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## Success in the university admission process in Germany: regional provenance matters

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# Discussion Papers

# 789

Sebastian Braun • Nadja Dwenger

**Success in the University Admission  
Process in Germany:  
Regional Provenance Matters**

Berlin, April 2008

Opinions expressed in this paper are those of the author and do not necessarily reflect views of the institute.

## IMPRESSUM

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# Success in the University Admission Process in Germany: Regional Provenance Matters

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April 15, 2008

## Abstract

School education in Germany is under the responsibility of the federal states and as a consequence average grades differ widely across regions. Since school leavers apply nationwide for admission to university, regional provenance may thus matter a lot for the success probability in the admission process. Using a comprehensive dataset of the German central clearing house for university admissions in 2006/2007, we show that success rates indeed differ dramatically between federal states, provided that grades are not made comparable across state boundaries. Most of the variation in success can be explained by state-level differences in grading. By defining quotas for federal states and restricting competition among applicants to the state-level, the link between state-level grading and success rates in the university admission process can be broken.

**JEL Classification:** C21, I23, H77

**Keywords:** Admission to university, central clearing house, federalism, federal education system

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## 1. Introduction

In Germany, education is a matter for the federal states. Every state is responsible for the design of its schooling system. As a consequence, grading differs significantly between federal states. In 2006, the average grade in the German high-school diploma (*Abitur*) varied between 2.3 in Thuringia and 2.7 in Lower Saxony.<sup>3</sup> While schooling is administered at the state-level, school leavers apply to universities nationwide. So if applicants' grades are not made comparable across state boundaries, regional provenance may matter a lot for the success probability in the admission process, even though German law explicitly dictate the contrary (Hochschulrahmengesetz, 1999, paragraph 35). This is clearly worrisome for prospective students. However, not only students but universities as well may be adversely affected. Differences in grading at the state level are likely to not (only) reflect performance but simply mirror peculiar features of the respective schooling system. If this is the case, the quality of school grades as a predictor of academic success, as which it is typically used by universities, will seriously be impaired.

In this paper, we utilise a detailed data set of the German Central University Admissions Service (ZVS), which is responsible for admission to university in medical subjects, to quantify the effect of regional provenance as a determinant of success in the university admission process. While the German case is of some stand-alone interest for policy makers and universities in Germany, regional differences in schooling are not an idiosyncratic feature of the German system but can be observed in other countries as well.<sup>4</sup> Whenever school performance suffers from a lack in comparability across regions, university admission processes face similar problems. To the best of our knowledge, and despite the high policy relevance of the issue, our paper is nevertheless the first to provide an (empirical) assessment of the issue at hand. We analyse two different admission procedures implemented by the German central clearing house. While both procedures concentrate on school performance as an admission criterion, only one accounts for regional differences in schooling systems.

If competition is nationwide and regional differences are not taken into account, we find dramatic differences in the success ratio of applicants from different federal states. In fact, average success rates may differ by a factor of more than three. Most of the variation can be explained by regional differences in grading. The result is particularly alarming since for all but the medical subjects,

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<sup>3</sup> Grades in Germany are measured on a 1 to 6 scale. The lowest passing grade is 4.0.

<sup>4</sup> Austria, Belgium, Hungary, Poland, Sweden, and Switzerland also have a federal schooling system. In the United Kingdom schooling in Scotland takes on a special position. In the United States, in the Czech Republic and in Spain, regions have at least some influence on education.

admission to university in Germany has been fully decentralised and universities generally do not correct applicants' grades for state-specific influences. By defining quotas for federal states and restricting competition among applicants to the state-level, as it is done in the second procedure analysed, the link between grading at the state level and the success probability in the admission process can be broken. However, we show that the mechanism applied at present penalises applicants from states with a large number of applications relative to the population figure.

The paper is organised as follows. Section 2 describes admission to university in Germany. Section 3 presents the dataset, while empirical results are provided in Section 4. Finally, Section 5 concludes.

## **2. Admission to University in Germany**

The German system of university admission is characterised by the coexistence of two diametrically opposed mechanisms. For the majority of subjects, universities select the students themselves. However, for all medical subjects admission is centrally administered. Nationwide all prospective students of biology, medicine, pharmacy, psychology, animal health and dentistry have to apply with the German central clearing house, which assigns students according to the following three procedures:

1. Procedure A (*Abiturbestenverfahren*) admits students who are top of the class to around 20 % of all seats.
2. Procedure W (*Wartezeitverfahren*) admits students with long waiting times to around 20 % of all seats.
3. Procedure U (*Auswahlverfahren der Hochschulen*) represents admission by universities according to their own criteria to around 60 % of all seats.

While procedure W rewards the waiting time of an applicant, admission through procedures A and U is mainly based on school performance. Since federalism in Germany gives rise to strong regional differences in average high-school grades but should be unrelated to the average waiting time of an applicant, regional provenance may come into play in procedures A and U.

Procedure A is a two-stage procedure. At the first stage applicants with the best average grades are selected. The number of selected applicants matches the seats to be allocated through procedure A.

The selection decision depends only on an applicants' final grade from school and possibly on subordinated criteria.<sup>5</sup> Using a matching mechanism selected students are then allocated to a university according to their stated preferences. We will calculate success probability in procedure A as the probability to be selected at the first stage.<sup>6</sup>

The design of procedure A explicitly accounts for differences in school education across federal states. To guarantee independence of an applicant's success probability in the admission process from her regional provenance, competition for selection is not nationwide: applicants only compete with those who have passed their high school diploma in the same federal state. For this purpose, the ZVS establishes 16 federal state quotas for every subject at each university nationwide.<sup>7</sup> Federal state quotas reserve a share of all the seats available for a subject-university combination to applicants from a federal state.

The quota of each federal state is determined by two elements:

1. Fraction of applicants (1/3):

To one third, the quota is determined by a federal state's share in the total number of people applying for a specific subject.

2. Fraction of population aged 18 to 20 (2/3)

To two thirds, the quota is determined by a federal state's fraction in the total German population aged 18 to 20.

For the three city states Berlin, Bremen and Hamburg, the resulting quota is cross-the-board increased by 30 %.<sup>8</sup> Applicants from the same federal state then compete for the seats reserved.

Procedure U guarantees universities to select 60 per cent, i.e. the majority of their students, themselves according to their own set of criteria. Applicants have to apply with the central clearing house and universities can delegate the implementation of the admission process to the ZVS. Universities are required to resort to final grades from school as the predominant admission criterion. In contrast to procedure A, competition among applicants for admission is nationwide.

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<sup>5</sup> Subordinated criteria for selection are waiting time, military or civil service and a lottery.

<sup>6</sup> Selection in stage 1 does not necessarily guarantee admission. Since strategic behaviour on part of the applicants can alter the outcome at stage 2 (cf. Braun et al., 2007), we concentrate on success in the selection stage. Here, success cannot be influenced by applicants' behavior. For a more detailed description of admission on the second stage, confer Braun et al., 2007.

<sup>7</sup> Vergabeordnung ZVS (VergabeVO ZVS), as at May 2006.

<sup>8</sup> As will be seen in Section 4, the addition can be justified by the relatively large share of applicants in city states.



Hence, average grades required for a successful application are not state-specific but apply to any applicant – regardless of her regional provenance. Nationwide competition among applicants is not only a characteristic of procedure U but also characterises admission to university for those subjects for which universities decentrally select their students themselves. Universities typically do not distinguish between an applicant from, say, Thuringia with an average grade of 2.0 and one from Lower Saxony with the same grade.

### 3. Data Description

We have access to a database of the German central clearing house covering applications for the winter term 2006/2007.<sup>9</sup> The dataset records all information provided by the applicants. In particular, it records an applicant's average grade in the high school diploma, the regional provenance and the subject chosen. Furthermore, the database provides information on the procedure a prospective student has participated in. For procedure U, we directly observe success or failure of an application. Success in procedure A, which we define as being selected in stage 1, is not directly reported but can be inferred by applying the selection criteria made public by the central clearing house (ZVS, 2006). Since we are interested in a potential federal state effect on the selection probability, we exclude applications by individuals who have not received their university entrance diploma in Germany. This leaves us with a total number of 65,254 individuals that either apply in procedure A, in procedure U or in both.

In order to analyse the effects of an applicant's regional provenance on success or failure of his application, we first aggregate the individual data at the state level. Specifically, for every federal state we calculate the average success ratio in procedures A and U, respectively, of applicants holding a high-school diploma from the state considered. We furthermore compute for each subject the share of applicants that has received the university-entrance diploma in a given federal state. Finally, from the German Federal Statistical Office we obtain state-level data on average grades in the high school diploma and on state population aged 18 to 20.<sup>10</sup>

Table 1 gives a comprehensive overview of the variables used.

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<sup>9</sup> Before granting access the individual data has been made anonymous.

<sup>10</sup> The reference date for the population data is 31<sup>st</sup> December, 2005. This is also the reference date which is used by the ZVS to establish the federal states quotas in procedure A.

| <b>Variable</b>    | <b>Description</b>  |
|--------------------|---|
| Success            | Average success rate in procedure A and U, respectively   |
| CityState          | Dummy variable for city states (i.e. Berlin, Bremen, Hamburg)   |
| AvGrade            | Average grade in the high school diploma  |
| Applicants         | Share of applicants for a given subject that have received the university-entrance diploma in a given federal state |
| Pop1820            | State population aged 18 to 20 (as share of total German population in that age category)                           |
| Applicants_Pop1820 | Ratio of <i>Applicants</i> and <i>Pop1820</i>   |

**Table 1:** Variable Description (State-Level)

#### 4. Empirical Results

As a first step towards evaluating the effect of grading differences among federal states on applicants' chances to get a seat at university, we take a closer look at average grades and success probabilities in each federal state. Table 2, column 2, documents the strong regional variation in average grades in the high-school diploma. With an average grade of 2.3 students in Thuringia are evaluated much better than their fellows in Berlin or Lower Saxony.<sup>11</sup>

Columns 4 and 5 show for every region the average percentage of applicants that are successful in procedures A and U, respectively. Consider procedure U first and remember that the admission mechanism used does not account for regional differences in the schooling system. On average, 34.37 per cent of all candidates that have applied through procedure U (and were not successful in any of the two other procedures)<sup>12</sup> have been offered a seat at a university. The standard deviation of 10.01 indicates considerable variation in the success probability across German federal states. In fact, scrutinising the success probabilities reveals dramatic differences. While just 16 per cent of all applicants that have obtained the high-school diploma in Berlin are successful, the figure stands at more than 54 per cent for Thuringia. Hence, on average the probability of getting a seat at university through procedure U is more than three times as high for applicants from Thuringia than for prospective students from Berlin. Since to a large extent success in procedure U is determined

<sup>11</sup> The grade distributions do not only differ in terms of the mean but also with respect to the variance and the skewness. Figure A1 in the Appendix depicts the distribution of grades in all 16 German federal states. The quotas of young people getting their high school diploma differ largely between federal states (between 31.3 % and 52.4 % in 2005, German Federal Statistical Office, 2007). One may be worried that the differences in the distribution of grades could be due to a selection of high-school graduates. A comparison of the quotas of young people with high school diploma across federal states shows that this seems not to be true: For instance, consider Baden-Württemberg and Berlin. Both federal states are quite similar in the percentage of young people obtaining a high school diploma (Baden-Württemberg: 44.0 %, Berlin: 44.7 %) but the shapes of their grade distributions are diametrically opposed. Hence, we conclude that the differences in distributions do not result from earlier selection processes.

<sup>12</sup> The ZVS administers the procedures in a sequential order with U being the last procedure. If candidates are successful in a previous procedure, they do not longer participate in procedure U.

by school performance, differences in grading are a natural culprit for divergent success rates.

| Federal state                         | Average Grade | Applicants /<br>Pop1820 | Success Probability in... |             |
|---------------------------------------|---------------|-------------------------|---------------------------|-------------|
|                                       |               |                         | Procedure A               | Procedure U |
| Schleswig-Holstein                    | 2.63          | 1.02                    | 5.24                      | 25.57       |
| Free and Hanseatic<br>City of Hamburg | 2.57          | 1.33                    | 5.72                      | 23.22       |
| Lower Saxony                          | 2.71          | 0.93                    | 5.39                      | 23.09       |
| Free Hanseatic City<br>of Bremen      | 2.49          | 1.36                    | 4.95                      | 32.68       |
| North Rhine-<br>Westphalia            | 2.66          | 0.96                    | 5.19                      | 29.36       |
| Hesse                                 | 2.49          | 1.09                    | 4.57                      | 32.77       |
| Rhineland-Palatinate                  | 2.63          | 0.86                    | 5.28                      | 30.24       |
| Baden-Württemberg                     | 2.38          | 1.19                    | 4.64                      | 40.70       |
| Bavaria                               | 2.43          | 0.94                    | 5.46                      | 32.20       |
| Saarland                              | 2.51          | 1.07                    | 5.35                      | 37.01       |
| Berlin                                | 2.68          | 1.38                    | 5.65                      | 16.17       |
| Brandenburg                           | 2.48          | 0.83                    | 6.95                      | 39.87       |
| Mecklenburg-<br>Western Pomerania     | 2.40          | 0.77                    | 6.15                      | 46.42       |
| Saxony                                | 2.44          | 0.96                    | 5.89                      | 40.82       |
| Saxony-Anhalt                         | 2.41          | 0.81                    | 6.80                      | 45.23       |
| Thuringia                             | 2.33          | 0.94                    | 5.97                      | 54.56       |
| Mean                                  | 2.51          | 1.03                    | 5.58                      | 34.37       |
| Std. Dev.                             | 0.13          | 0.20                    | 0.67                      | 10.01       |
| Min                                   | 2.30          | 0.77                    | 4.57                      | 16.17       |
| Max                                   | 2.72          | 1.38                    | 6.95                      | 54.56       |

**Table 2:** Success Probabilities and State

Figure 1 illustrates that there indeed exist a very strong negative relation between the success rate and the average grade in a federal state. Notice that a simple regression of the success probability on a constant and the average grade of a federal state can explain almost 80 per cent of the variation. The regression result suggests that an improvement of the average grade of a federal state by 0.1 increases the success probability of its applicants by 7.49 percentage points.

Consider next procedure A, which is explicitly designed such that applicants compete only with other prospective students from the same federal state. Table 2, column 4, shows that the success rates in procedure A still vary across federal states but the variation is much less pronounced compared to procedure U. On average, 5.58 per cent of all applicants endure the selection stage in procedure A. With 6.95 per cent the highest success probability is found for Brandenburg, while only 4.64 per cent of all applicants from Baden-Württemberg are selected. Figure 2 illustrates that for procedure A there is hardly any relation between the average grade in a federal state and the

success ratio of its applicants. In a simple regression of the success probability on a constant and the average grade, the latter enters with a negative sign but the coefficient is not statistically significant (standard deviation of 1.469).

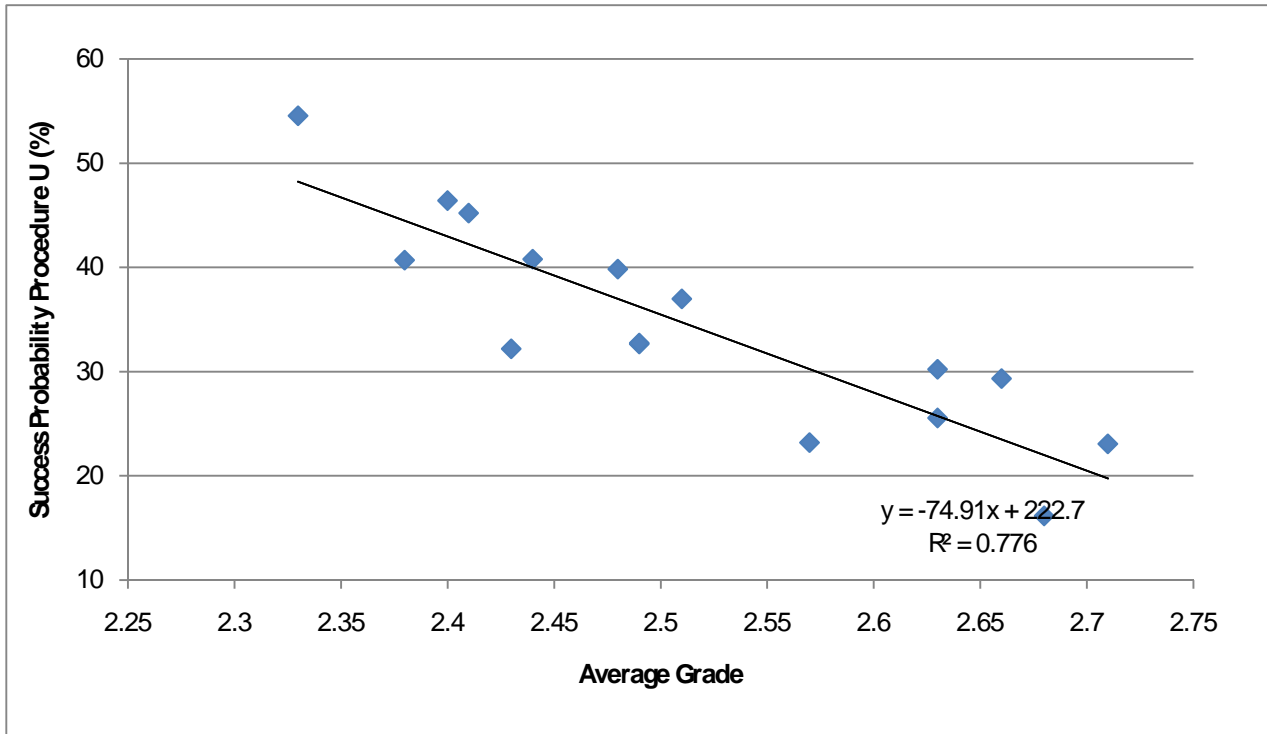


Figure 1: Relation between Success Probability and Average Grade, Procedure U

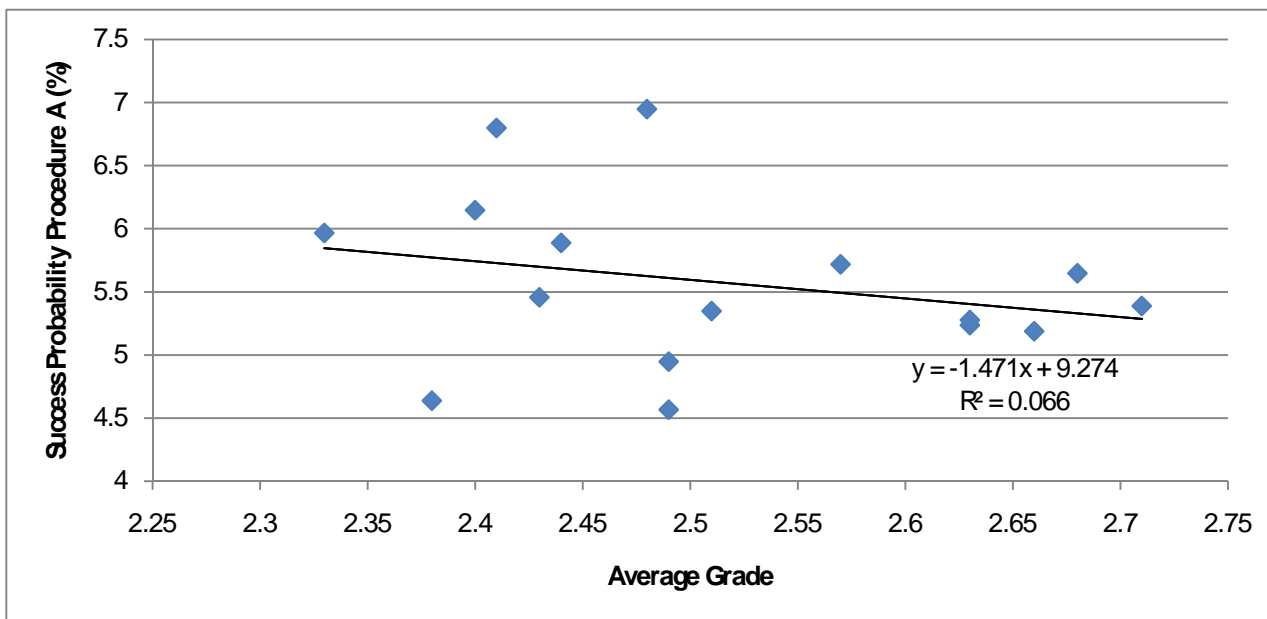


Figure 2: Relation between Success Probability and Average Grade, Procedure A

Of course, other factors may influence the average success ratio of a federal state. If these factors are correlated with the average grade, a simple univariate OLS regression will suffer from an omitted variable bias. To start with, the individual probability to get a seat at university depends a lot on the subject chosen by an applicant. The data shows, e.g., that in procedure A the share of successful applications for biology is twice as high as it is for medicine. Consequently, the average success ratio in a federal state will vary with the share of students applying for the different subjects. Hence, we calculate the success probability of applicants from a federal state separately for each of the six subjects and use these subject specific success ratios as the variable to be explained.

As additional regressors we include a full set of subject dummies as well as the ratio between a federal state's share of applicants for a given subject and the federal state's share of people aged 18 to 20 (*Applicants\_Pop1820*). If *Applicants\_Pop1820* exceeds one, then a federal state's share of applicants is larger than its population share. This is true in particular for all three city states, which exhibit much larger ratios than the territorial states (see Table 2, column 3). We also introduce a dummy for the city states Berlin, Hamburg, and Bremen (*CityState*). The variable is expected to have a negative effect in procedure U because universities in bigger cities are popular among students. Hence, if applicants from city states tend to apply at their home universities, they will on average have lower success probabilities due to the intense competition for their chosen university. By contrast, the success ratio in procedure A depends on selection, which is based on the applicant's average grade and which is independent from the universities listed. Thus, the aforementioned effect should not be present in procedure A. Quite the contrary, in procedure A we expect a positive influence since federal state quotas are cross-the-board adjusted upwards in city states as explained in Section 2. Finally, *Applicants\_Pop1820* is an indicator of the inclination of pupils to apply for a seat at university. Since federal state quotas in procedure A are not only based on the number of applications but are also calculated on the basis of population shares, a relatively large number of applications will intensify competition. Accordingly, we expect a negative influence on *Applicants\_Pop1820* on the success probability in procedure A.

In summary, to determine the influence of regional provenance on the average success of applicants from state  $i$  in subject  $j$  in procedure  $k \in \{A, U\}$ , we run the following regression

$$Success_{ij}^k = \beta_0 + \beta_1 AvGrade_i + \beta_2 Applicants\_Pop1820_{ij}^k + \beta_3 CityState_i + \varepsilon_{ij}$$

where we also include a full set of subject dummies.

Regression results are summarised in Table 3. Note first the strong influence of subject choice on the success probability in both procedures. In particular, the prospects of success of an average application are far higher in biology or pharmacy than they are in medicine or animal health. Turning to our main variables of interest, a strong and statistically significant negative effect of the average grade in high-school on the success ratio in procedure U is found. An increase (worsening) in the average grade by 0.1 is associated with a deterioration of the success probability by 5.47 percentage points. No such influence is established for procedure A. Hence, differences in average grades between federal states do not have a (statistically significant) impact on success rates in procedure A.

As it regards the variable “city state”, the signs are as expected and the influence is statistically significant for both procedures. In procedure A, on average applicants that have finished school in a city state face a 3.02 percentage points higher success rate than applicants from states with otherwise similar characteristics. On contrary, the corresponding estimate for procedure U is minus 5.14 percentage points.

For procedure A, we furthermore find that the inclination of the young people of a state to apply for university exhibit a negative and highly statistically significant effect on the average success rate. Therefore, while the selection mechanism for procedure A succeeds in making success independent from state-level grading, regional provenance still plays a role: a relatively large number of applications - as compared to the population share of a state - depresses the success probability of an individual applicant. Quantitatively, the influence is materially but clearly less dramatic than the influence of grading in procedure U. To take an extreme case: the ratio between the share of applicants and the share of people aged 18 to 20 (for all subjects) in Baden-Württemberg stands at 1.19, while the ratio is 0.77 in Mecklenburg-Western Pomerania. Our estimates then imply that the success probabilities of applicants in the former state are 1.8 percentage points lower than in the latter one.<sup>13</sup> City states have an even higher (relative) share of applicants. Their disadvantage, however, is (over)compensated by the city state mark-up.

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<sup>13</sup> Note that the average success probability in procedure A is 5.58 per cent only. So the influence is significant also in terms of its size.

|                    | Procedure A          | Procedure U          |
|--------------------|----------------------|----------------------|
| Average Grade      | -.0078<br>(.0101)    | -.5467***<br>(.0678) |
| Applicants_pop1820 | -.0491***<br>(.0042) | -.0434<br>(.0276)    |
| City state         | .0302***<br>(.0032)  | -.0514**<br>(.0207)  |
| Biology            | .0499***<br>(.0038)  | .6415***<br>(.0258)  |
| Medicine           | -.0053<br>(.0038)    | -.0223<br>(.0257)    |
| Pharmacy           | .0347***<br>(.0038)  | .3051***<br>(.0257)  |
| Psychology         | .0022<br>(.0039)     | .0694**<br>(.0260)   |
| Animal Health      | -.0117***<br>(.0038) | -.0458*<br>(.0258)   |
| Constant           | .1187***<br>(.0258)  | 1.7156***<br>(.1722) |
| R <sup>2</sup>     | .8802                | .9325                |
| N                  | 96                   | 96                   |

\*, \*\*, \*\*\* significant at the 10%, 5%, 1% level, respectively (two-tailed tests)

Reference category: dentistry

**Table 3:** Regression Results

## 5. Concluding Remarks

This paper has shown that differences in grading between federal states will lead to strong inequality in success probabilities if regional peculiarities are not taken into account in the university admission process. We analysed two admission procedures: procedure U, which does not make federal states grading comparable, and procedure A, where applicants compete only with other applicants from the same federal state. Regional success probabilities in procedure U vary up to a factor of more than three, with most of the variation being explained by the average grade in a federal state. This finding is especially precarious as most seats at university are allocated either by procedure U or by a decentralised procedure. Both heavily rely on the applicants' average grades but do typically not attempt to make school performance comparable across states. This fact also kept legal courts busy.<sup>14</sup> Meanwhile the legal disputes are clearly decided: universities are completely free to fully rely on average grades of the applicants without having to take different

<sup>14</sup> In Bavaria, some applicants were temporarily admitted to university because they successfully claimed that they were discriminated in the admission process because the grades of the applicants had not been made comparable (VG München, 2005). Similar legal proceedings took place in other federal states as well.

grading policies into account.<sup>15</sup> As our results show, however, this practice is highly questionable as it violates the principle of equal educational opportunities. It may also harm universities ability to find the truly appropriate candidates.

In the United Kingdom, an attempt to make grades comparable is made through the UCAS tariff tables (UCAS, 2008). Another possibility to overcome regional inequalities is to integrate other admission criteria like test scores as it is done with the Scholastic Aptitude Test (SAT) in the United States. Maybe the easiest way to deal with the problems described is not to level regional grading differences but to restrict competition to the federal state level. This is exactly what is done in the second procedure that we analysed: Procedure A considers the federal educational structure and establishes federal states quotas. Applicants exclusively compete for admission within federal states. The findings show that in principle these quotas are a sensible way to overcome differences in grading but that there is still room for improvement in the way these quotas are established. Across-the-board increases for city states and the influence of the population share introduces some inequalities but they are small compared to those inflicted by procedure U.

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<sup>15</sup> Superior Administrative Court, 2006.



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# Appendix

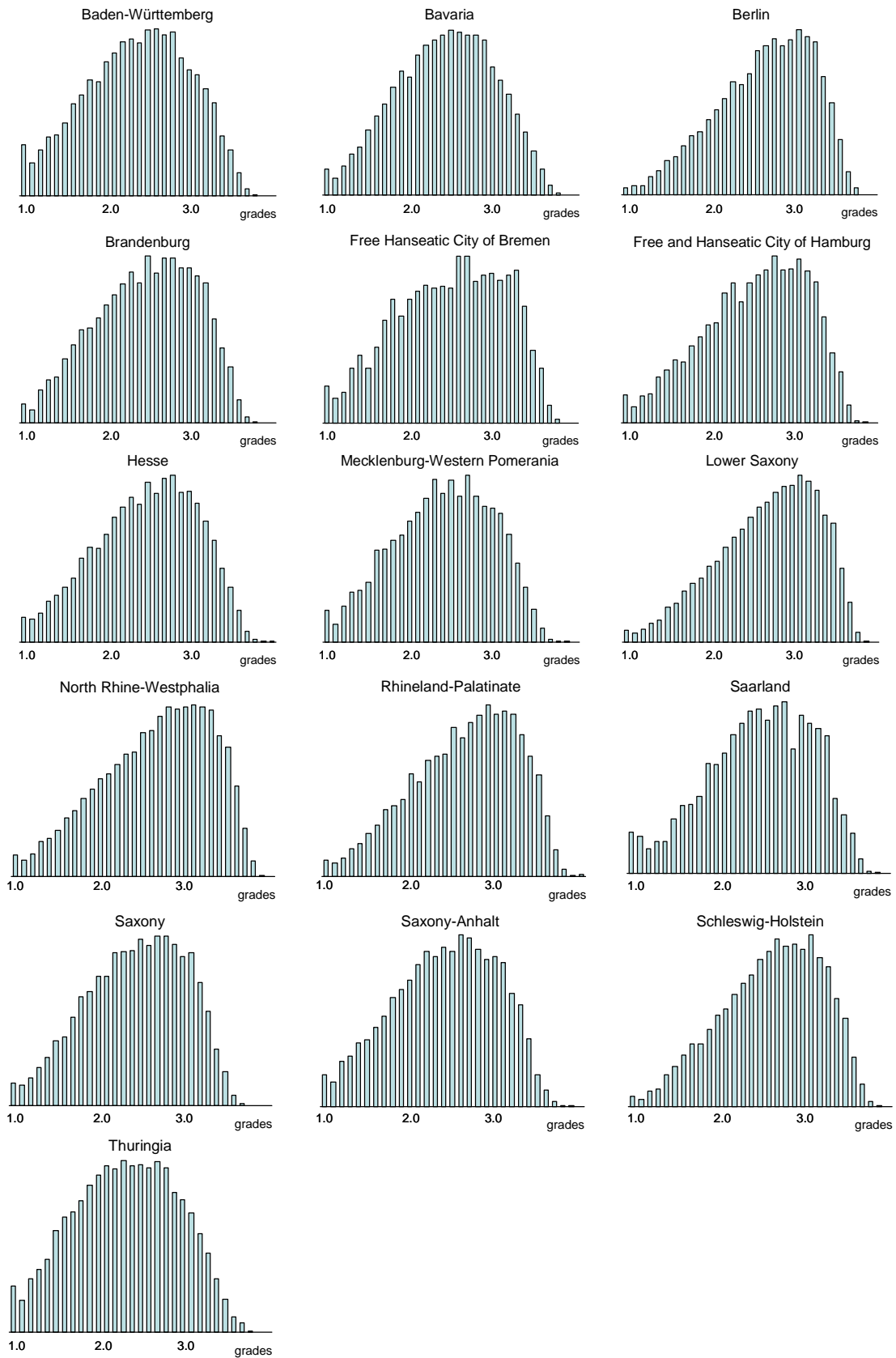


Figure A1: Histogram of average grades in the high school diploma across federal states.