Effects of German Universities' Excellence Initiative on Ability Sorting of Students and Perceptions of Educational Quality

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Abstract

We investigate potential spillover effects from the German *Excellence Initiative* on university education. Using data from a representative student survey, we find that winning the competition allows universities to enroll significantly better high-school graduates in three subsequent admission terms. We then investigate a possible channel explaining the effect on admissions by studying whether the excellence label improves students' perception of educational quality. We find that the label significantly improves students' ratings of a university's educational quality and their job market expectations immediately following the award. However, ratings largely return to previous levels when students are surveyed three years later, although the status persists. (JEL: D81, H52, I23, I24)

1 Introduction

In the past two decades, intensified competition among universities for funds and students has been widely observable in many countries (The Economist, 2015). In Europe, this competition is fostered by the Bologna process that began in 1999 and aims to render educational institutions and degrees more comparable and compatible. In its wake, many countries adopted policies to raise the quality of higher education and research by promoting a more efficient use of resources in public universities. Stronger competition for students has also resulted from the availability and increased prominence of a number of national and international university rankings in recent years.

In 2005, in order to foster competition in research, the German federal government and federal states jointly launched the *Excellence Initiative*, a contest that promises substantial amounts of additional funds and the prestigious title of *university of excellence*

to successful institutions. The aim of this contest is to strengthen academic research and international visibility by promoting competition in research among universities. It consists of three lines of funding: graduate schools, *clusters of excellence* to promote interdisciplinary research on socially relevant topics and so-called *future concepts* (or *institutional strategies*)[1] – the most important line of funding – which are "aimed at developing top-level university research in Germany and increasing its competitiveness at an international level."[2] To be eligible to compete for the *future-concepts* line of funding, a university must have been granted funding for at least one graduate school and at least one cluster of excellence. The program had an initial budget of 1.9 billion euros for the three funding lines, and an additional budget of 2.7 billion euros was granted for the second phase of the program starting in 2012.[3] All funds are to be spent on research only. Universities who were successful in the future-concepts line of funding were awarded the label "university of excellence" and subsequently received up to an additional 70 million euros over a five-year period.

In this paper, we focus on the *future-concepts* line of funding, as it was tied to the largest amounts of money and the label "university of excellence" was only awarded to a small number of institutions. This label evidently brought these institutions considerable public attention,[4] and they have used the label for public relations. Our aim is to test for two particular spillover effects of this competition on higher education. In the first part of the paper, we study the effects of increased differentiation in research reputation and research funding on ability sorting of students among universities. The announcements of the winning institutions of the Excellence Initiative are rare and highly publicized events in which information on the universities that are considered the best research universities in the country suddenly becomes common knowledge. Thus, they are suitable for studying whether a university's reputation has an effect on its success in recruiting talented students. We find that the award of excellence status allows a university to enroll significantly better students in three subsequent admissions terms, which increases differences in student ability between "excellent" and "non-excellent" universities.

In the second part of the paper, we study an important factor of enrollment decisions – the perceived quality of a university's education – by analyzing whether a signal of research quality influences students' perceptions of educational quality, as measured by their satisfaction ratings. We are able to study how students' perceptions respond to the award of the label itself because students were surveyed immediately after universities received excellence status and before research money tied to it could be used for organizational changes. Our results show a positive and highly significant effect of the

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[1] The terms *future concepts* and *institutional strategies* are used interchangeably. Note that the description here focuses on regulations that existed during the rounds covered by the study.

[2] German Research Foundation, http://www.dfg.de/en/research_funding/programmes/excellence_initiative/institutional_strategies/index.html, accessed November 18, 2016.

[3] German Research Foundation, http://www.dfg.de/en/research_funding/programmes/excellence_initiative/general_information/index.html, accessed November 18, 2016.

[4] Google Trends shows large peaks for searches containing the term Exzellenzinitiative in the months that the winners of each round were announced, i.e., in October 2006 and 2007 and in June 2012.

excellence label on the students' perceptions of quality of education and, consequently, on perceived job opportunities after graduation. We also find that none of the items referring to the students' satisfaction with their personal life that are unrelated to their university show any significant response to the award of the label. This indicates that improvements in a university's student ratings due to the label occur not because students identify with an "excellent" institution (and the positive emotions this might involve), but because students update their beliefs about the quality of their university's vis-à-vis other (non-excellent) universities' education. However, when students are surveyed three years later, student ratings largely return to previous levels, although the universities still enjoy excellence status.

2 Related Literature

2.1 Determinants of Quality of Admissions

An important line of research in the economics of higher education focuses on the institutional factors influencing student choice. In particular, students are interested in how much they will enjoy attending a university and how much their education will earn them in the labor market. Hence, both expectations of personal experience and development (DesJardins and Toutkoushian, 2005) and of job opportunities (Schaafsma, 1976; Lazear, 1977) are important drivers of enrollment in higher education. Thus, higher education can be described as having both an experience- and a credence-good property. The experience-good property derives from the fact that students generally only know what it "feels" like to pursue a certain academic program at a certain university once they have already (at least partially) completed it. The credence-good property derives from the nontransparency of educational production and students' uncertainty about the labor market's valuation of the human capital they acquire at a certain university.

Generally, credence- and experience-good properties create a situation of asymmetric information, in which the producer knows more about the properties of a good than the consumer (Akerlof, 1970; Wolinsky, 1995; DesJardins and Toutkoushian, 2005). This situation creates a demand for expert advice – for example expressed by quality labels – that allows consumers to reduce their uncertainty about the properties of such a good (Dulleck and Kerschbamer, 2006). The decision to attend a particular university affects the course of a person's life and often poses a once-in-a-lifetime choice. These kinds of decisions are particularly difficult to make, which is why people tend to be bad at making them (Benartzi and Thaler, 2007). Hence, quality signals, such as a high rank or the award of a label, which are easier for better universities to acquire, may be used by prospective students as a signal of a university's quality and may guide their enrollment decisions. Indeed, there is robust evidence that the reputation of an institution reflected by its rank in a league table is an important factor in student choice (Hossler, Braxton, and Coopersmith, 1989; Weiler, 1996; Abbott and Leslie, 2004; Mueller and Rockerbie, 2005; Schwartz, 2011) and particularly affects the matriculation probability of high-ability students (Griffith and Rask, 2007; Gibbons, Neumayer, and Perkins,

2015). Hoxby (2009) has shown that due to increased student mobility and decreased information costs, U.S. students' college preferences have become more responsive to resources and peers, resulting in stronger ability-sorting between colleges. In the UK, Broecke (2015) has found that worsening of a university's rank leads to a small, but statistically significant, reduction in the number of applications and in the quality of accepted applicants.

In Germany, the factors affecting student choice have received little attention (Obermeit, 2012). Recent studies have focused on the few subjects, such as medicine and pharmaceutics, for which there is centralized matching of students with institutions by the clearing-house for university admissions, and the role of distance between students' hometown and the nearest university in application decisions (Braun, Dwenger, and Kübler, 2010; Spiess and Wrohlich, 2010; Hüber and Kübler, 2012). Horstschräer (2012) has investigated how the likelihood of high-ability students' application to medical schools is influenced by the Excellence Initiative and has found that becoming a "university of excellence" significantly increases the application likelihood of high-ability students. The first part of our analysis draws a more comprehensive picture of the effects of the Excellence Initiative than Horstschräer (2012) by covering students of all subjects of study and investigating changes in the actual composition of students over time. Additionally, the study by Bruckmeier, Fischer, and Wigger (2015) is closely related to our study, and its authors show that the loss of university-of-excellence status within the Excellence Initiative negatively affects the number of enrolled first-year students in the subsequent winter term at universities in the federal state of Baden-Wuerttemberg. They also present evidence that this result is driven by the loss in reputation due to the withdrawal of excellence status and not due to a decrease in university quality. Conversely, being awarded excellence status had no significant effect on enrollment quantity. Whereas Bruckmeier, Fischer, and Wigger (2015) focus on the number of newly enrolled graduates, we analyze the effects of the Excellence Initiative on ability sorting.

2.2   Determinants of Perceived Quality of Education

Since education is a credence and an experience good, potential students are likely to use quality labels or rankings provided by external bodies to reduce information asymmetries. If research quality and educational quality are positively correlated, and evidence suggests that this is indeed the case (Ford, Joseph, and Joseph, 1999; Dahl and Smimou, 2011), it is rational to interpret excellence status – although awarded to universities on the sole basis of research merits – as a signal of educational quality. As students were surveyed in the same semester in which some universities attained excellence status, and as the disbursement of research funds began later during that semester, any potential effects of the new status on student ratings are likely driven by the label "university of excellence" and not by any institutional changes. Because students likely care little about research quality and much about educational quality when making their enrollment decision, students' belief in this correlation is assumed when analyzing the effect of the label on enrollment.

Many studies in the field of consumer psychology have shown that labels affect beliefs

about a product's nonobservable properties (see, e.g., Teisl, Rubin, and Noblet, 2008; Lotz, Christandl, and Fechenhauer, 2013). However, we are not aware of any previous studies analyzing how a new signal about a university's *research* quality affects students' perceptions of *educational* quality. Showing that current students' ratings of educational quality respond to a label awarded for research will also help us to shed light on the psychological mechanism by which the research competition might affect the enrollment decisions of new students. A rationale for the existence of such an effect is that as students rate their university on a given scale, they implicitly rate it relative to other universities with which they have little or no experience. When their institution receives a label they interpret as revealing information about the institution's high educational quality relative to other institutions, they update their belief about the relative quality of the institution's education and rate it higher on the given scale, although no actual changes have taken place.

One can distinguish between experience-related factors (ratings of teaching, course content, supervision, acquired skills, etc.) and expectations-related factors (expected labor market outcomes) of perceived quality of education. There is evidence from the U.S. that job opportunities are significantly better and starting salaries are significantly higher for graduates of more respected institutions (Black, Smith, and Daniel, 2005). We thus also expect students' labor market expectations to respond to the label: first, because higher perceived quality of education implies better perceived acquired qualifications, and second, because students may hold the belief that the label also independently affects potential employers' expectations with respect to the quality of graduates. Our analysis of responses in students' perceptions will be organized according to this distinction between experience-related factors and expectations-related factors and will focus on common items typically used in student surveys.

3   Data

We use data from a national student survey administered by the University of Konstanz on behalf of Germany's Federal Ministry of Education and Research. The data set comprises a representative sample of German students in tertiary education and covers 18 universities and 15 polytechnics (*Fachhochschulen*). Twelve waves of data were collected between winter semester 1982/1983 and winter semester 2012/2013, although not all 33 institutions are included in all waves, as some institutions were included later and data collection in other institutions was discontinued. The data are collected every two to three years from a new random sample of students at covered institutions, with approximately 8,000 students per wave (Simeaner, Ramm, and Kolbert-Ramm, 2013). The data set is representative of students at German universities and polytechnics with respect to attributes such as gender, subject of study, and age, and institutions were selected to guarantee representative coverage of federal states (Multrus, 2004). In winter semester 2012/2013, the last available wave, the response rate amounted to 18.6 percent.

The survey data consist of information on student characteristics, including university attended, field of study, type of degree program, number of semesters, admission to

a program during a summer or a winter term, full-time or part-time student status, and demographics such as gender, age, and parents' highest level of education. The data also contain information on the grade point average (GPA) of the *Abitur*, the German high-school diploma, which is a measure of a student's academic ability that is still the most important admission criterion for the vast majority of programs at German universities. Furthermore, information is available on a large number of items measuring student attitudes and satisfaction, such as ratings of content, supervision, acquired skills, and practical relevance of education, as well as expected labor market outcomes (see Table 11 in the appendix for a description of the survey items).

In our analysis, we use data on full-time and part-time students who enrolled after 1990, contained in seven waves collected in winter semesters 1994/1995 through 2012/2013, viz., the waves surrounding the first, second, and third rounds of the Excellence Initiative. There are two survey waves coinciding with the first (2006) and third (2012) rounds of the Excellence Initiative. We restrict the data set to universities and exclude polytechnics, because only the former were eligible to participate in the excellence competition. We also restrict the sample to universities that are present in at least three different waves.[5] This leaves us with a total of approximately 37,000 students enrolled at 15 different universities.[6]

The data set contains information on two successful universities from the first round, one successful university from the second round, and one successful university from the third round of the competition: university-of-excellence status was announced for the University of Karlsruhe and the University of Munich (LMU) on October 13, 2006, for the University of Freiburg on October 19, 2007, and for the Technical University of Dresden on June 15, 2012.

Descriptive statistics are shown in Table 5 in the appendix. The average proportion of female students in our sample is 55 percent, the average number of semesters is 6.6, and the average high-school diploma GPA is 2.2. The majority of the students are enrolled in the humanities and the social sciences.

4 Quality of Admissions

4.1 Empirical Strategy

To examine whether becoming a *university of excellence* affects the competitiveness of admissions (and student demand for a given university) in subsequent admission terms, we use the average high-school GPA of newly enrolled students as the dependent variable.

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[5] Furthermore, we exclude doctoral candidates (0.32% of our sample), because they are not subject to regular admissions and typically do not attend regular classes. We also exclude individuals who state that they are "pro forma students" (2.76% of our sample), i.e., matriculated as students because it entails financial benefits, but who are actually not taking any classes. This is very common in Germany, since matriculation fees are low.

[6] The 15 universities included are: TU Berlin, Bochum, TU Dresden, Duisburg-Essen, Frankfurt, Freiburg, Hamburg, Karlsruhe (KIT), Kassel, Leipzig, Magdeburg, LMU Munich, Oldenburg, Potsdam, and Rostock.

We estimate the following baseline specification of an OLS regression model:

$$GPA(z\text{-}score)_{ijt} = \alpha + \beta Excellent(A)_{jt} + \gamma University_j + \delta Cohort_t$$
$$+ \zeta Individual\ Controls_{ijt} + \varepsilon_{ijt},$$

where $GPA(z\text{-}score)_{ijt}$ is the standardized school GPA of student i who enrolled at university j in year t. We standardize grades over the entire sample to zero mean and unit variance, to abstract from the German grading scale (1.0 = excellent, 4.0 = sufficient, greater than 4.0 = fail) and to make the effect sizes internationally comparable. The $Excellent(A)_{jt}$ dummy is equal to 1 for all the students who enrolled (= were in their first semester) in a university after the university was labeled excellent, and is equal to 0 otherwise.[7] We include fixed effects for university to control for time-constant heterogeneity among universities, and fixed effects for cohort to control for time-varying heterogeneity constant over universities, both potentially influencing the competitiveness of admissions. Since $Excellent(A)_{jt}$ varies within the awarded universities (Dresden, Freiburg, Karlsruhe, and Munich) over time cohorts and stays constant in the nonawarded universities, this dummy, given university and time fixed effects, identifies the difference-in-differences effect of the award of excellence status on admissions.

Furthermore, we include the following individual-level control variables: age, gender, parents' level of education, field of study, full-time or part-time student status, degree program (e.g., bachelor's, master's, state examination, Diplom), and whether the student was admitted during the summer term. The degree-program dummies allow us to control for the gradual conversion from the former German system to the international system of bachelor's and master's programs during the Bologna process. The summer-term admission dummy allows us to identify students who did not enroll during the main winter-term admissions and instead enrolled during summer-term admissions. Summer-term admissions account for 14.3 percent of total admissions in our sample and might have different admission criteria. In a further specification, we interact $Excellent(A)_{jt}$ with separate dummies for the years following the competition, to account for time trends in the selectivity of universities after receiving excellence status. For example, $Excellent(A)_{jt} \times 1st\ year_{jt}$ identifies students who enrolled during the first year (summer or winter semester) after the university was awarded excellence status. This specification allows us to investigate when the effect begins and whether or after how much time it wanes.

To investigate whether the selectivity of universities was more responsive to excellence status in some fields than in others, we include interaction effects between $Excellent(A)_{jt}$ and $Field\ of\ Study_{ijt}$ in a further specification. This allows us to investigate whether certain fields of study drive the response of admissions to the award of the label. For all the specifications, we present results both with and without controls for the presence of tuition fees ($Tuition\ Fee(A)_{jt}$) and double high-school graduation

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[7] The suffix (A) is used to differentiate the dummy variables used in the analysis of admissions from the dummy variables used in the analysis of perceptions, which must be defined differently and will have a suffix (B). Suffixes are dropped in the regression tables, but it should be noted that the variables were defined differently for correct identification of effects.

cohorts ($Double\ Cohort(A)_{jt}$) in some German federal states at the time of admission. We consider it important to test whether our results are robust to these reforms because both of them might have affected the number of applicants at universities and hence the competitiveness of admissions.[8] The presence of tuition fees at some universities might drive students to apply to universities in other federal states without tuition fees or might affect the transition from high school to university (Dwenger, Storck, and Wrohlich, 2012; Hübner, 2012; Bruckmeier, Fischer, and Wigger, 2013; Bruckmeier and Wigger, 2014).[9] The presence of a double cohort in a federal state likely drives up the number of applicants at universities located in that federal state. For all the regressions, standard errors clustered on university level are reported.

4.2 Results

Table 1 and Table 2 contain OLS regression results estimating the impact of the Excellence Initiative on the quality of admissions, measured by the GPA of the students' high-school diploma. In our baseline regression, five cohorts after the first wave of the Excellence Initiative are included. Column (1) of Table 1 presents the results from our baseline regression with standardized GPA. The coefficient of the excellence dummy ($Excellent(A)$) is negative and statistically significant. Note that in the German grading system, a smaller grade is a better grade. The results indicate that in the six years following the award of university-of-excellence status, a university's admissions were, on average, 0.125 standard deviation better than the admissions of universities without the excellence label. This is a sizable effect compared to the between-university difference in grades and comparable in size to the effects of randomized controlled interventions in higher education.[10] Long-term field experiments in schools report similar effect sizes (Angrist, Bettinger, and Kremer, 2006; Fryer, 2014). These results are also consistent with evidence showing a sorting of more able students into higher-quality educational institutions (Black, Smith, and Daniel, 2005). In column (2), we also control for tuition fees and double cohorts, which only slightly decreases the coefficient of interest.

Column (3) presents the regression results for the interaction between the excellence dummy and six[11] dummies identifying each year since the receipt of the award, again

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[8] Between 2006 and 2007, 7 of 16 federal states introduced tuition fees amounting to approximately 500 euros per semester. However, between 2008 and 2014, all the states that had introduced fees abolished them again after meeting widespread resistance from students. Since 2008, most federal states have converted from a school system comprising 13 years to a system with 12 years. This has caused larger numbers of university applications in the years when the last cohort of the old system and the first cohort of the new system graduated in a federal state at the same time.

[9] For a discussion on the relationship between tuition fees, graduate taxes, and teaching quality see, for instance, Kemnitz (2007) and McKenzie and Sliwka (2011).

[10] In our sample, the mean difference between the better half and the worse half of universities in terms of their student's Abitur grade is 0.49 standard deviations. Effect sizes between 0.1 and 0.3 standard deviations are common in randomized studies in higher education when outcomes are measured in grades (Hattie, 2015).

[11] Note that during the sixth year after the first round of the competition, Munich was the only university in our sample that had its excellence status renewed (with considerable new media attention),

Table 1
Excellence Status and Quality of Admissions

Dependent variable: GPA Abitur (standardized)	(1)	(2)	(3)	(4)
Excellent	–0.125**	–0.100**		
	(0.0489)	(0.0453)		
Excellent × 1st year			–0.0961**	–0.0813**
			(0.0340)	(0.0366)
Excellent × 2nd year			–0.183**	–0.157*
			(0.0758)	(0.0735)
Excellent × 3rd year			–0.204**	–0.175**
			(0.0695)	(0.0644)
Excellent × 4th year			0.0140	0.0299
			(0.0750)	(0.0764)
Excellent × 5th year			0.0340	0.0696
			(0.0927)	(0.0798)
Excellent × 6th year			–0.0863	–0.0551
			(0.0677)	(0.0738)
Tuition fees		–0.0431**		–0.0413**
		(0.0168)		(0.0161)
Double cohort		–0.0073		–0.0360
		(0.0547)		(0.0571)
Observations	38,904	38,904	38,904	38,904
Adjusted R^2	0.173	0.173	0.173	0.173

Notes: We regress school GPA (standardized with zero mean and unit variance over the entire sample) on a dummy that indicates whether a student enrolled in a university after the university was labeled excellent. In columns (3) and (4), this dummy is separated into six dummies for each year following the award of excellence status. Columns (2) and (4) also control for tuition fees and double cohorts. All the regressions contain a constant and cohort and university fixed effects. Additionally, all the regressions control for field of study, degree program, summer-term admissions, part-time study, age, gender, and parents' highest level of education. Robust standard errors clustered on university level are reported in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

with additional controls for tuition fees and double cohorts in column (4). The results reveal that the overall effect of the award of excellence status on admissions is driven by the first three years after the award. This can also be observed by looking at the change in raw average grades before and after the award (see the figure in the appendix). The positive effect on admissions seems slightly larger in the second and third years than in the first year; however, Wald tests show that only the coefficients of the first and

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whereas Freiburg and Karlsruhe lost their excellence status. Thus, the dummy for the sixth year only identifies Munich and captures the effect of both the original award of excellence status and the renewal.

Table 2

Quality of Admissions: Interaction with Field of Study

Dependent variable: GPA Abitur (standardized)	(1)	(2)
Excellent	0.0829	0.110**
	(0.0502)	(0.0482)
Excellent × Social sciences	−0.240***	−0.241***
	(0.0393)	(0.0398)
Excellent × Law	−0.330***	−0.329***
	(0.0454)	(0.0446)
Excellent × Economics	−0.537***	−0.539***
	(0.113)	(0.113)
Excellent × Medicine	−0.325***	−0.324***
	(0.0319)	(0.0314)
Excellent × Natural sciences	−0.176**	−0.178**
	(0.0592)	(0.0605)
Excellent × Engineering	−0.147	−0.153
	(0.132)	(0.133)
Excellent × Other	−0.102	−0.104
	(0.171)	(0.171)
Social sciences	−0.0056	−0.0052
	(0.0499)	(0.0497)
Law	−0.125***	−0.125***
	(0.0349)	(0.0352)
Economics	0.0670	0.0678
	(0.0570)	(0.0570)
Medicine	−0.444***	−0.443***
	(0.0502)	(0.0503)
Natural sciences	−0.140***	−0.140***
	(0.0311)	(0.0310)
Engineering	0.0832*	0.0838*
	(0.0439)	(0.0439)
Other	0.125*	0.124*
	(0.0661)	(0.0661)
Tuition fees		−0.0431**
		(0.0170)
Double cohort		−0.0034
		(0.0566)
Observations	38,904	38,904
Adjusted R^2	0.174	0.174

Notes: We regress school GPA (standardized with zero mean and unit variance over the entire sample) on interaction terms between a dummy that indicates whether a student enrolled in a university after the university was labeled excellent and dummies for the field of study. Humanities is the reference category. Column (2) also controls for tuition fees and double cohorts. Both regressions contain a constant and cohort and university fixed effects. Additionally, all the regressions control for degree program, summer-term admissions, part-time study, age, gender, and parents' highest level of education. Robust standard errors clustered on university level are reported in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

the third year are significantly different from each other ($\beta_{\text{1st yr}} = \beta_{\text{2nd yr}}$: $p = 0.198$; $\beta_{\text{1st yr}} = \beta_{\text{3rd yr}}$: $p = 0.053$; $\beta_{\text{2nd yr}} = \beta_{\text{3rd yr}}$: 0.633). After the third year, the effect seems to wane. The negative (but insignificant) interaction coefficient identifying the sixth year after the original award is a weak indication that the renewal of excellence status, similar to the original award, has a positive (but noisier) effect on admissions.[12]

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[12] Robustness checks with regressions containing Munich as the only excellence university show the

In principle, the effect of excellence status on admissions could be driven by universities' restricting their capacities in the years after the award in order to become more "elite" and allow only a handful of students with very good GPAs to enroll. However, legal regulations prevent public universities in Germany from freely adjusting their capacity. Rather, the education ministries of the federal states determine how many places for new enrollment each university has to supply each semester. This means that a change in the competitiveness of admissions is driven by student demand for places at a given university. The evidence thus suggests that the effects of the Excellence Initiative on overall admissions are driven by an increase in medium-term student demand for places and that it is the novelty of the excellence status (and the media attention it entails) rather than the status alone that allows universities to recruit better students.

To further investigate whether certain study subjects are driving the identified effect of the excellence status on admissions, we interact the excellence dummy with dummies for different fields of study. As observed in Table 2, enrollment in economics responds most strongly to the award of excellence status,[13] with student ability significantly improving by more than half a standard deviation, followed by enrollment in medicine, law, and the social sciences (compared to the baseline group humanities). A considerably weaker response to the excellence status is detectable for admissions in the natural sciences. It is, however, unlikely that the stronger competitiveness of admissions in economics is the reason why these admissions respond more strongly to the excellence label than admissions in the natural sciences, because, as observed in the coefficients of the field-of-study dummies, economics students on average have a worse GPA than students in the natural sciences.[14]

Additionally, the effect cannot be explained by the label revealing more information about the quality of research in economics than in the natural sciences, as the excellence universities in our sample qualified to compete for the third line of funding (and the label) because they all had won excellence funds for graduate schools and research clusters (only) in the natural sciences (and none in economics). However, the difference in response to the label might be driven by economics students' placing more weight than students in the natural sciences on the alleged benefits of attending an excellent university, for example with respect to labor market signaling. Further analyses of the items asking about motivation to choose a certain program or university support this rationale: the economics students were more concerned about their earnings prospects when choosing a program and attached greater importance to a university's "tradition and reputation" when choosing at which university to study than the natural sciences students. To rule out that any one university alone is driving our results, we also run robustness checks excluding each excellence university in turn, which does not alter the results. We also rule out that summer-term admissions are driving our results. (See Tables 6 and 7 in the appendix.)

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same pattern.

[13] Wald tests show that the coefficient of the interaction of excellence status and economics is significantly different from the coefficients of all of the other interaction terms.

[14] Wald tests show that the coefficients for the GPA of economics and natural sciences students are significantly different ($p = 0.001$).

Overall, our results suggest that there is a significant and sizable medium-run effect of the Excellence Initiative on ability sorting at German universities, that this effect is strongest for economics students, and that "excellent" universities are able to recruit better school leavers at the expense of universities that did not succeed in this competition for three years after the award of excellence status. However, we do not find evidence that successful universities benefit in terms of better enrollments in the longer run.

5 Perceived Quality of Education

5.1 Empirical Strategy

To investigate whether the award of excellence status immediately affects students' perceptions of the quality of an institution's education, we study the relationship between recently having been named a "university of excellence" and an institution's student evaluations. We estimate the following baseline specification of an ordered logit model:

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\begin{aligned}
(1) \quad Student\ Evaluation_{ijt} = {} & \alpha + \beta Excellent(B)_{jt} + \gamma Excellent(B)_{j\,t+1} \\
& + \delta\, University_j + \zeta\, Wave_t + \eta Individual\ Controls_{ijt} + \varepsilon_{ijt},
\end{aligned}
$$

where $Student\ Evaluation_{ijt}$ denotes different survey items measuring student i's evaluation of the educational quality of university j, which she is attending at the time of survey wave t. The items are chosen to match criteria for student satisfaction used by internationally known university rankings such as the CHE ranking, the Times Higher Education World University Rankings, the Academic Ranking of World Universities (Shanghai Ranking), or the U.S. News & World Report's college rankings. (See Table 11 in the appendix for a precise definition of each item.) To ensure comparability between the different item scales in the regression models, the items are standardized to zero mean and unit variance. The $Excellent(B)_{jt}$ dummy is equal to 1 if a rating was given by a student in the winter semester immediately after the university in which he or she is enrolled was awarded excellence status, and is equal to 0 otherwise. The $Excellent(B)_{j\,t+1}$ dummy identifies the ratings of students at universities with excellence status collected in the following survey wave (3 years later). We include fixed effects for university and survey wave to control for time-constant heterogeneity among universities and time-varying heterogeneity constant over universities potentially influencing student ratings. Since $Excellent(B)_{jt}$ varies within the awarded universities over the survey waves and remains constant in the nonawarded universities, this dummy, given university and wave fixed effects, identifies the difference-in-differences effect of the award of the excellence label on student ratings before the research funds tied to the award could be used for organizational changes. Longer-term effects of the excellence label cannot be cleanly identified, because the research funds tied to the label could have caused actual changes. We thus focus on the short-term effects of excellence status on student satisfaction ratings. However, it is still interesting to see whether student ratings are affected in the next survey wave, i.e., three years after the university was awarded

excellence status. Consequently, we also include an $Excellent(B)_{j\,t+1}$ dummy to identify potential long-term effects. We cannot study the isolated labeling effect on students at the University of Freiburg, because its excellence status was announced in October 2007, and there was no survey wave during the semester immediately following the announcement. Hence, identification of the $Excellent(B)_{jt}$ effect relies on the three remaining universities of Karlsruhe, Munich, and Dresden,[15] whereas the $Excellent(B)_{j\,t+1}$ effect also includes the University of Freiburg.

Furthermore, we include the following individual-level control variables: age, gender, parents' level of education, field of study, full-time or part-time student status, degree program, school GPA, number of semesters a student has attended university, and whether a student was admitted during the summer term. Dummies for the field of study control for the potentially different experiences of students in different subjects; for example, due to class size. We also control for school GPA because students' ability levels differ between universities, and less academically able students may rate their educational experience worse than their more academically able counterparts. Furthermore, both tuition fees and double cohorts might have an effect on student ratings: The presence of tuition fees might raise students' expectations concerning the quality of education and the intensity of personal support, whereas an instantaneous surge in the number of newly enrolled students due to double high-school graduation cohorts might strain a university's facilities and likewise lead to lower satisfaction ratings. The dummy $Tuition\ Fees(B)_{jt}$ indicates whether a tuition fee was collected at the university, whereas the dummy $Double\ Cohort(B)_{jt}$ indicates whether there was a double graduation cohort in the federal state in which the university is located during the time of the survey. Again, we present results both with and without controls for the presence of tuition fees and double high-school graduation cohorts and report robust standard errors clustered on university level for all regressions.

5.2 Results

Tables 3 and 4 present ordered logit regression results with student ratings of educational quality and job market expectations as the dependent variables, which were standardized to zero mean and unit variance. We differentiate between experience-related items reflecting the educational experience of students and expectations-related items reflecting expected job opportunities and other labor market outcomes.

Table 3 presents the estimation results for the experience-related items. The dummy variable $Excellent(B)$ identifies students' perceptions of quality of education at universities that were recently announced as "excellent." The results reveal that these students rated their university's quality of education significantly better during that semester on dimensions such as quality of curriculum content, quality of teaching, and supervision. Moreover, the quality of professional knowledge and practical skills the students acquired

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[15] Although excellence status was announced earlier in the year for Dresden than for Karlsruhe and Munich (June versus October), the disbursement of money from the award began at the same time for all three universities (November 1), i.e., well into the winter semester and after the admission period for that semester.

while attending university, as well as the practical relevance of the material taught, was also rated significantly better at universities recently awarded excellence status.

Similarly, students at universities that recently received excellence status also significantly adjusted their expectations with respect to their job opportunities. As presented in Table 4, the three items show responses of similar magnitude. Since all these items were formulated negatively – for example, by asking about expected difficulties in finding a job – the negative coefficients indicate that the students increased their job expectations. To help with the interpretation of the results, Tables 8 and 9 in the appendix report the marginal effects of the $Excellent(B)_{jt}$ dummy at the means of the categories of the respective dependent variable for the models reported in Tables 3 and 4. The results show that while students whose university was recently labeled excellent are less likely to select a worse category on the questions referring to educational quality or job market expectations, they are more likely to select a better category. For instance, students whose university was recently labeled excellent were 4.3 percentage points more likely than students whose university was not labeled excellent to select response category 6 on a scale from 1 to 7 (very bad to very good) answering the following question: What have been your experiences during your studies with respect to the quality of the curriculum's content?

Table 3

Perceived Quality of Education: Experience-Related Items

Dep. variable:	(1) Content quality	(2) Teaching quality	(3) Supervision	(4) Professional knowledge	(5) Practical skills	(6) Practical relevance
$Excellent_t$	0.247***	0.192**	0.222***	0.170**	0.146**	0.141**
	(0.0749)	(0.0826)	(0.0620)	(0.0705)	(0.0689)	(0.0598)
$Excellent_{t+1}$	0.0943	0.0160	0.110	0.0824	0.149**	0.243***
	(0.0709)	(0.0778)	(0.101)	(0.0669)	(0.0700)	(0.0709)
GPA Abitur	−0.133***	−0.0609**	−0.0721***	−0.346***	−0.0966***	−0.0728***
	(0.0254)	(0.0248)	(0.0275)	(0.0201)	(0.0204)	(0.0220)
# Semesters	−0.0534***	−0.0411***	−0.0110	0.0357***	0.0507***	−0.0701***
	(0.0049)	(0.0055)	(0.0081)	(0.0050)	(0.0075)	(0.0046)
Tuition fees	0.0358	0.0513	0.195***	0.0709	0.0427	0.0243
	(0.0611)	(0.0685)	(0.0461)	(0.0672)	(0.0739)	(0.104)
Double cohort	0.328**	0.267*	0.0327	0.117	0.0621	0.138
	(0.150)	(0.144)	(0.138)	(0.0867)	(0.0983)	(0.0967)
Observations	36,865	36,847	36,833	36,881	36,861	36,694
Pseudo R^2	0.029	0.025	0.037	0.030	0.031	0.034

Notes: We regress different survey items (standardized with zero mean and unit variance) on a dummy that identifies ratings of students collected immediately after these universities were awarded excellence status (viz., winter semester 2006/2007 for Munich and Karlsruhe, and winter semester 2012/2013 for Dresden). All the regressions contain wave and university fixed effects. Additionally, all the regressions control for subject of study, degree program, summer-term admissions, part-time study, number of semesters a student has attended university, age, gender, and parents' highest level of education. Robust standard errors clustered on university level are reported in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

As hypothesized, the students' ratings of both the quality of their education and their job market expectations show significant positive short-term responses to the excellence label. Thus, as students update their beliefs with respect to the quality of their education, they also update their job market expectations. A possible explanation for the fact that the students' ratings of their *past* educational experiences respond to the excellence

Table 4
Perceived Quality of Education: Expectations-Related Items

Dependent variable:	(1) Difficulties in finding a job	(2) Insecure job prospects	(3) Employment worries
Excellent$_t$	−0.140**	−0.128***	−0.115***
	(0.0669)	(0.0364)	(0.0386)
Excellent$_{t+1}$	0.124	−0.0295	−0.0744
	(0.116)	(0.0678)	(0.0777)
GPA Abitur	0.189***	0.104***	0.268***
	(0.0222)	(0.0144)	(0.0185)
# Semesters	0.0446***	0.0840***	0.0315***
	(0.0051)	(0.0024)	(0.0036)
Tuition fees	0.0445	0.00564	0.102**
	(0.130)	(0.0616)	(0.0437)
Double cohort	−0.0328	−0.0329	−0.0360
	(0.164)	(0.113)	(0.105)
Observations	33,290	36,810	36,588
Pseudo R^2	0.070	0.035	0.049

Notes: We regress different survey items (standardized with zero mean and unit variance) on a dummy that identifies ratings of students collected immediately after these universities were awarded excellence status (viz., winter semester 2006/2007 for Munich and Karlsruhe, and winter semester 2012/2013 for Dresden). All the regressions contain wave and university fixed effects. Additionally, all the regressions control for subject of study, degree program, summer-term admissions, part-time study, age, gender, and parents' highest level of education. Robust standard errors clustered on university level are reported in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

label is that the students implicitly benchmark their university against other universities with which they have no or little experience. To corroborate this explanation, we tested whether the students' emotional response to the label – for example, because they identify with their university and feel proud and happy about "being excellent" – might partially drive the positive nature of their ratings and expectations. However, we find that none of the items in the data referring to students' satisfaction unrelated to their belief about their university, such as emotional stress (for example fears and depression) and worries about their personal relationships and financial situation, exhibit any significant response to the award of the excellence label (see Table 10 in the appendix). This finding indicates that students' perceived quality of education response is indeed driven by an update of their beliefs about the relative quality of their institution and not by emotions.

The data set also allows us to study whether excellence status has a positive effect on student satisfaction in the long run, i.e., three years after the award, when the next wave of data are collected. A possible long-term effect is likely driven not only by the label, but also by the money tied to the award and by the organizational and cultural changes the university underwent due to its new status. As observed in the coefficient of the lead dummy variable $Excellent(B)_{j\,t+1}$ in Tables 3 and 4, the evidence that excellence status affects student satisfaction positively in the long run is rather weak. Only the practical skills acquired during one's studies and the practical relevance of one's studies are rated significantly better three years later. The students' responses to all the other experience-related and expectations-related questions are not significantly more positive

three years later, although the universities still enjoy excellence status. However, as shown in Table 10 in the appendix, three years after a university was awarded excellence status, students report more emotional stress from fears and depression, for instance, and seem to worry more about their financial situation. This is an interesting finding the causes of which are worth investigating in further research.

Our findings for students' perceptions in this section also illustrate an important mechanism underlying the results for admissions in section 4.2. It seems that excellence status causes more students to apply to a university because the award is perceived as a signal of high educational quality and, consequently, better job prospects. As universities have limited capacity and high-school grades generally are the most important selection criterion, "excellent" universities can have more competitive admissions.
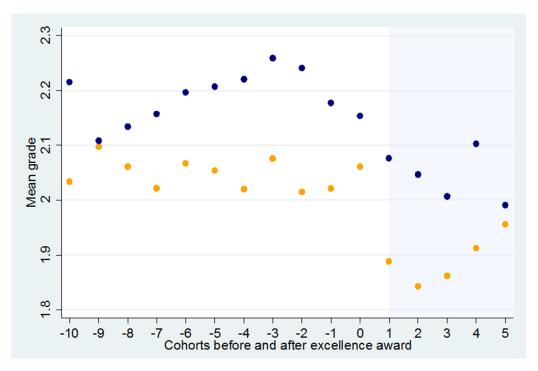
6 Conclusion

Using data from a representative student survey, we investigated whether being successful in the German universities' Excellence Initiative (a competition for research funding) and the accompanying label "university of excellence" allow a university to enroll better students. We found that designated "universities of excellence" recruit students with better high-school grades. This effect is statistically significant for three years following the award of excellence status, indicating that the award has a positive effect on student selection for successful universities and increases the ability differences of students at "excellent" and "non-excellent" universities in the medium term. We do not find evidence that the award has a positive effect on the enrollments of successful universities in the longer term.

We also investigated an important factor of enrollment decisions: the perceived quality of a university's education. Our findings show that the label "university of excellence" in itself, before any organizational changes due to additional research funds can take effect, has a strongly positive and significant effect on students' satisfaction ratings. Interestingly, this effect is observed even though these ratings refer to past experiences. We hypothesize that this is due to students implicitly comparing their university with other universities with which they have no or little experience when responding to survey items measuring student satisfaction. The award of the label thus causes students to update their beliefs about the relative educational quality of their institution. The fact that, following the award of the label, students also adjust their job market expectations but not their satisfaction in areas unrelated to education further supports the hypothesis that the excellence label is perceived as a signal of a university's quality of education vis-à-vis other universities. The actual quality of a university's education, however, does not seem to benefit from the privileged status, because ratings of educational quality largely return to previous levels three years after the award, whereas excellence status persists. By studying a rare and highly publicized event in which information on which universities are considered the best research universities in a country suddenly became common knowledge, we provide evidence that there is a clear link between a university's research reputation and student satisfaction ratings.

Overall, we find that the research competition resulted not only in stronger competition for (and more inequality of) research funds, which was its declared aim, but also in a more unequal distribution of talented students across universities, an effect that has been found to contribute to increasing wage inequality among graduates (see, e.g., Hoxby and Terry, 1999; Bergh and Fink, 2009). Our results thus shed light on an important implication of competition policies for public universities that has, until now, received little attention in the public debate. So far, however, we can only detect a transitory effect. It remains to be seen whether the effect is reinforced by more universities having their status renewed in further waves of the German Excellence Initiative.

Appendix

Figure
Mean Grades by Cohort for Excellence and Non-Excellence Universities

Key: Blue dots (upper): mean grades by cohort of non-excellence universities; yellow dots (lower): mean grades by cohort of excellence universities.

Table 5
Descriptive Statistics

Variable	Obs.	Mean	Std. dev.	Min.	Max.
GPA Abitur	37,642	2.198	0.633	1	4
GPA Abitur (stand.)	37,642	0.000	1.000	−1.901	2.822
Excellent(A)	37,967	0.042	0.200	0	1
Excellent(B)	37,967	0.038	0.191	0	1
Excellent$(B)_{t+1}$	37,967	0.041	0.198	0	1

Table 1
(continued)

Variable	Obs.	Mean	Std. dev.	Min.	Max.
Student Perceptions					
Content quality	37,761	4.849	1.310	1	7
Professional knowledge	37,773	4.484	1.168	1	7
Practical skills	37,753	2.433	1.625	1	7
Practical relevance	37,611	2.330	1.593	1	7
Teaching quality	37,741	4.324	1.351	1	7
Supervision	37,727	4.074	1.496	1	7
Difficulties to find a job	34,104	2.148	0.973	1	4
Insecure job prospects	37,721	2.594	1.915	1	7
Employment worries	37,483	3.578	1.963	1	7
Stress financial situation	37,800	2.706	2.016	1	7
Emotional stress	37,746	2.218	1.895	1	7
Stress relationship	37,227	1.523	1.985	1	7
Field of Study					
Humanities	37,865	0.223	0.416	0	1
Social sciences	37,865	0.138	0.345	0	1
Law	37,865	0.075	0.264	0	1
Economics	37,865	0.126	0.332	0	1
Medicine	37,865	0.102	0.302	0	1
Natural sciences	37,865	0.190	0.392	0	1
Engineering	37,865	0.121	0.326	0	1
Other fields	37,865	0.025	0.158	0	1
Degree Program					
Bachelor's	37,738	0.121	0.327	0	1
Master's	37,738	0.038	0.192	0	1
Diplom	37,738	0.384	0.486	0	1
Magister	37,738	0.119	0.323	0	1
State examination	37,738	0.305	0.460	0	1
Other program	37,738	0.020	0.140	0	1
Not defined	37,738	0.008	0.091	0	1
Age	37,898	23.873	4.055	17	83
Female	37,895	0.550	0.497	0	1
Summer admission	37,967	0.144	0.351	0	1
Part-time student	37,782	0.235	0.424	0	1
Semester	37,967	6.637	4.316	1	20
Tuition fees(A)	37,967	0.166	0.372	0	1
Double cohort(A)	37,967	0.012	0.110	0	1
Tuition fees(B)	37,967	0.266	0.442	0	1
Double cohort(B)	37,967	0.026	0.160	0	1
Parents' Highest Level of Education					
Lower secondary (Hauptschule)	37,904	0.090	0.286	0	1
Upper secondary (Realschule)	37,904	0.178	0.383	0	1
High school (Abitur)	37,904	0.143	0.350	0	1
Polytechnic (Fachhochschule)	37,904	0.128	0.335	0	1
University	37,904	0.451	0.498	0	1
Other	37,904	0.010	0.100	0	1
University					
TU Berlin	37,967	0.065	0.247	0	1
Bochum	37,967	0.070	0.255	0	1
TU Dresden	37,967	0.096	0.295	0	1
Duisburg-Essen	37,967	0.045	0.208	0	1
Frankfurt	37,967	0.069	0.253	0	1
Freiburg	37,967	0.086	0.280	0	1
Hamburg	37,967	0.088	0.283	0	1
Karlsruhe (KIT)	37,967	0.083	0.276	0	1
Kassel	37,967	0.029	0.169	0	1
Leipzig	37,967	0.094	0.292	0	1
Magdeburg	37,967	0.042	0.200	0	1
LMU Munich	37,967	0.117	0.321	0	1
Oldenburg	37,967	0.020	0.141	0	1
Potsdam	37,967	0.047	0.211	0	1
Rostock	37,967	0.049	0.215	0	1

Table 6

Excellence Status and Quality of Admissions (results when excluding one excellence university)

Dependent variable: GPA Abitur (standardized)	(1) Excluding Dresden	(2) Excluding Freiburg	(3) Excluding Karlsruhe	(4) Excluding Munich
Excellent × 1st year	–0.0659	–0.103***	–0.0744*	–0.0796*
	(0.0391)	(0.0341)	(0.0376)	(0.0449)
Excellent × 2nd year	–0.135*	–0.192**	–0.0904**	–0.215**
	(0.0727)	(0.0886)	(0.0416)	(0.0981)
Excellent × 3rd year	–0.150**	–0.206***	–0.126*	–0.198*
	(0.0643)	(0.0595)	(0.0693)	(0.101)
Excellent × 4th year	0.0694	0.103	0.0103	0.00305
	(0.0683)	(0.0696)	(0.0816)	(0.0930)
Excellent × 5th year	0.101	0.0111	0.0476	0.0952
	(0.0827)	(0.0801)	(0.0908)	(0.0876)
Excellent × 6th year	–0.0487	–0.0557	–0.0752	–
	(0.0818)	(0.0758)	(0.0757)	–
Tuition fees	–0.0299*	–0.0423**	–0.0384**	–0.0427**
	(0.0147)	(0.0169)	(0.0177)	(0.0178)
Double cohort	–0.0216	–0.0399	–0.0113	–0.0262
	(0.0585)	(0.0632)	(0.0631)	(0.0639)
Observations	35,296	35,479	35,569	34,318
Adjusted R^2	0.176	0.167	0.174	0.183

Notes: We regress school GPA (standardized with zero mean and unit variance over the whole sample) on six dummies for each year following the award of excellence status. All regressions control for tuition fees and double cohorts, and contain a constant and cohort and university fixed effects. Additionally, all regressions control for field of study, degree program, summer-term admissions, part-time study, age, gender, and parents' highest level of education. Robust standard errors clustered on university level are reported in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7

Excellence Status and Quality of Admissions (results when excluding summer-term admissions)

Dependent variable: GPA Abitur (standardized)	(1)	(2)	(3)
Excellent	−0.0903*		0.103*
	(0.0467)		(0.0502)
Excellent × 1st year		−0.0820*	
		(0.0384)	
Excellent × 2nd year		−0.147*	
		(0.0740)	
Excellent × 3rd year		−0.175**	
		(0.0640)	
Excellent × 4th year		0.0898	
		(0.0875)	
Excellent × 5th year		0.104	
		(0.0875)	
Excellent × 6th year		−0.0809	
		(0.0747)	
Excellent × Social sciences			−0.261***
			(0.0373)
Excellent × Law			−0.245***
			(0.0432)
Excellent × Economics			−0.526***
			(0.111)
Excellent × Medicine			−0.285***
			(0.0381)
Excellent × Natural sciences			−0.157**
			(0.0684)
Excellent × Engineering			−0.131
			(0.136)
Excellent × Other			0.0767
			(0.0964)
Tuition fees	−0.0777***	−0.0755***	−0.0775***
	(0.0218)	(0.0204)	(0.0221)
Double cohort	−0.0387	−0.0770*	−0.0361
	(0.0498)	(0.0419)	(0.0524)
Observations	33,112	33,112	33,112
Adjusted R^2	0.171	0.172	0.172

Notes: We regress school GPA (standardized with zero mean and unit variance over the whole sample) on a dummy that indicates whether a student enrolled in a university after the university was labeled excellent. In column (2) this dummy is separated into six dummies for each year following the award of excellence status. Column (3) contains interaction terms between the excellence dummy and fields of study. Humanities is the reference category. All regressions control for field of study, tuition fees, and double cohorts, and contain a constant and cohort and university fixed effects. Additionally, all regressions control for degree program, part-time study, age, gender and parents' highest level of education. Robust standard errors clustered on university level are reported in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 8

Marginal Effects of the Excellence Dummy for the Models Reported in Table 3

	(1) Content quality		(2) Professional knowledge		(3) Practical skills		(4) Practical relevance		(5) Teaching quality		(6) Supervision	
	dy/dx	$P > \|z\|$	dy/dx	$P > \|z\|$	dy/dx	$P > \|z\|$	dy/dx	$P > \|z\|$	dy/dx	$P > \|z\|$	dy/dx	$P > \|z\|$
1	−0.002	0.001	−0.001	0.014	−0.015	0.036	−0.015	0.019	−0.004	0.016	−0.009	0.000
2	−0.009	0.001	−0.002	0.027	−0.017	0.034	−0.017	0.018	−0.013	0.019	−0.019	0.000
3	−0.021	0.001	−0.005	0.015	−0.005	0.030	−0.003	0.021	−0.020	0.022	−0.022	0.000
4	−0.020	0.001	−0.016	0.017	0.008	0.033	0.010	0.019	−0.011	0.020	−0.004	0.000
5	−0.003	0.001	−0.019	0.014	0.015	0.032	0.013	0.019	0.019	0.021	0.023	0.000
6	0.043	0.001	0.016	0.015	0.010	0.038	0.008	0.017	0.026	0.020	0.024	0.000
7	0.012	0.001	0.026	0.016	0.004	0.039	0.003	0.023	0.003	0.020	0.007	0.001

Table 9

Marginal Effects of the Excellence Dummy for the Models Reported in Table 4

	(1) Difficulties in finding a job		(2) Insecure job prospects		(3) Employment worries	
	dy/dx	$P > \|z\|$	dy/dx	$P > \|z\|$	dy/dx	$P > \|z\|$
1	0.026	0.034	0.018	0.000	0.009	0.003
2	0.001	0.048	0.011	0.000	0.008	0.003
3	−0.014	0.036	0.003	0.000	0.006	0.003
4	−0.013	0.034	−0.003	0.000	0.006	0.003
5			−0.009	0.000	−0.001	0.003
6			−0.011	0.000	−0.010	0.003
7			−0.008	0.001	−0.017	0.003

Table 10

Excellence Status and Emotions

	(2) Stress financial situation	(3) Emotional stress	(4) Stress relationship
Excellent	−0.0248	−0.0261	0.0374
	(0.105)	(0.0476)	(0.0418)
Excellent$_{t+1}$	0.155*	0.155**	0.0581
	(0.0918)	(0.0606)	(0.0598)
GPA Abitur	0.359***	0.155***	−0.0389**
	(0.0219)	(0.0176)	(0.0184)
# Semesters	0.0260***	0.0181***	−0.0191***
	(0.0054)	(0.0039)	(0.0037)
Tuition fees	−0.0011	−0.127**	−0.0039
	(0.146)	(0.0641)	(0.0537)
Double cohort	−0.0441	−0.0215	−0.103
	(0.115)	(0.0949)	(0.0831)
Observations	36,883	36,830	36,333
Pseudo R^2	0.029	0.011	0.009

Notes: We regress different survey items (standardized with zero mean and unit variance) on a dummy that identifies ratings of students collected immediately after these universities were awarded excellence status (viz., winter semester 2006/2007 for Munich and Karlsruhe and winter semester 2012/2013 for Dresden). All regressions contain wave and university fixed effects. Additionally, all regressions control for subject of study, degree program, summer-term admissions, part-time study, age, gender, and parents' highest level of education. Robust standard errors clustered on university level are reported in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 11

Survey Items and Scales

Item [*variable names in italics*]	Scale

What have been your experiences during your studies with respect to ...
   ... the quality of the curriculum's content? [*content quality*]
   ... the way lectures are given? [*teaching quality*]
   ... supervision and counseling by lecturers? [*supervision*]
	1–7
	(very bad–very good)

Please indicate to what extent your studies have promoted your knowledge and skills in the following areas ...
   ... professional knowledge. [*professional knowledge*]
   ... practical skills. [*practical skills*]
	1–7
	(not at all–very much)

How strongly, from your point of view, is your subject of study at your university characterized by ... ... good professional preparation/strong practical relevance? [*practical relevance*]	1–7 (not at all–very much)
Which of the following options best describes your job prospects after graduation? [*difficulties in finding a job*]	1–4 (hardly any difficulties in finding a job–difficulties in finding any job at all)

How much do you personally feel stressed by ...
   ... insecure job prospects? [*insecure job prospects*]
   ... your current financial situation? [*stress financial situation*]
   ... personal problems (e.g., fears, depression)? [*emotional stress*]
   ... the lack of a stable relationship? [*stress relationship*]
	1–7
	(not at all–very much)

What do you think is important for improving your personal situation as a student? ... improvement of employment outlook for students of your subject of study [*employment worries*]	1–7 (not at all–very much)

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