 2010. In Germany, this goal was widely achieved, with a few exceptions.[4] In 2003, less than 5 percent of all departments had adopted the new degree whereas by 2008 almost 90 percent had completely switched to offering Bachelor degrees (see Horstschräer and Sprietsma, 2015, p. 1).

[2] The usual duration of Bachelor programs is three years, that of Master programs two years. Traditional programs took four to five years.

[3] In fact, an explicit goal of the Bologna Reform also was the promotion of interdisciplinary study programs (European Ministers of Education, 2003).

[4] For example, neither of the medicine departments introduced the new degrees. Likewise, law departments were still offering traditional degree programs by 2010.

The Bologna agreement did not provide any distinct implementation rules with regard to contents of the new degree programs. This led to a fairly heterogeneous adoption. Some departments tried to set up new programs that were specifically tailored to the shorter study period of the Bachelor cycle. Others continued to offer the same program and only replaced the old with the new degree which ultimately led to a tighter schedule of teaching (Winter et al., 2010).

3 Related Literature

The existing evidence on the effects of the Bologna Reform on student outcomes is rather scarce, although it induced large changes in the tertiary education systems of many European countries. This circumstance is most likely due to a lack of adequate data sources and compelling strategies to identify causal effects. Cappellari and Lucifora (2009), for instance, estimate the effect of the Bachelor introduction in Italy on enrollment and dropout rates using a simple before-after comparison, thereby ignoring any potential biases from time trends as well as confounding factors that may have occurred together with the implementation of the Bologna Reform and that may have had an effect on the enrollment decision. Di Pietro (2012) re-evaluates their analysis by employing a difference-in-differences approach. The author argues that the Bologna Reform was primarily targeted towards individuals from less advantaged social backgrounds, so that this subgroup constitutes the treatment group. He identifies individuals as belonging to the treatment group when neither of their parents have a university degree. Individuals with at least one parent with a university degree constitute the control group.[5] In order to capture the effect from time trends in enrollment, the author uses four cohorts of high school leavers, two before and two after the Bachelor introduction in Italy in 2001.

[5]Although not explicitly stated in the paper, the author most likely refers to the fact that in theory the Bachelor introduction reduced the cost of investing in higher education, because it takes less time to earn a first degree so that the investment becomes profitable for individuals at the margin of investing.

While this approach is more refined than a simple before-after comparison, it hinges on the assumption that the Bachelor introduction did not affect individuals from the control group. In fact, it is plausible to assume that the Bologna Reform also influenced individuals from the control group in their decision to enroll in higher education as it introduced a considerable amount of flexibility as described in Section 2. If this also motivated more individuals from the control group to enroll in higher education, the reform effect is underestimated. Cappellari and Lucifora (2009) conclude that the reform increased enrollment by 15 percent, whereas Di Pietro (2012) estimates a reform effect of 7 percent.

Two further studies attempt to gauge the effect on dropout rates in the Italian context based on mainly descriptive evidence: D'Hombres (2007) finds significant lower dropout rates among post-reform cohorts of university students, whereas Boero et al. (2005) find no evidence of reduced dropout. Finally, Bratti et al. (2006) analyze the extent to which the reform had an impact on study programs. They analyze data from a single Italian university department and conclude that it became easier for students to pass first-year courses. Cardoso (2008) and Portela et al. (2009) analyze students' demand for study programs in Portugal. They find that departments which introduced the Bachelor degree were more often chosen by first-year students than those which remained offering a traditional degree program.

In a recent study, Horstschräer and Sprietsma (2013) analyze the effect of the Bologna Reform on enrollment and dropout rates in Germany. They employ a fixed effects panel model to analyze administrative data on the department level from 1998 to 2008. Overall, they do not find any effect of the Bachelor introduction on neither enrollment nor dropout rates. However, results appear to differ by subjects. In English Language, German Language as well as Computer Sciences the Bachelor introduction seems to have had a positive enrollment effect, whereas in Mechanical Engineering and Electrical Engineering the effect is negative. Due to the decentralized introduction of Bachelor programs in Germany, i.e. old and new degree programs coexisted for several years, this result is likely to reflect students' selection into one or the other degree program. For the analysis of dropout rates a similar picture emerges. For Biology, the estimated effect is positive, whereas it is negative for Business Administration, English Language Studies, and German Language Studies. Unfortunately, the authors are not able to distinguish between students who quit studying and those who change subject or university.

Mühlenweg (2010) tries to answer the question whether studying in a Bachelor's program affected students' satisfaction. Controlling for observable student characteristics, she concludes that the satisfaction of students in Bachelor programs is slightly higher compared to their peers in traditional degree programs.

Finally, there are a few studies in the spirit of our IV approach exploiting proximity to a specific (treatment) location as a source of exogenous variation. Originating in labor economics, studies in that field exploit distance measures orthogonal to unobserved individual heterogeneity to investigate for example labor market returns of further training programs (Mallar, 1979), years of schooling (Card, 1995) and type of college and its degree's completion (Maluccio, 1998). In other areas, studies have used the distance to the nearest nursery (Attanasio et al., 2013) or hospital (Baiocchi et al., 2010; McClellan et al., 1994) to evaluate their causal impact.

4 Empirical Framework

4.1 Data and Descriptives

For our analysis, we use a cross-section from a rich panel dataset on German high track leavers who graduated in 2006. We observe the individuals in December of 2009, i.e. three and a half years after graduating from high school.[6] The survey is conducted by the German Centre for Research on Higher Education and Science Studies (Deutsches Zentrum für Hochschul- und Wissenschaftsforschung (DZHW)) and offers some important advantages for analyzing the effects of the Bologna Reform on student outcomes. First, the dataset allows us to analyze several outcome variables related to the policy goals of the Bologna Reform. Second, it contains information on

[6] The individuals were originally sampled in 2005, when they were still in school. However, all our outcome variables are contained in the 2009 questionnaire.

a student's place of high school (zip code) which enables us to merge information on German universities and their degree programs in 2006. This information is needed for our instrumental variable approach which is described in detail in the following section.

The dataset contains information on a student's international and national mobility, i.e. whether he/she went abroad for interim studies and whether he/she changed his/her university. It also contains information on whether a student dropped out or not and whether he/she did an internship while enrolled. The last two variables are likely to play a role for an individual's employability. Dropping out of tertiary education may signal a lower ability so that this outcome should be negatively correlated with labor market success. On the other hand, internship participation may increase an individual's chances on the labor market. Since most students were still enrolled at the time of the interview, we cannot observe any direct labor market outcomes yet.

To relate the student information to the tertiary education supply in 2006, we obtained an administrative dataset containing information on the universe of German higher education institutions and their degree programs in 2006 from the German Rectors' Conference (Hochschulrektorenkonferenz (HRK)).[7] For every institution of higher education, the dataset includes information on its type and degree programs (including the subject and the degree) offered in the winter term of 2006/07.[8] Based on the awarded degree, we constructed a categorical variable on the university-subject level: 1 if only a Bachelor's program was offered, 2 if only a traditional degree program was offered, 3 if both a Bachelor and a traditional degree program were offered, and 0

[7]Some universities (especially universities of applied sciences) have departments that are located in different regions/towns, which is not accounted for in the original data. As our identification strategy is based on regional variation in the availability of degree programs, it was important to ensure that the location of the departments was exact. Therefore, in some cases, we had to manually check and add information on the exact location of a department.

[8]There are three basic types of higher education institutions in Germany. One is rather research oriented, called "university," the other is rather applied, called "university of applied sciences," and the third offers only art subjects, called "art college". The funding of these institutions can either be public, private, or clerical.

if the subject was not offered at all.[9] Since correspondence courses are not bound to a specific location, we did not consider them in our analysis.

Based on the university's address, we geocoded all universities and used QGIS to calculate the air-line distance between an individual's place of high school and the universities. We merged the university data to our student dataset using the zip code of the high school location. This resulted in a student-university-level dataset, where each student was matched with 409 university observations. In addition, we obtained information on the GDP, population, and size of each county in Germany in 2006 from the regional statistics database of the Federal Statistical Office. From this, we calculated the population density as inhabitants per km^2 and the GDP per capita for each county and merged these variables at the high school county level to our individual data. This enables us to control for regional characteristics of a student's origin (place of high school). We consider students enrolled in the 20 most popular subjects as of the winter term 2006/07 (Statistisches Bundesamt, 2007, p. 46) which accounts for 68.3 percent of all students in the original dataset after dropping medical students.[10]

Our final dataset has a sample size of 1626 students, who enrolled in either a Bachelor's or a traditional degree program between the winter term 2006/07 and the winter term 2007/08. We have information on a student's demographic characteristics such as a student's gender, age, nationality, and father's and mother's education. Information is also provided on a student's grade point average in the high school exit exam and the type of the high school leaving certificate (general or subject specific university entrance diploma). We observe the subject in which a student enrolled

[9] The traditional degree category comprises all "old" degree types such as *Diplom*, *Magister*, and *Staatsexamen*. We also included teaching degrees if it was clear to which category (old or new) they belonged.

[10] The information on the degree programs was raw data, meaning that it indicated the specific title of the program. We were very cautious in categorizing them into subjects so as to avoid coding errors. As this was a time-intensive process, we focused our analysis on the 20 most popular subjects which are: business administration, law, German, medicine, mechanical engineering, computer sciences, economics, industrial engineering and management, electrical engineering, mathematics, biology, English, educational science, architecture, psychology, chemistry, physics, construction engineering, business informatics, political science. Since there were no Bachelor programs in medicine, we omitted this subject.

and the semester of enrollment. For 1471 students we also observe the first university attended.

Table 1 provides summary statistics of our data. 56 percent of the students in our sample are enrolled in a Bachelor's degree program. The other 44 percent are enrolled in a traditional degree program. Students are 23 years old on average and have a high school GPA of 2.9 on a scale from 1 (lowest) to 4 (highest). 35 percent of the students enrolled in a subject within the area of social sciences, 26 percent within natural sciences, 21 percent within engineering, and 18 percent within language and culture studies. The nearest university is on average 23 km away from the high school location of the student. This distance varies considerably within a range from 0 to 115 km.[11] By the time we observe the individuals in 2009, 7.3 percent had gone abroad for interim studies, 2.3 percent had changed their university, 3.1 percent had dropped out, and 20.2 percent had done an internship. On average, a student's assessment of the study atmosphere is 3.9 on a scale from 1 (lowest) to 5 (highest).

For many variables there is a significant difference between students enrolled in a Bachelor's versus a traditional degree program. It is likely that a considerable fraction of these differences is due to student selection into old and new degree programs. The large differences in the fields of study also reflect variation in the timing of the introduction of the new degree system across departments. On average, programs in social sciences were changed earlier to the new degree system compared to programs in language and culture studies.

Most of our outcomes increase in probability with the time since enrollment. For example, students who enrolled earlier than others are more likely to have gone abroad by the time we observe the students in our data. In our sample, 68.5 percent of the students enrolled in the winter term 2006/07, 4.1 percent enrolled in the summer term 2007, and 27.4 percent enrolled in the winter term 2007/08. The later enrollment rates are mainly caused by male students due to the military/civilian service requirement at that time. 46 percent of the male students in our sample began their studies in the

[11] Due to data protection rules, we had to aggregate our distance measure in intervals of 5 km starting with zero.

fall of 2007. To capture time effects from differential enrollment dates, we control for time of enrollment in all of our regressions.

4.2 Estimation Strategy

To investigate the relationship between studying in a Bachelor's degree program and student outcomes of individual i from federal state m in subject l, we consider a model of the following form:

$$Y_{ilm} = \alpha_1 + \beta_1 Bachelor_i + X_i' \gamma_1 + \delta_l + \mu_m + \epsilon_{ilm} \quad (1)$$

Y denotes our respective outcome of interest: "going abroad," "change of university," "dropout," "internship," and students' "satisfaction" with the study atmosphere. "Change of university" includes only changes within a subject and degree program. This means that students who changed universities because they wanted to study a different subject or degree type are excluded. *Bachelor* indicates studying in a Bachelor's degree program compared to in a traditional degree program and X is a vector of covariates that includes student demographic characteristics, information about parents education, and information about the location of the high school. We include subject dummies (δ) in order to account for unobserved heterogeneities between subjects. We also include state dummies with respect to the high school of an individual (μ). These are necessary because schooling policies, such as high school curricula, are set at the state level and can have a substantial impact on graduates' preparation for tertiary education. To account for interdependence of observations within a university, we cluster the standard errors on the attended university level.

The parameter of interest in the equation above is β_1 which is supposed to capture the effect of studying in a Bachelor's degree program on the respective student outcome. Estimating the equation by OLS, however, may yield biased estimates. Although controlling for potentially confounding influences can reduce the threat of biases, one can easily think of unobserved heterogeneities that can have influenced the selection of students into new or old degree programs. For example, since the new degree programs were intended to facilitate the transferability of course credits, it is possible that students with a higher taste for mobility choose to enroll in Bachelor's programs. In a regression with "going abroad" as our outcome variable, β_1 would be biased upwards, since the unobserved variable 'taste for mobility' is positively correlated with studying in a Bachelor's program.

To solve the problem of omitted variable bias we apply an instrumental variables (IV) approach that exploits regional variation in the supply of Bachelor and traditional degree programs. Due to the decentralized introduction of the Bachelor degree system in Germany under which university departments were free to choose when to implement the Bachelor, both degree systems coexisted for many years. Our IV approach is based on the idea that most students choose to attend a local university so that it is the local education supply which matters to them. Figure 1 shows the distribution of the distance between a student's place of high school and his/her first attended university in our sample. The graph reveals that, indeed, most students decide to enroll at a university close to their place of origin.[12]

We construct our instrument as the difference in distances between the nearest public university with a Bachelor's program and the nearest public university with a traditional program in a student's subject. We condition our instrument on a student's subject for two reasons: First, in 2006, almost all universities had introduced the Bachelor degree in at least one subject. Constructing the instrument on the university rather than the subject (department) level would result in almost no variation in the instrumental variable which is needed to identify a causal effect. Second, there is evidence that the personal interest in a particular subject is by far the most important determinant of the decision where and what to study (Heine et al., 2005; 2008).[13] We further restrict our university data to public institutions since 95 percent of all students in the winter term 2006/07 enrolled in a public institution (Statistisches Bun-

[12]This fact is also established in a number of other studies: For example, Spiess and Wrohlich (2010) investigate the relationship between the distance to the nearest university from a student's home and university attendance in Germany and find a negative correlation.

[13]Hachmeister et al. (2007, p. 58) provide suggestive evidence that almost 95 percent of German students choose their subject before their university location.

desamt, 2007, p. 60). However, we do provide a robustness check using all universities (including private and clerical institutions) in the distance calculation.

Let $MinDist\_trad_i$ denote the air-line distance between student i's place of high school and the nearest university with a traditional degree program in student i's subject.[14] Accordingly, let $MinDist\_ba_i$ denote the air-line distance between student i's place of high school and the nearest university with a Bachelor's degree program in student i's subject. The difference of these two distance measures yields our instrumental variable:

$$IV \equiv Distance\ differential_i = MinDist\_trad_i - MinDist\_ba_i. \quad (2)$$

The distance differential can be thought of as a measure of the regional supply with a Bachelor's program relative to a traditional program.[15] Thus, our first stage is given by the following equation:

$$Bachelor_{ilm} = \alpha_0 + \beta_0 Distance\ differential_i + X_i'\gamma_0 + \delta_l + \mu_m + \epsilon_{ilm}. \quad (3)$$

The intuition is as follows: The nearer the university with a Bachelor's degree program relative to the university with a traditional degree program in student i's subject, the likelier it is that student i enrolled in a Bachelor's degree program. Spieß and Wrohlich (2010) have already shown that the distance from home to a university plays a significant role in the educational choice of high school graduates in Germany, hence anything but a likewise effect on choice of type of program would be surprising.

Our IV approach identifies a local average treatment effect (Angrist and Imbens, 1994), i.e. the effect of the Bachelor introduction for individuals for whom distance matters. These individuals have higher transaction costs of moving to a faraway university than on average and thus prefer to attend an institution which is close to

[14] We use the place of high school to calculate our distance measure, because we do not have exact information on a student's place of residence at the time he/she finishes school. In practice, this should not make a big difference since most students attend a school close to their home.

[15] A relative distance measure is also used in an instrumental variables approach in Oosterbeek et al. (2010) to estimate the effect of entrepreneurship education on entrepreneurship skills and motivation.

their home. In an attempt to reveal some basic traits of potential compliers in our sample, we divide the students into quartiles according to the distance between the place of high school and the first attended university. As can be observed from Table 2, students who stay rather close to their hometown (Column 1) have on average worse high school GPA scores compared to more mobile students and also are from lower educated families.

We also estimate the effects of the Bologna Reform using a modified version of the instrument described above. Because the German higher education system comprises two main types of higher education institutions (i.e. universities which are rather research oriented and universities which are rather applied), it might be the case that many students only consider studying at one specific type of university. Since our data provides information on a student's first attended university, we are able to calculate the distance differential based on the type of the university attended. Students who only consider studying at one type of university may constitute a different complier group, so that we do not expect the results to remain unchanged. Figure 2 shows density plots of our two instruments. There is substantial variation in both instruments, although for most students the nearest universities that offer new and old degree programs in the chosen subject are located rather close to each other. The last two rows in Table 1 contain summary statistics of our instruments. The average distance differential for IV1 is -1.24 km, for IV2 -7.3 km. IV2 denotes the instrument in which we account for the type of university attended. Students who enrolled in a traditional degree program have a negative distance differential on average which means that the nearest Bachelor university is farther away than the nearest university with a traditional degree program. For students who enrolled in a Bachelor's degree program the distance differential is positive on average which means that the Bachelor university is closer.

5 Results

Our headline results are presented in Table 3. All regressions are based on linear probability models with the exception of the categorical outcome variable ‘satisfaction’ which ranges from 1 (lowest) to 5 (highest). The standard errors in all estimated models are clustered on the attended university level. The first stage F-statistics in all IV specifications are sufficiently large to reject weak instrument concerns. We further divide the student population into subgroups to investigate heterogeneous effects on different subpopulations. In particular, we analyze heterogeneities by gender and high school GPA. Reduced-form estimation results are contained in Table A.1.

5.1 OLS Results

Table 5 displays the results of OLS regressions for the respective outcome. Column 1 shows the effect of the Bologna Reform on international student mobility. Participation in a Bachelor’s degree program has a small, positive, but insignificant effect of 0.02. Other explanatory variables have the expected signs. For example, better students, as measured by the high school GPA, have a higher probability of going abroad. A higher socio-economic background, as measured by the educational attainment of the parents, also increases the probability of going abroad. Time of enrollment is negatively correlated with going abroad reflecting the time effect of later enrollment.

Results for the effect on national student mobility (change of university) are reported in Column 2. Participation in a Bachelor’s degree program has no effect on the probability of changing universities. Germans have a 3 percent higher probability of changing universities compared to immigrants.

OLS estimates further suggest that participating in a Bachelor’s degree program has no effect on dropout (Column 3) or internship participation (Column 4). Better students have a significantly lower dropout probability (2.7 percent per 1 point better high school GPA) and a higher, although insignificant, probability of doing an internship. Later enrollment significantly lowers the probability of having done an internship by the time the students are observed. A one year later enrollment is associated with an 11 percent lower probability of having done an internship.

Column 5 shows the effect of participating in a Bachelor's degree program on a student's satisfaction with the study atmosphere. Results suggest that students in a Bachelor's program are more content than students in a traditional degree program, although the effect is rather small. On a scale from 1 to 5, the effect is 0.11. Female students are on average less content than male students and younger students are on average more content than older students.

5.2 First Stage Results

Table 4 provides first stage regression results for IV1 and IV2. The potentially endogenous variable *Bachelor* is regressed on the instrument and further explanatory variables. Each specification in columns 1 to 6 (IV1) includes additional covariates and fixed effects. Column 6 and 7 report estimates of IV1 and IV2, respectively, in our preferred specification. The F-statistic for IV1 is 18.86 and for IV2 22.42. Throughout all specifications, the estimated effect of the instrument on participating in a Bachelor's degree program is highly significant and fairly robust. The probability increases by 1.3 to 2.9 percent with every 10 km depending on the respective specification. This confirms our hypothesis that the nearer a department with a Bachelor's degree program relative to a department with a traditional degree program the more likely it is that a student enrolled in a Bachelor's program. We find a highly significant effect of 0.0029 in a univariate regression of the Bachelor indicator variable on IV1 (Column 1). The inclusion of student controls, region controls, and state of high school fixed effects does not change the effect. Only the inclusion of subject fixed effects reduced the estimate to 0.0017 for IV1 and 0.0013 for IV2.

Results also show that the type of high school degree plays a crucial role whether a student enrolled in a Bachelor's or a traditional degree program. Students who obtained a subject specific or vocational university entrance diploma (i.e. study options are either limited to certain subjects or to the type of university) have a higher probability to enroll in a Bachelor's program compared to students with a general university entrance diploma. It may be that these students are attracted to the Bachelor degree due to the shorter duration of study. Results also show that the time of enrollment is a major determinant of enrolling in a Bachelor's degree program. Since the availability of Bachelor's programs increased over time whereas the availability of traditional programs decreased, the probability to enroll in a Bachelor's program increased by 26 to 29 percent for one year later enrollment.

5.3 IV Results

As discussed above, OLS results are potentially biased by omitted variables. Table 3 presents our IV results using IV1 and IV2 in separate regressions for all outcomes. As mentioned above, we do not expect identical results from both IVs due to potentially different complier groups. Using IV1, we estimate a local average treatment effect (LATE) for students for whom the local tertiary education supply matters. Using IV2, we estimate a LATE for students who, in addition, make a more conscious decision about the type of university they want to enroll at. This group of students is likely to be better informed about their expected study conditions compared to the complier group of IV1.

Columns 1 and 2 contain our estimates of the effect of the Bologna Reform on international mobility. Results show no effect when using IV1 as an instrument for enrolling in a Bachelor's degree program. However, using IV2, we find a positive effect of 0.17 which is almost statistically significant at the 10 percent level. Since we most probably estimate different LATEs with IV1 and IV2, it may be the case that students who make a deliberate choice regarding the type of university are also more able to take advantage of the new homogeneous degree system which was intended to facilitated the transfer of course credits between universities. The estimates for high school GPA and parent education background have the expected sign in both IV regressions. A one point better high school GPA leads to a 4 to 5 percent higher probability of going abroad. Better educated parents also increase the probability of going abroad, although the effect is small.

IV point estimates for the impact of the reform on national mobility (change of university) indicate that there may be a small positive effect of roughly 2 percent in both IV specifications (Columns 3 and 4). However, standard errors increased substantially compared to the OLS estimations so that the effect is not statistically significant. Since IV is less efficient than OLS, the increase in the size of the standard errors is a common phenomenon in IV approaches. In addition, it is worth mentioning that our sample size is rather low with less than 1500 observations and about 200 cluster. It may be that the results show the true effect, however, we cannot make a definite statement. Intuitively, it makes sense that the new degree system may have increased the probability of changing universities because of the easier transferability of course credits.

The effect on dropout is shown in Column 5 and 6. Compared to the OLS result which indicates no effect of the reform on dropout, IV results suggest that the dropout probability decreased by 1.5 to 3.8 percent. Again, standard errors are large for the reasons discussed above so that the effect is statistically insignificant. High school GPA has a negative impact on dropout which is in line with the common view that better students are more likely to finish their studies.

Columns 7 and 8 show our IV estimates of the effect of the reform on the probability of doing an internship. Whereas the OLS estimate is zero, the IV estimates are 0.04 and 0.07. Both estimates are not statistically significant due to large standard errors. Unfortunately, we do not have enough information to what extend the introduction of the new degree system caused changes in study conditions that might have facilitated doing an internship.

Columns 9 and 10 contain the results for the effect of the reform on students' satisfaction with the study atmosphere. The estimate is 0.35 in the IV1-regression and 1.25 in the IV2-regression. The latter is statistically significant at the 10 percent level. Both estimates are larger than the OLS estimate of 0.11. This suggests that the Bologna Reform had, in fact, a positive impact on the study atmosphere as perceived by students. The larger point estimate in our IV2-regression might again reflect the specific effect for students who deliberately chose one type of university.[16]

As our IV estimates do not provide clear evidence due to a lack of statistical significance, we cannot definitively state that the Bologna Reform had an impact on student mobility, dropout, and internship participation. However, IV point estimates slightly deviate from OLS point estimates. OLS estimates might be biased due to omitted variables, whereas IV estimates are unbiased but imprecisely estimated.

We also estimated the effects of the Bologna Reform on the outcomes using an unconditional distance differential as the instrumental variable. In particular, we included private and clerical institutions in the distance calculations. In comparison, IV1 is calculated using only public universities. Due to the fact that only 5 percent of all students enroll at private and clerical universities, the relevance of the unconditional instrument is lower compared to IV1. The first stage F-statistic is approximately 16 for this instrument, compared to 19 for IV1 and 22 for IV2. Nevertheless, we find very similar results to our IV1 specification.

5.4 Heterogeneous Effects

It might be that certain subgroups of our student population were affected differently by the introduction of the new degree system. To explore the impact of the Bologna Reform on student outcomes in more detail, we estimate separate effects by gender and high school GPA. We do not find pronounced effect heterogeneities for our considered outcomes except for dropout (Table 6). For female students, we find that the reform reduced the dropout probability by about 9 percent. When IV1 is used as the instrument, the effect is almost statistically significant at the 10 percent level. In comparison to the IV results, OLS yields an estimated effect of zero as in the full sample. The instruments are highly relevant for females with first stage F-statistics of

[16] The differences in the estimates are not due to differences in sample size. Due to missing information in the variable indicating the university attended, IV2-regressions are based on a lower sample size than IV1-regressions. However, restricting the IV1-regressions to the sample used in the IV2-regressions yields almost identical results for IV1.

almost 24. For males, the F-statistics are insufficiently large so that we cannot make a statement for this subgroup.

We also find differential effects for students with a high school GPA above versus below the median of 2.9. For high achievers (GPA $>$ 2.9), we find that the reform significantly (IV2) reduced the dropout probability by 9 to 10 percent. For low achievers (GPA $<$ 2.9), point estimates are positive but not statistically significant.

5.5 Check of Identifying Assumption

The identifying assumption of our estimation strategy is that the distance differential is uncorrelated with any observable or unobservable covariates which are not included in the regression. This requires that the Bachelor introduction was geographically random conditional on covariates included in the regressions. As stated earlier, the introduction of the Bachelor degree system occurred on rather heterogeneous grounds, because there was no common introduction plan. There is evidence that the variation in pace of introduction within a subject area was mainly caused by external, political pressure and not due to university or department specific factors like quality, finance or prestige (Krücken et al., 2005). However, individuals from rural areas are likely to have larger distance differentials than individuals from urban areas due to the lower density of universities in rural areas. To account for this possibility, we control for regional characteristics of a student's place of high school which we believe to capture potentially spurious correlation between our instrument and geographic differences.

In Table 7, we provide suggestive evidence on the exogeneity of our instruments. The table shows results from regressions of the instruments on student characteristics and our regional controls. We do not find significant correlations between a student characteristic and the instruments, except for a weakly significant relationship between IV2 and the gender variable. Most notably, there is no correlation between a student's high school GPA and our instruments. Column 9 contains estimates from a regression of the instruments on all student characteristics. Their joint significance can be rejected as indicated by the p-values.

6 Conclusion

This study investigates the impact of the Bologna Reform on student mobility, dropout, internship participation, and a student's satisfaction with the study atmosphere in Germany using survey data from 2009 on German high track leavers who graduated in 2006. To account for the potentially endogenous sorting of individuals into new and old degree programs at the time of enrollment, we use an instrumental variables approach based on the nearest universities that offer a Bachelor's and a traditional degree program in a student's subject. In particular, we use the distance differential between the nearest university with a Bachelor's and the nearest university with a traditional degree program in a student's subject as an instrument for participation in a Bachelor's degree program.

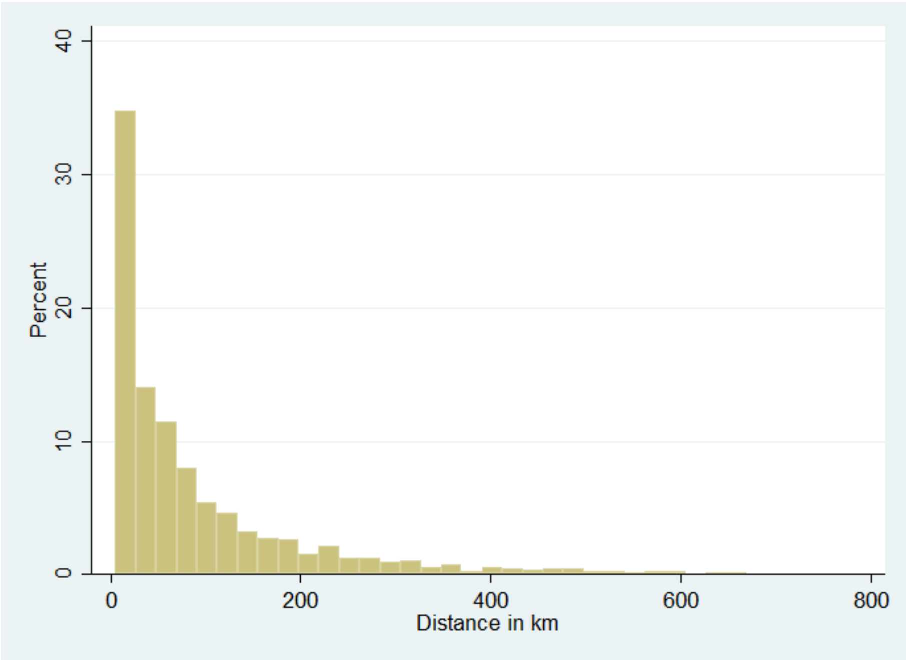
Overall, we do not find a significant effect from studying in a Bachelor's degree program on student mobility, dropout, and internship participation. However, we find a significantly negative effect on dropout for higher achieving students of about 10 percent and an almost significantly negative effect on dropout for females of about 9 percent. Results further indicate that the reform had a positive effect on a student's satisfaction with the study atmosphere.

It is important to emphasize that our results should be interpreted as short-term effects. Since we analyze students that were among the first cohorts to enroll in a Bachelor's program, our estimates are likely to reflect also the circumstances of the introduction of the new degree system. In many cases the new degree structure was applied to existing programs without much adjustments in study content. As the new study programs are gradually being improved and adjusted to the new two-tier degree structure, effects may differ for more recent cohorts. One should also keep in mind, that our IV approach identifies a local average treatment effect for individuals for whom distance matters. This means that the results are not easily transferable to more mobile students.

Future research should explore the mediating channels of the reform in more detail and try to disentangle the effects of the new, homogeneous, two-tier degree structure from effects related to adjustments in study content. To fully assess the implications of the reform, especially in light of further policy advice, it is crucial to also evaluate the reform effects on direct labor market outcomes, such as wages or unemployment probability. Once appropriate data become available, one could use the IV strategy presented in this study to estimate causal effects of the reform on these outcomes.

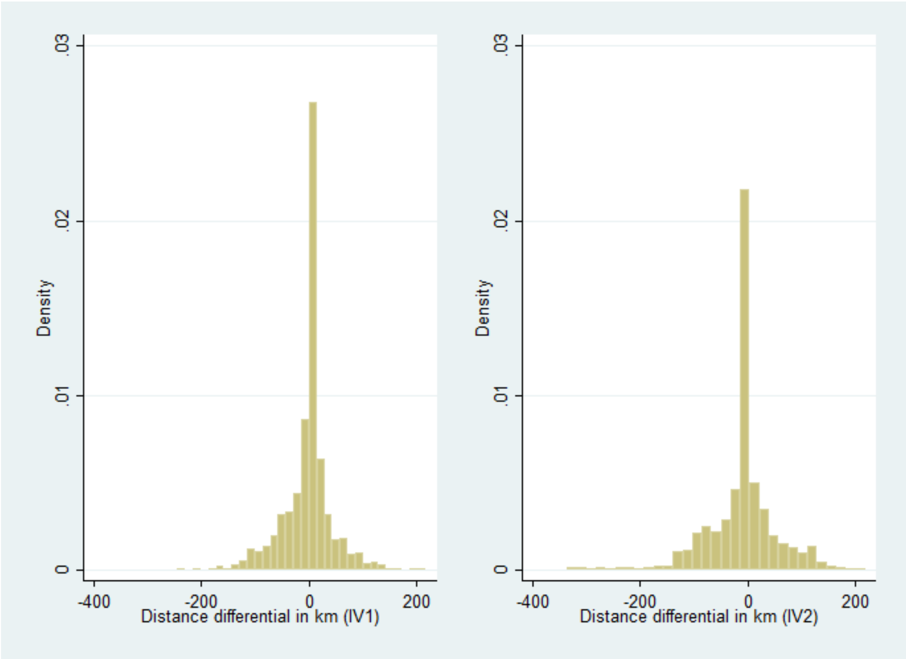
Figures and tables

Figure 1
Distribution of distance to university attended



Notes: The figure shows the distribution of distances between a student's place of high school and the first university attended in our data.

Figure 2
Density distribution of distance differential



Notes: The figure shows the density distributions of our instruments. IV1 represents the distance differential between the nearest public university with a traditional degree program and the nearest public university with a Bachelor's program in a student's subject. IV2 represents the distance differential between the nearest public university with a traditional degree program and the nearest public university with a Bachelor's program in a student's subject while additionally accounting for the type of university a student enrolled at.

Table 1
Summary statistics

	Full Sample			Traditional			Bachelor			
	Mean (SD)	Min/Max	Obs	Mean (SD)	Min/Max	Obs	Mean (SD)	Min/Max	Obs	Difference [SE]
Bachelor	0.561	0	1626							
	(0.496)	1								
Student Characteristics										
Female	0.601	0	1626	0.667	0	714	0.549	0	912	0.117***
	(0.490)	1		(0.472)	1		(0.498)	1		[0.024]
Year of birth	1986.274	1968	1624	1986.283	1968	714	1986.267	1969	910	0.016
	(1.305)	1989		(1.311)	1989		(1.302)	1988		[0.065]
German	0.974	0	1622	0.965	0	712	0.981	0	910	-0.016**
	(0.159)	1		(0.184)	1		(0.135)	1		[0.008]
High school GPA	2.917	1	1621	2.934	1	712	2.904	1	909	0.030
	(0.586)	4		(0.590)	4		(0.583)	4		[0.029]
Type of HS degree	0.087	0	1626	0.057	0	714	0.110	0	912	-0.052***
	(0.282)	1		(0.233)	1		(0.313)	1		[0.014]
Father's education	3.592	0	1626	3.634	0	714	3.559	0	912	0.075
	(1.396)	5		(1.360)	5		(1.422)	5		[0.069]
Mother's education	3.490	0	1626	3.517	0	714	3.469	0	912	0.048
	(1.280)	5		(1.259)	5		(1.296)	5		[0.064]
Enrollment WS 2006	0.685	0	1623	0.791	0	714	0.602	0	909	0.190***
	(0.465)	1		(0.407)	1		(0.490)	1		[0.022]
Enrollment SS 2007	0.041	0	1623	0.055	0	714	0.031	0	909	0.024**
	(0.199)	1		(0.227)	1		(0.173)	1		[0.010]
Enrollment WS 2007	0.274	0	1623	0.154	0	714	0.367	0	909	-0.213***
	(0.446)	1		(0.361)	1		(0.482)	1		[0.021]
Distance to next univ. in km	23.444	5	1626	23.018	5	714	23.777	5	912	-0.759
	(17.999)	115		(17.473)	115		(18.404)	105		[0.894]
Regional Characteristics										
GDP/C in Euro	29684.307	13542	1445	30770.451	13956	623	28861.110	13542	822	1909.341***
	(10285.564)	79039		(11534.295)	79039		(9149.057)	79039		[561.586]
Population density	818.197	39	1626	849.775	43	714	793.476	39	912	56.299
	(915.877)	4171		(925.772)	4171		(907.798)	4171		[45.869]

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	Full Sample			Traditional			Bachelor			
	Mean (SD)	Min/Max	Obs	Mean (SD)	Min/Max	Obs	Mean (SD)	Min/Max	Obs	Difference [SE]
Area of Study										
Language and Culture	0.179	0	1626	0.248	0	714	0.125	0	912	0.122***
	(0.383)	1		(0.432)	1		(0.331)	1		[0.0195]
Social Sciences	0.348	0	1626	0.280	0	714	0.401	0	912	-0.121***
	(0.477)	1		(0.449)	1		(0.490)	1		[0.0233]
Natural Sciences	0.261	0	1626	0.286	0	714	0.242	0	912	0.0433**
	(0.440)	1		(0.452)	1		(0.429)	1		[0.0220]
Engineering	0.212	0	1626	0.186	0	714	0.231	0	912	-0.0450**
	(0.409)	1		(0.390)	1		(0.422)	1		[0.0201]
Outcomes										
Going Abroad	0.073	0	1626	0.076	0	714	0.070	0	912	0.005
	(0.260)	1		(0.265)	1		(0.256)	1		[0.013]
Change of university	0.023	0	1626	0.031	0	714	0.018	0	912	0.013*
	(0.151)	1		(0.173)	1		(0.131)	1		[0.008]
Dropout	0.031	0	1536	0.033	0	675	0.030	0	861	0.002
	(0.174)	1		(0.178)	1		(0.171)	1		[0.009]
Internship	0.202	0	1626	0.210	0	714	0.196	0	912	0.014
	(0.402)	1		(0.408)	1		(0.397)	1		[0.020]
Satisfaction	3.881	1	1612	3.769	1	711	3.969	1	901	-0.200***
	(0.899)	5		(0.913)	5		(0.878)	5		[0.045]
Instruments										
IV1	-1.236	-240	1626	-14.545	-240	714	9.183	-170	912	-23.728***
	(44.703)	220		(42.389)	155		(43.713)	220		[2.147]
IV2	-7.301	-335	1471	-29.688	-335	705	13.303	-185	766	-42.991***
	(64.595)	220		(65.581)	155		(56.328)	220		[3.200]

Notes: The left part shows descriptive statistics on the whole student sample, the middle part on students enrolled in a traditional degree and the right part on students enrolled in a Bachelor's degree program. The last column shows the difference in means between both programs with standard errors [SE] in brackets. Standard deviations (SD) are shown in parentheses. To the right of each mean are the minima (Min) and maxima (Max) of each variable, as well as the number of observations (Obs). High school GPA ranges from 1 (worst) to 4 (best). Type of HS (high school) degree indicates subject specific *Fachabitur* versus general university entrance diploma *Abitur*. Father's and mother's education are categorical variables ranging from 0 (No degree) to 5 (University degree). Distance to next university is measured in kilometers and indicates the distance to the next university within a student's field of study. GDP/C indicates the gross domestic product per capita in Euro within a county. Population density is measured as inhabitants per km^2. All outcome variables are binary, with the exception of satisfaction which ranges from 1 (unhappy) to 5 (happy). Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

Table 2
Descriptive statistics by distance to university attended

	1st quart. 0 - 20 km	2nd quart. 20 - 50 km	3rd quart. 50 - 120 km	4th quart. 120 - 670 km
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Female	0.627	0.608	0.637	0.567
	(0.484)	(0.489)	(0.482)	(0.496)
Year of birth	1986.193	1986.222	1986.417	1986.289
	(1.602)	(1.488)	(0.871)	(1.174)
German	0.972	0.963	0.980	0.975
	(0.164)	(0.189)	(0.139)	(0.157)
High school GPA	2.829	2.855	2.901	3.030
	(0.594)	(0.574)	(0.598)	(0.563)
Type of HS degree	0.087	0.105	0.082	0.070
	(0.282)	(0.307)	(0.274)	(0.256)
Father's education	3.471	3.480	3.682	3.857
	(1.437)	(1.442)	(1.350)	(1.304)
Mother's education	3.398	3.392	3.470	3.803
	(1.317)	(1.267)	(1.283)	(1.204)
Enrollment WS 2006	0.725	0.715	0.699	0.612
	(0.447)	(0.452)	(0.460)	(0.488)
Enrollment SS 2007	0.048	0.037	0.042	0.039
	(0.214)	(0.189)	(0.201)	(0.195)
Enrollment WS 2007	0.227	0.248	0.259	0.348
	(0.419)	(0.432)	(0.439)	(0.477)
Distance to next univ. in km	12.437	25.298	31.451	27.444
	(9.812)	(13.014)	(21.311)	(20.971)
Observations	437	352	355	356

Notes: The table contains descriptive statistics by the distance between a student's place of high school and the first university attended. Each column shows means and standard deviations of student characteristics within quartiles of the distance distribution.

Table 3
IV results for the effect of the Bologna Reform on student outcomes

Dep. Var.:	(1) Going Abroad		(2) Change of University		(3) Dropout		(4) Internship		(5) Satisfaction	
	IV1	IV2	IV1	IV2	IV1	IV2	IV1	IV2	IV1	IV2
Bachelor	-0.0102	0.1713	0.0266	0.0172	-0.0148	-0.0377	0.0409	0.0755	0.3451	1.2487***
	(0.0914)	(0.1157)	(0.0560)	(0.0644)	(0.0609)	(0.0751)	(0.1592)	(0.1597)	(0.3633)	(0.3541)
Female	0.0014	-0.0016	0.0047	0.0019	0.0120	0.0146	0.0373	0.0354	-0.1035*	-0.1230
	(0.0190)	(0.0222)	(0.0111)	(0.0124)	(0.0118)	(0.0137)	(0.0257)	(0.0268)	(0.0572)	(0.0750)
Year of birth	0.0063*	0.0055	0.0012	0.0015	-0.0117	-0.0117	0.0129	0.0169**	0.0448**	0.0471**
	(0.0033)	(0.0037)	(0.0032)	(0.0035)	(0.0085)	(0.0089)	(0.0080)	(0.0075)	(0.0206)	(0.0219)
German	0.0266	0.0263	0.0293***	0.0316***	-0.0170	-0.0146	0.0304	0.0303	0.1156	0.1026
	(0.0373)	(0.0380)	(0.0082)	(0.0087)	(0.0414)	(0.0431)	(0.0503)	(0.0530)	(0.1658)	(0.1805)
High school GPA	0.0420***	0.0495***	-0.0131	-0.0142*	-0.0259**	-0.0273**	0.0246	0.0424**	0.0217	-0.0004
	(0.0115)	(0.0122)	(0.0084)	(0.0085)	(0.0130)	(0.0135)	(0.0205)	(0.0213)	(0.0492)	(0.0549)
Type of HS degree	0.0078	-0.0160	0.0019	0.0070	0.0509	0.0560	-0.0765*	-0.1033**	-0.0533	-0.1713
	(0.0210)	(0.0264)	(0.0174)	(0.0204)	(0.0335)	(0.0391)	(0.0455)	(0.0517)	(0.1009)	(0.1266)
Father's education	0.0060	0.0051	0.0028	0.0037	-0.0038	-0.0043	0.0102	0.0065	0.0020	0.0072
	(0.0045)	(0.0048)	(0.0034)	(0.0037)	(0.0042)	(0.0045)	(0.0085)	(0.0086)	(0.0184)	(0.0226)
Mother's education	0.0105*	0.0111*	0.0007	0.0017	0.0037	0.0044	-0.0001	-0.0026	0.0224	0.0338
	(0.0057)	(0.0059)	(0.0034)	(0.0034)	(0.0041)	(0.0045)	(0.0086)	(0.0089)	(0.0225)	(0.0265)
Enrollment SS 2007	-0.0261	-0.0361	0.0109	0.0108	-0.0353***	-0.0357***	-0.0579	-0.0776	-0.0484	-0.0772
	(0.0317)	(0.0342)	(0.0256)	(0.0281)	(0.0099)	(0.0113)	(0.0474)	(0.0504)	(0.1436)	(0.1602)
Enrollment WS 2007	-0.0135	-0.0678*	-0.0057	-0.0068	0.0072	0.0153	-0.1249**	-0.1434***	-0.0372	-0.3223**
	(0.0278)	(0.0376)	(0.0191)	(0.0221)	(0.0194)	(0.0248)	(0.0467)	(0.0529)	(0.1049)	(0.1252)
Distance to next university	-0.0003	-0.0006	-0.0002	-0.0003	0.0003	0.0004	0.0000	-0.0001	-0.0002	-0.0021
	(0.0005)	(0.0006)	(0.0003)	(0.0003)	(0.0004)	(0.0004)	(0.0009)	(0.0009)	(0.0016)	(0.0019)
Region controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State of high school FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Subject FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1434	1292	1434	1292	1365	1227	1434	1292	1424	1282
Cluster	231	197	231	197	228	194	231	197	229	195
1st stage F-Stat	18.8608	22.4182	18.8608	22.4182	16.5960	21.8354	18.8608	22.4182	18.6729	21.6952

Notes: Dependent variable as indicated in the first row. 1 to 4 are binary outcomes, 5 is categorical ranging from 1 (lowest) to 5 (highest). Standard errors are clustered on the attended university level. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

Table 4
First stage results

Dep. Var.: Bachelor (1=yes; 0=no)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IV1	0.0029***	0.0029***	0.0029***	0.0029***	0.0028***	0.0017***	
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0004)	(0.0004)	
IV2							0.0013***
							(0.0003)
Female		-0.0169	-0.0178	-0.0323	-0.0293	0.0265	0.0373
		(0.0362)	(0.0360)	(0.0364)	(0.0365)	(0.0316)	(0.0340)
Year of birth		0.0060	0.0055	0.0066	0.0105	0.0023	0.0018
		(0.0114)	(0.0114)	(0.0110)	(0.0110)	(0.0099)	(0.0108)
German		0.0909	0.0902	0.0810	0.0607	0.0355	0.0367
		(0.0746)	(0.0747)	(0.0775)	(0.0752)	(0.0632)	(0.0650)
High school GPA		0.0078	0.0071	0.0246	0.0338	0.0412**	0.0276
		(0.0250)	(0.0251)	(0.0238)	(0.0239)	(0.0200)	(0.0201)
Type of HS degree		0.1551***	0.1548***	0.1419***	0.1639***	0.0851	0.1165**
		(0.0461)	(0.0458)	(0.0466)	(0.0475)	(0.0530)	(0.0548)
Father's education		-0.0111	-0.0106	-0.0072	-0.0066	-0.0035	-0.0005
		(0.0088)	(0.0088)	(0.0095)	(0.0094)	(0.0085)	(0.0088)
Mother's education		-0.0014	-0.0009	-0.0104	-0.0152	-0.0068	-0.0060
		(0.0108)	(0.0108)	(0.0113)	(0.0114)	(0.0096)	(0.0104)
Enrollment SS 2007		-0.0547	-0.0532	-0.0127	-0.0137	0.0058	0.0313
		(0.0712)	(0.0709)	(0.0728)	(0.0738)	(0.0552)	(0.0592)
Enrollment WS 2007		0.2535***	0.2527***	0.2699***	0.2660***	0.2578***	0.2869***
		(0.0326)	(0.0325)	(0.0338)	(0.0343)	(0.0324)	(0.0338)
Distance to next university in km			0.0007	-0.0002	-0.0006	0.0019**	0.0016**
			(0.0007)	(0.0008)	(0.0008)	(0.0008)	(0.0008)
Region controls	No	No	No	Yes	Yes	Yes	Yes
State of high school FE	No	No	No	No	Yes	Yes	Yes
Subject FE	No	No	No	No	No	Yes	Yes
Observations	1625	1613	1613	1434	1434	1434	1292
Cluster	241	241	241	231	231	231	197
R^2	0.0691	0.1349	0.1355	0.1485	0.1705	0.3243	0.3259
F-Statistic	87.8161	88.1004	89.2101	75.6017	55.6276	18.8608	22.4182

Notes: Dependant variable indicates studying in a Bachelor's degree program (1) versus a traditional degree program (0). All specifications employ a linear probability model (LPM). Standard errors are clustered on the attended university level. All explanatory variables including the indicated regional controls are described in Table 1. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

Table 5
OLS results for the effect of the Bologna Reform on student outcomes

Dep. Var.:	(1) Going Abroad	(2) Change of University	(3) Dropout	(4) Internship	(5) Satisfaction
Bachelor	0.0213	-0.0008	0.0011	0.0001	0.1050**
	(0.0160)	(0.0095)	(0.0104)	(0.0264)	(0.0491)
Female	0.0007	0.0053	0.0115	0.0383	-0.0985*
	(0.0194)	(0.0114)	(0.0117)	(0.0255)	(0.0557)
Year of birth	0.0062*	0.0013	-0.0116	0.0130	0.0454**
	(0.0033)	(0.0032)	(0.0087)	(0.0082)	(0.0216)
German	0.0251	0.0306***	-0.0179	0.0323	0.1266
	(0.0375)	(0.0079)	(0.0422)	(0.0498)	(0.1681)
High school GPA	0.0407***	-0.0120	-0.0266**	0.0263	0.0319
	(0.0111)	(0.0080)	(0.0126)	(0.0199)	(0.0501)
Type of HS degree	0.0048	0.0045	0.0494	-0.0726	-0.0296
	(0.0200)	(0.0178)	(0.0347)	(0.0445)	(0.0903)
Father's education	0.0062	0.0027	-0.0037	0.0100	0.0009
	(0.0045)	(0.0035)	(0.0042)	(0.0085)	(0.0182)
Mother's education	0.0106*	0.0006	0.0037	-0.0003	0.0213
	(0.0056)	(0.0033)	(0.0042)	(0.0087)	(0.0223)
Enrollment SS 2007	-0.0262	0.0110	-0.0356***	-0.0577	-0.0448
	(0.0320)	(0.0263)	(0.0104)	(0.0490)	(0.1457)
Enrollment WS 2007	-0.0214	0.0012	0.0030	-0.1146***	0.0236
	(0.0157)	(0.0117)	(0.0119)	(0.0232)	(0.0613)
Distance to next university	-0.0004	-0.0001	0.0003	0.0001	0.0003
	(0.0005)	(0.0003)	(0.0004)	(0.0008)	(0.0015)
Region controls	Yes	Yes	Yes	Yes	Yes
State of high school FE	Yes	Yes	Yes	Yes	Yes
Subject FE	Yes	Yes	Yes	Yes	Yes
Observations	1434	1434	1365	1434	1424
Cluster	231	231	228	231	229
R^2	0.0767	0.0278	0.0507	0.0893	0.0733

Notes: Dependent variable as indicated in the first row. 1 to 4 are binary outcomes, 5 is categorical ranging from 1 (lowest) to 5 (highest). Standard errors are clustered on the attended university level. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

Table 6
Heterogeneous effects by gender and high school GPA

Dep. Var.: Dropout

	OLS	IV1	IV2	OLS	IV1	IV2
	Females			Males		
Bachelor	0.0084	-0.0891	-0.0891	-0.0115	0.3473	0.1588
	(0.0123)	(0.0592)	(0.0902)	(0.0167)	(0.3151)	(0.1777)
Observations	818	818	752	547	547	475
F-Statistic		23.8050	23.5201		1.0927	3.5440
	Above median high school GPA			Below median high school GPA		
Bachelor	0.0054	-0.0865	-0.1004*	0.0003	0.1159	0.0154
	(0.0128)	(0.0635)	(0.0598)	(0.0180)	(0.1354)	(0.1002)
Observations	763	763	667	602	602	560
F-Statistic		12.1722	11.4985		7.2376	20.5845
Student controls	Yes	Yes	Yes	Yes	Yes	Yes
Region controls	Yes	Yes	Yes	Yes	Yes	Yes
State of high school FE	Yes	Yes	Yes	Yes	Yes	Yes
Subject FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Binary dependent variable for dropout (1=yes, 0=no). The upper panel shows estimation results of studying in a Bachelor's degree program for females and males, respectively. The lower panel shows estimation results of studying in a Bachelor's degree program for students with a high school GPA above and below the median of 2.9. Standard errors are clustered on the attended university level. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

Table 7
Correlations between the instruments and observed student characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dep. Var.: IV1										
Female	-3.0892									-3.0298
	(2.6251)									(2.8143)
Year of birth		-0.4467								-0.1298
		(0.9100)								(0.9188)
German			6.2182							7.0965
			(5.5634)							(5.5223)
High school GPA				-3.1721						-3.4519
				(2.2791)						(2.2261)
Type of HS degree					4.2643					2.7147
					(5.0773)					(5.2131)
Father's education						-0.4812				-0.9399
						(0.9387)				(0.9758)
Mother's education							0.7401			1.5774
							(1.0029)			(0.9977)
Enrollment SS 2007								-4.9525		-5.3893
								(5.0699)		(5.1991)
Enrollment WS 2007									-0.0001	-1.1676
									(0.0262)	(2.8270)
Regional controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1434	1434	1434	1434	1434	1434	1434	1434	1434	1434
p-value	0.2405	0.6240	0.2649	0.1653	0.4019	0.6087	0.4613	0.3297	0.9981	0.3253
Dep. Var.: IV2										
Female	-7.5960*									-5.5751
	(4.2644)									(4.5275)
Year of birth		-0.8896								-0.1935
		(1.3827)								(1.2619)
German			6.0936							6.6868
			(10.0159)							(9.5799)
High school GPA				-2.6498						-2.1950
				(3.4218)						(3.2497)
Type of HS degree					14.8800					12.8274
					(13.6675)					(13.9312)
Father's education						-0.4358				-1.2285
						(1.3750)				(1.4786)
Mother's education							1.2284			2.4206*
							(1.3066)			(1.3332)
Enrollment SS 2007								-5.2798		-4.1309
								(8.2141)		(8.3264)
Enrollment WS 2007									0.0328	1.3906
									(0.0294)	(4.1515)
Regional controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1292	1292	1292	1292	1292	1292	1292	1292	1292	1292
p-value	0.0764	0.5207	0.5436	0.4396	0.2776	0.7516	0.3483	0.5211	0.2645	0.5303

Notes: The table contains results from regressions of the instrumental variables (IV1 and IV2) on observed student characteristics. In Columns 1 to 9, the p-value indicates the level of significance of the explanatory variable. In Column 10, the p-value indicates the level of joint significance of all explanatory variables. Significance levels: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Appendix A

Table A.1
Reduced forms

Dep. Var.:	(1) Going Abroad		(2) Change of University		(3) Dropout		(4) Internship		(5) Satisfaction	
IV1	-0.0000		0.0000		-0.0000		0.0001		0.0006	
	(0.0002)		(0.0001)		(0.0001)		(0.0003)		(0.0006)	
IV2		0.0002		0.0000		-0.0001		0.0001		0.0017***
		(0.0001)		(0.0001)		(0.0001)		(0.0002)		(0.0004)
Female	0.0011	0.0048	0.0054	0.0025	0.0115	0.0125	0.0384	0.0382	-0.0952*	-0.0801
	(0.0193)	(0.0213)	(0.0114)	(0.0127)	(0.0118)	(0.0132)	(0.0254)	(0.0269)	(0.0556)	(0.0581)
Year of birth	0.0063*	0.0058	0.0013	0.0015	-0.0116	-0.0116	0.0130	0.0170**	0.0456**	0.0494**
	(0.0034)	(0.0036)	(0.0032)	(0.0035)	(0.0086)	(0.0092)	(0.0082)	(0.0077)	(0.0218)	(0.0234)
German	0.0263	0.0326	0.0302***	0.0322***	-0.0177	-0.0162	0.0318	0.0331	0.1274	0.1455
	(0.0377)	(0.0393)	(0.0080)	(0.0083)	(0.0421)	(0.0434)	(0.0500)	(0.0528)	(0.1690)	(0.1723)
High school GPA	0.0416***	0.0542***	-0.0120	-0.0137	-0.0265**	-0.0285**	0.0263	0.0445**	0.0361	0.0338
	(0.0112)	(0.0116)	(0.0079)	(0.0086)	(0.0127)	(0.0136)	(0.0199)	(0.0211)	(0.0498)	(0.0530)
Type of HS degree	0.0069	0.0040	0.0041	0.0090	0.0496	0.0513	-0.0730*	-0.0945*	-0.0226	-0.0198
	(0.0201)	(0.0227)	(0.0173)	(0.0194)	(0.0349)	(0.0388)	(0.0441)	(0.0489)	(0.0910)	(0.0925)
Father's education	0.0061	0.0050	0.0028	0.0037	-0.0037	-0.0042	0.0100	0.0064	0.0007	0.0070
	(0.0045)	(0.0048)	(0.0035)	(0.0038)	(0.0042)	(0.0046)	(0.0085)	(0.0088)	(0.0181)	(0.0193)
Mother's education	0.0106*	0.0101*	0.0006	0.0016	0.0038	0.0046	-0.0004	-0.0030	0.0200	0.0262
	(0.0056)	(0.0060)	(0.0033)	(0.0034)	(0.0042)	(0.0047)	(0.0088)	(0.0091)	(0.0221)	(0.0233)
Enrollment SS 2007	-0.0261	-0.0307	0.0110	0.0113	-0.0356***	-0.0376***	-0.0576	-0.0753	-0.0439	-0.0281
	(0.0322)	(0.0351)	(0.0263)	(0.0288)	(0.0104)	(0.0117)	(0.0489)	(0.0523)	(0.1459)	(0.1473)
Enrollment WS 2007	-0.0161	-0.0187	0.0011	-0.0019	0.0032	0.0039	-0.1144***	-0.1217***	0.0518	0.0366
	(0.0155)	(0.0167)	(0.0109)	(0.0117)	(0.0119)	(0.0133)	(0.0215)	(0.0228)	(0.0583)	(0.0621)
Distance to next univ. in km	-0.0003	-0.0003	-0.0001	-0.0003	0.0003	0.0003	0.0001	-0.0000	0.0005	-0.0001
	(0.0005)	(0.0005)	(0.0003)	(0.0002)	(0.0004)	(0.0004)	(0.0008)	(0.0008)	(0.0015)	(0.0016)
Region controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State of high school FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Subject FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1434	1292	1434	1292	1365	1227	1434	1292	1424	1282
Cluster	231	197	231	197	228	194	231	197	229	195
R^2	0.0756	0.0868	0.0279	0.0291	0.0507	0.0528	0.0894	0.1058	0.0716	0.0819

Notes: Dependent variable as indicated in the first row. 1 to 4 are binary outcomes, 5 is categorical ranging from 1 (lowest) to 5 (highest). Standard errors are clustered on the attended university level. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

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