

Schumann, Mathias; Freier, Ronny; Siedler, Thomas

Conference Paper

The Economic Returns to Graduating with Honors - Evidence from Law Graduates

Beiträge zur Jahrestagung des Vereins für Socialpolitik 2014: Evidenzbasierte Wirtschaftspolitik
- Session: Human Capital, No. B04-V1

Provided in Cooperation with:

Verein für Socialpolitik / German Economic Association

Suggested Citation: Schumann, Mathias; Freier, Ronny; Siedler, Thomas (2014) : The Economic Returns to Graduating with Honors - Evidence from Law Graduates, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2014: Evidenzbasierte Wirtschaftspolitik - Session: Human Capital, No. B04-V1, ZBW - Deutsche Zentralbibliothek für Wirtschaftswissenschaften, Leibniz-Informationszentrum Wirtschaft, Kiel und Hamburg

This Version is available at:

<https://hdl.handle.net/10419/100338>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

The Economic Returns to Graduating with Honors - Evidence from Law Graduates

Ronny Freier* Mathias Schumann† Thomas Siedler‡

February 19, 2014

Abstract: This paper studies the causal effects of graduating from university with an honors degree on subsequent labor market outcomes. While a rich body of literature has focused on estimating returns to human capital, few studies have analyzed returns at the very top of the education distribution. We highlight the importance of honors degrees for future labor market success in the context of German law graduates. Using a difference-in-differences research design combined with entropy balancing, we find that students of law who passed the state bar exam with an honors degree receive a significant earnings premium (about 14 percent), are more likely to work in public service (about 16 percentage points), are less likely to be self-employed (seven percentage points) and are more often engaged in Ph.D. studies (about 20 percentage points).

Keywords: returns to education, difference-in-differences, entropy balancing,
law students and earnings

JEL classification: J01, J31, J44

Acknowledgments: We would like to thank Michael Bahrs, Iwan Barankay, Bernt Bratsberg, Frederic Döhl, Bart Goldsteyn, Luise Görge, Peter Haan, Daniel Hamermesh, Katja Maria Kaufmann, Oliver Marie, Aderonke Osikominu, Annemarie Paul, Petra Persson, Guido Schwerdt, Gesine Stephan and Niels Westergaard-Nielsen for their helpful comments and suggestions. Also, we are grateful to seminar participants at the Berlin Network of Labor Market Economists (BeNA) and the University of Hamburg. We would also like to thank the DZHW and, in particular, Gregor Fabian, Thomas Lewerenz, Ulrich Prigge and Torsten Rehn at DZHW for providing access to the graduate survey data and for all their support. The usual disclaimer applies.

*DIW Berlin.

†University of Hamburg.

‡University of Hamburg, DIW Berlin, University of Essex and IZA Bonn.

1 Introduction

The majority of industrialized countries experienced massive increases in educational attainment in the twentieth century. Goldin and Katz (2010) report that among Americans born in 1930, only one in four attended college, whereas over 60 percent of the cohort born in 1970 did so. Similarly, the share of 25–64 year-olds with tertiary education has increased from 22 to 31 percent in the OECD countries in recent years (OECD, 2013). It is also well documented that university graduates fare better in the labor market than non-graduates in terms of employment, salaries, and the risk of experiencing unemployment (Blundell et al., 2000; OECD, 2013). It is, however, less known how the performance in higher education affects individual’s labor market chances, and whether students with an excellent study performance are also more successful in the labor market.

How important is an outstanding study performance for graduates’ labor market outcomes? In particular, do students who graduate with an honors degree experience positive labor-market returns later in life? The present study focuses on evaluating the causal effect of graduating with an honors degree in law in Germany on subsequent labor market outcomes such as earnings, employment in public service and self-employment. In addition, law graduates’ likelihood of continuing higher education by pursuing Ph.D. studies is examined. The case of German law graduates is of particular interest for a number of reasons. First, students of law in Germany receive an explicit honors degree (*Prädikatsexamen*) if they exceed a grade threshold of nine points in the overall grade point average (on a scale of 0 to 18). Second, in our observation period, the final examination was the responsibility of state law examination departments (and not of the universities), which makes the law degrees comparable. While the exact examination rules vary slightly by state, the honors degree status is generally accepted and students of law are free to work throughout Germany. Third, anecdotal evidence points to the major importance of the honors degree in determining future labor market outcomes. Both in the public and private sectors, an honors degree is often the explicit entrance requirement to positions of high responsibility and prestige.

The economic literature has put extensive effort into estimating causal pecuniary and non-pecuniary effects of education (see, for example, Card, 1999; Stephens and Yang, 2013 and references in this work as well as the recent surveys on non-pecuniary effects of schooling by Lochner, 2011 and Oreopoulos and Salvanes, 2011). Most of our understanding about the importance of education is from estimating causal

effects of an additional year of schooling. To achieve identification, scholars have used instrumental variable approaches based, for instance, on distance to institutions of education (Card, 1993; Altonji et al., 2005; Freier and Storck, 2012), or changes in compulsory schooling laws (Angrist and Krueger, 1991; Harmon and Walker, 1995; Oreopoulos, 2006; Pischke and Wachter, 2008; Brunello et al., 2009).

A second related body of literature studies the effects of being admitted to university in general, or to a particular college, or obtaining a certain degree or class of degree. Hoekstra (2009) and Saavedra (2009), for example, use a fuzzy regression discontinuity design based on university admission rules and report sizable positive effects of graduating from particular colleges on labor market outcomes such as employment and earnings. Kane and Rouse (1995), Jacobson et al. (2005) and Jepsen et al. (2014) study economic returns of attending colleges in the United States. The most recent study by Jepsen et al. (2014) analyzes labor-market returns to community college degrees, diplomas, and certificates based on administrative panel data from Kentucky. The authors find sizable positive returns, with associate’s degrees and diplomas resulting in quarterly earning returns of around \$1,500 for men and \$2,000 for women. The paper that is closest to our analysis is a study by Di Pietro (2010) for the United Kingdom. He finds that graduates just above or below several grade cut-offs—degree classes—do not differ significantly in their probability of being in employment or in continued education six months after graduation. Because of limitations of the data, however, the author is only able to examine labor market outcomes six months after graduating from university. A unique aspect of our paper is that we are able to study individuals’ labor market outcomes five to six years after graduating from university.

The present study contributes to this literature in several ways. First, it provides one of the first estimates on the labor-market returns to graduating with honors among university students. While previous studies mainly identify the causal effect of human capital at the lower end of the education distribution, our analysis focuses on economic returns at the upper end. Second, rich longitudinal data allows us to control for a comprehensive set of proxy variables for individuals’ ability, intelligence, and social background, as we have information on graduates’ high school grade point average, their university performances as well as on their mother’s and father’s highest general school degree and their parents’ highest vocational qualification obtained. Third, our study is the first in the field that combines a difference-in-differences method with entropy balancing to estimate causal labor-market returns to graduating from university.

Our analysis is mainly based on data from the University Graduates Panel (*Absolventenpanel*) provided by the DZHW organization (*German Centre for Research on Higher Education and Science Studies*). In the data, we first observe individuals one year after receiving their initial university degree. At this point, we observe their treatment status and collect important baseline characteristics such as gender, age, high school grade, comprehensive information on parental background, and academic career choice during the period of studies. Five to six years after graduation, the same individuals are surveyed a second time. We take all labor market outcome variables from this second wave.

Methodologically, we use a number of different strategies to identify the treatment effects. In the descriptive part of the paper, we use regression-control, matching techniques and entropy balancing. In our main specifications, we rely on a difference-in-differences (DiD) research design and a DiD strategy combined with entropy balancing. In both specifications, we make use of the fact that students of other subjects also take state bar exams, but do not have an explicit honors degree. By comparing law graduates (with and without an honors degree) to students of medicine and pharmacy (students with a high or low grade point average), we isolate the particular effects of the honors degree. In the sensitivity analysis, we also compare law graduates to economics and education graduates to shed additional light on the generalizability of our estimates.

In line with Spence's job market theory (Spence, 1973), our empirical findings suggest strong signaling effects of obtaining an honors degree for future labor market outcomes. We find that students of law who passed the state bar exam with an honors degree receive a sizable and significant earnings premium (about 14 percent), are more likely to work in the public sector (16 percentage points), are less likely to be self-employed (seven percentage points) and are more often engaged in Ph.D. studies (about 20 percentage points). Thus, we provide new evidence on the returns to education at the upper end of the educational distribution and complement the influential literature estimating treatment effects at the lower end of educational levels.

The paper is structured as follows: Section 2 lays out the institutional framework, Section 3 introduces the data, and Section 4 develops the empirical model. The key findings and various robustness checks are presented in Section 5. Moreover, Section 5 also discusses some limitations of the present study. The final section concludes.

2 Background and Institutional Setting

Law continues to rank among the most popular subjects for university studies in many industrialized countries, including Germany. In 2012, around 103,000 students (four percent of the student population) studied law in Germany.¹ Contrary to the Anglo-Saxon system, German students begin their law studies from day one at university directly after finishing high school. Unlike in most other fields of study, the examination for law graduates is not the responsibility of the universities, but instead it is organized by specific state law examination boards (*Landesjustizprüfungsämter*). While the education is state-specific, a law degree from any German state qualifies a student to practice law in the entire country.

Law students in Germany have to complete four stages to be able to practice law in all its varieties. First, students have to study law at a German university. On average, students attend university for ten semesters during which they study various fields of law. In order to successfully complete their studies at university, students take courses in civil, criminal, public, and procedural law, and one elective (*Schwerpunktbereich*), for instance, European and international law. Law students learn about the philosophical, historical, and social foundations of the law and techniques for applying the law in case studies.

After successfully completing their university education, students are entitled to register for the first state bar examination (*Erstes Staatsexamen*).² The first bar exam consists of several written tests followed by an oral test and a presentation. The exact regulations for the examination vary slightly across states. For example, the number of written tests varies between four and nine, and some states use different weighting for the written and the oral parts of the exam for the final grade point average. The committee that conducts the oral examination knows the results from the written tests and is therefore in a position to ultimately decide on the final grade.³ The grading scale for the final grade point average varies between 0 and 18 points and the grading

¹See, for example, <https://www.destatis.de/DE/ZahlenFakten/Indikatoren/LangeReihen/Bildung/lrbil103.html>.

²The first bar exam was reformed in 2003. Students who began their studies prior to 2003 and registered for the first bar exam no later than July 1, 2006, were tested according to the old examination regulations. This paper studies law graduates who graduated before the reform became effective.

³Generally, students are allowed to repeat the first bar exam once if they fail; those who pass the exam are not allowed to repeat it to obtain a better grade. Additionally, students who studied without interruption and registered for the exam before the end of the eighth and final semester are granted one extra free attempt (*Freiversuch*); those who fail the free attempt are allowed to repeat the exam as if they had not participated in the free attempt; those who pass the free attempt are allowed to repeat the exam once more to improve their grades. In our data, less than one percent of

is as detailed as two decimal points. A student passes the exam with four or more points. Traditionally, the field of law formally distinguishes graduates with an honors degree if they pass the final grade of the first exam with nine points or more. The grading scheme is very selective at the top. In 2005, for example, about 15.8 percent of all law graduates obtained an honors degree (Bundesamt für Justiz, 2006) and only three percent of all successful candidates scored a final grade above or equal to 11.5 points.

Conditional on passing the first exam, law candidates must complete a legal clerkship (*Referendariat*). This period typically lasts two to three years, during which time, students acquire further knowledge in law. Here, the particular focus is on the code of procedure. The candidates practice law as interns at different institutions. Typically, students work at a minimum of four different legal institutions, for instance, practicing civil law at a district court, criminal law at a criminal court or with a prosecutor, working in the legal administration or in an administrative court, as well as doing an internship in an attorney's office or a law firm.

As the fourth (and final) step in becoming a fully qualified lawyer, candidates have to pass a second (state) bar exam (*Zweites Staatsexamen*). The second exam again comprises written and oral tests and a presentation on knowledge acquired during the period of legal clerkship. The grading scheme follows the same procedure as in the first exam. In the second exam, candidates can also earn an honors degree if they pass with an average above nine points.

Anecdotal evidence points to the paramount importance of receiving an honors degree for career prospects in the private and public sectors. For example, in recent articles in the weekly newspaper *Der Spiegel*, it is argued that the final exam grades are crucial throughout a lawyer's entire career and that the grades are considered to be the key criteria in the hiring process (SPIEGEL, 2011, 2013). In the private sector, the top ten private law firms in Germany seem to require an outstanding performance in the first and second state bar exam.⁴ Some firms explicitly state on their websites that they are looking to recruit candidates who have at least an honors degree in both exams. A Master of Law (LL.M.) and a doctorate degree are also mentioned as being advantageous.

the graduates of the cohorts 1993 and 1997 indicated they had repeated the first bar exam after a free attempt. Unfortunately, we do not have this information for other cohorts and we have no data on whether students have repeated the exam.

⁴For an overview of the largest private law firms in Germany, see, <http://de.statista.com/statistik/daten/studie/191422/umfrage/die-zehn-groessten-kanzleien-in-deutschland-nach-anzahl-der-anwaelte/>.

In the public sector, the first and second bar exam also seem to be of exceptional importance. Judges and prosecutors are employed and recruited by the ministries of justice and higher regional courts of the federal states. According to the employment regulations posted on the official websites of these institutions, hiring criteria include an honors degree in the first and/or second bar exam with slight differences across states.⁵ Furthermore, the final grade of the second bar exam is still a crucial factor in the decision whether a practicing lawyer with three to five years of work experience is allowed to work as a notary.

3 Data and Descriptive Statistics

We use data from the University Graduates Panel (*Absolventenpanel*) from the DZHW organization (*German Centre for Research on Higher Education and Science Studies*) in Hanover. For detailed information about the data and the surveys, see <http://www.dzhw.eu>. Studies that have also used DZHW data are, for example, Parey and Waldinger (2011) and Grave and Goerlitz (2012). While the data contains information on university graduates from all fields, we focus mainly on law graduates. In the difference-in-differences specifications, we also use data for graduates from medicine and pharmacy, who also obtain state-certified degrees (Staatsexamen) when graduating from university. However, there are no explicit honors degrees in these fields. In sensitivity analyses, we also use economics and education graduates as alternative comparison groups.

We make use of the initial survey waves from the years 1994, 1998, 2002, and 2006. The initial surveys were conducted around one year after students passed the state bar exam. These surveys collect important information such as high school grade point average, location of high school (eastern or western Germany), completion of an apprenticeship before studying, duration of studies (in semesters), age at graduation, location of university (eastern or western Germany), and the highest general school degree, job qualifications and employment status of both parents. After four to five years, graduates are invited to participate in a follow-up survey (see Figure A-1 in

⁵About two-thirds of the federal states require minimum standards with respect to the first and second bar exam. For example, Saxony, Saxony-Anhalt and Schleswig-Holstein explicitly require an honors degree in both exams. Other states only require one of the exams to be an honors degree while the other should have been passed with at least 8.0 points. About one-third of the federal states indicate that they also employ graduates without an honors degree in either of the exams, but state they prefer graduates with an honors degree in both exams. Around two-thirds of the federal states apply rules which mainly concern the second bar exam. However, Bavaria and Rhineland-Palatinate are the only states which indicate that they only consider the grades obtained in the second bar exam in the hiring process.

the appendix for an illustration of our data structure). The follow-up surveys mainly collect labor market information. Overall, our main sample consists of around 800 law graduates and 1,400 medical and pharmacy graduates who successfully completed their university studies and state bar exams between 1993 and 2005.

Table 1 shows summary statistics, separately for the sample of law graduates and the sample of medical and pharmacy graduates. The upper panel in Table 1 provides descriptive statistics for the outcome variables. Four different outcome measures are used: 1.) monthly gross earnings (expressed in 2010 prices), 2.) an indicator variable that takes the value one if the individual is employed in the public service sector, 3.) an indicator variable for being self-employed, and 4.) an indicator variable for whether a person has obtained or pursues a Ph.D. All outcome variables come from the follow-up surveys.⁶ In addition to earnings returns to an honors degree, graduates' labor market choices are also studied. For instance, examining whether individuals acquired or are currently engaged in a doctoral degree is interesting because a doctoral degree in Germany does not only qualify people for an academic career: 90 percent of all doctoral degree holders in Germany work in industry or in public services. In contrast, around 30 percent of doctorate holders in the U.S. stay in academia (Janson et al. 2006). Second, a recent study by Mertens and Röbbken (2013) reports that doctoral holders in Germany have a higher average income than graduates without a doctoral degree. Third, graduates' decisions whether or not to work in the public sector are analyzed because positions at a court or in a ministry are of high prestige and imply very secure employment, as civil servants. Fourth, we study graduates' propensity to become self-employed as anecdotal evidence suggests that the decision to enter self-employment is often made by law graduates who have few other attractive job opportunities. Column 1 in Table 1 shows that, five to six years after passing the first bar exam, law graduates have average gross earnings of around 3,660 euros per month, 37 percent work in the public sector, fewer than one in five is self-employed, and 25 percent of them had completed or were engaged in Ph.D. studies at the time of the interview.

Columns 3 and 4 in Table 1 show the means and standard deviations for university graduates in medicine and pharmacy, who constitute our main comparison group in the difference-in-differences framework. Graduates in medicine and pharmacy earn on average 4,260 euros a month on average, 56 percent of them work in the public

⁶Graduates who report monthly gross earnings below 1,000 euros are dropped from the sample because measurement error is highly probable. This reduces the sample size by 69 observations (less than five percent). The estimates are similar when these individuals are included in the sample.

sector, 12 percent are self-employed, and 68 percent have completed or are engaged in Ph.D. studies. The unconditional differences in the labor market outcomes between law graduates and graduates in medicine and pharmacy are all statistically significant at the one percent level, as indicated by two-sample mean comparison tests in column 5 of Table 1.

The most important explanatory variable in our study is an indicator variable that takes the value one if a student of law obtained an honors degree, or medical and pharmacy students have a final grade in the top level of the grade distribution. To generate this variable, we make use of the self-reported grade point average in the first state bar exam which is elicited in the initial survey waves (e.g. from survey years 1994, 1998, 2002, and 2006).⁷ Law students who report a final grade of nine or above are defined as having an honors degree. Column 1 in Table 1 shows that 30 percent of law students received an honors degree in their first state bar exam. Column 3 reports the average grades of the final exam for medical and pharmacy graduates. It should be noted that the scale of grading differs from that of law graduates. Medical and pharmacy students receive a final grade between one and four, with a one indicating the highest, and a four indicating the lowest possible grade. On average, students from these fields leave university with a grade of 2.24. In order to distinguish between high- and lower-performing students among the medical and pharmacy graduates, we define those students who are in the top 23 percent of the grade distribution as high-performing students (equivalent to law graduates with an honors degree) and the others as lower-performing students (equivalent to law graduates without an honors degree). Results obtained using alternative thresholds are also presented in the robustness section below. High-performing students in medicine and pharmacy are alternatively defined as those whose final grade is among the top 18, 22, 25, 27, 30, and 32 percent in the grade distribution. Figure 1 displays the distribution of the average grades in the first state bar exam, separately for law graduates and for medical and pharmacy graduates. The figure shows that the majority of successful law candidates have an average grade between six and eight points, and only around ten percent score 12 or more points. Among medical and pharmacy students, around 25 percent graduate with a score higher than 2.0, and only 10 percent graduate with a grade of 1.5 or better.

Figure 2 shows the distribution of the log of gross monthly earnings for lawyers with and without an honors degree (upper panel) and for medical and pharmacy graduates

⁷For law graduates interviewed in 1994 and 1998, the grade variable takes integer values between 3 and 15, and in the waves 2001 and 2005, the grade average is shown to one decimal place.

with and without a top grade in their state bar exam (lower panel). The upper panel shows considerable differences in the earnings distribution between lawyers with and without an honors degree in their state bar exam five to six years after graduating from university. The differences are particularly striking at the bottom and top percentiles. Among medical and pharmacy graduates, the differences in earnings between top-performers and lower-performing graduates are more pronounced in the center of the income distribution.

Table 1 also shows summary statistics for a comprehensive set of control variables, which are all obtained from the initial survey waves. These are gender, high school grade point average, location of high school (eastern or western Germany), completion of an apprenticeship before studying, duration of studies (in semesters), whether labor market aspects played a role in the choice in the field of study, age at graduation from university, location of university (eastern or western Germany), having a child at the time of graduation, parents' highest general school degree, highest job qualification obtained, and mother's and father's employment status at the time of the interview for the initial survey. The descriptive statistics on parental background show, for example, that most graduates have highly educated parents, with 49 (53) percent of all fathers of law (medicine and pharmacy) graduates having obtained a university entrance qualification.

4 Empirical Specifications

A variety of different empirical strategies are used to estimate the effects of obtaining an honors degree on subsequent labor market outcomes. This section describes the empirical models in two parts. First, in the descriptive part, estimation methods that rely on the selection on observables assumption are discussed. Here, ordinary least square specifications (OLS), propensity score matching and entropy balancing estimators (PSMATCH and ENTROPY) are used, as well as fully interacted linear models (FILM). These methods are estimated using our sample of 828 lawyers. Second, approaches are introduced that aim to make use of quasi-experimental variation: a difference-in-differences specification (DiD) and a DiD research design combined with entropy balancing. For the DiD methods, the sample used is of lawyers, medical and pharmacy students, who all graduated from university having passed the state bar exam, comprising around 2,200 individuals.

4.1 Selection on Observables Research Designs

We begin our empirical analysis using a regression-control framework. The basic OLS specification is as follows:

$$Y_i = \beta_0 + \beta_1 \text{Honors}_i + X_i \delta + \epsilon_i, \quad (1)$$

for $i = 1, 2, \dots, 828$ lawyers. Y_i indicates one of the labor market outcomes of individual i , Honors_i is an indicator variable that takes the value one if the individual obtained an honors degree in law, and the vector X_i includes a rich set of control variables.

The parameter of interest is β_1 . To consistently estimate the causal effect of an honors degree, we require that $E(\epsilon_i | \text{Honors}_i, X_i) = 0$. This leads us to the selection on observables assumption that the OLS estimate ultimately hinges on. Given the set of observable control variables in X_i , our treatment variable Honors_i must be independent of additional confounding factors that also affect labor market outcomes, but remain unobserved in equation 1.

Hence, whether the OLS produces reliable estimates depends on the quality and relevance of the control variables in X_i . There are a number of obvious concerns about the exogeneity assumption of obtaining an honors degree. The first is that individuals' ability is of crucial importance both for selection into treatment as well as for labor market outcomes. Similarly, it is very likely that students' motivation, intelligence, and persistence are key drivers for obtaining an honors degree, and also for performing well in the labor market. While it is almost impossible to control for all relevant factors, the DZHW data allows us to capture what we believe to be the most important background characteristics. Apart from gender and age, we have information on the high-school grade performance that can serve as a proxy for students' ability and motivation. Moreover, we have self-reported indicators on the student effort over the period of studies (particularly the duration of studies and the motivation for studying with regard to the labor market). Finally, we can also control for the educational background and employment status of both the mother and the father. The literature on intergenerational transmission of educational and labor market outcomes advises us to also control for parental characteristics.

In addition to a regression-control framework, we also estimate propensity score and entropy balancing models. While matching relies on the same selection on observables assumption as OLS, the assumptions on functional form are markedly different. In the matching regressions, we identify the average treatment effect on the treated by linking

a number of control observations to each treated observation. Under the assumption that selection into treatment depends only on the variables that we observe, our estimate of the effect of an honors degree is consistently identified by taking the difference between law graduates with an honors degree and the appropriately weighted control group (those without an honors degree):

$$ATT = \frac{1}{N_T} \sum_{i=1}^{N_T} \left(Y_{T,i} - \sum_{j=1}^{N_{NT}} \omega(i, j) Y_{NT,j} \right) \quad (2)$$

where, N_T and N_{NT} are the number of treated and non-treated observations, respectively. The function $\omega(i, j)$ assigns a weight to individual j in the non-treated group depending on the identity of individual i in the treatment group. In practice, this weighting function can take different forms. We use radius matching in which we link each treated observation to all observations in the control group with a propensity score within a 0.01 caliper. In robustness checks, we also test the results with alternative matching estimators.⁸

Apart from the propensity score matching, we also apply entropy balancing as a reweighting technique to ensure comparability of the treatment and the control group. Entropy balancing assigns a weight to each observation of the control group directly so that the moments of the control variables of the reweighted control group are equal to the moments of the treated group (Hainmueller and Xu, 2013; Hainmueller, 2012). The weights are calculated so that a loss function using the directed Kullback (1959) entropy divergence as a distance metric is minimized under a set of pre-specified balance constraints imposed on the sample moments of the control variables. In the paper, the control variables' first three moments—namely the mean, variance and skewness—of the treatment and the control group are balanced. The main advantages of using entropy balancing rather than propensity matching techniques are an increase in balance quality, and the redundancy of potentially tedious balance checks since the covariate moments are automatically balanced by the algorithm (Hainmueller, 2012).

Fully interacted linear models are used to complement the OLS and matching analyses. Here, the treatment variable is interacted with all control variables to allow for maximal flexibility (also testing for heterogeneity in the treatment effect). If the treatment effect is driven only by one or several control variables, the FILM would pick that up. Note that, while the basic OLS does not allow for any heterogeneity in the treatment effect, the matching implicitly allows for complete flexibility, as each

⁸To implement matching, we use the Stata program *psmatch2* (Leuven and Sianesi, 2012).

treated observation is assigned a set of control observations. Consequently, the FILM provides an in-between solution between OLS and matching. The specification for the FILM reads as follows:

$$Y_i = \beta_0 + \beta_1 \text{Honors}_i + X_i \delta_0 + (X_i \cdot \text{Honors}_i) \delta_1 + \vartheta_i \quad (3)$$

where the addition to equation 1 is the term $X_i \cdot \text{Honors}_i$, which describes the interaction effects of all control variables with the treatment dummy.⁹

4.2 Difference-in-Differences Research Design

In this section, we describe the difference-in-differences (DiD) approaches. These are our main specifications, as they arguably rely on weaker identifying assumptions than the models based on the selection on observables assumption.

In the DiD research design, we make use of the fact that the DZHW data has information not only on law graduates, but also on university graduates from other fields. Graduates in medicine and pharmacy also obtain a formal degree from the state authorities (*Staatsexamen*), but there is no specific honors degree in medicine and pharmacy that can be obtained when graduating with a good or very good grade. Since medical and pharmacy students also have to pass a state bar exam, they are an appropriate comparison group. In the robustness section below, we also report the results when using economics graduates and teachers as alternative comparison groups.

The main idea of the DiD research design in our setting is to compare labor market outcomes of law students to students of medicine and pharmacy across the grade distribution in the first state bar exam. In particular, we compare labor market outcomes of four different groups: high- and lower-performing students from law, and medicine and pharmacy, respectively. As about 30 percent of all students in law included in the data obtain an honors degree, we also code the best students in the other two fields into an artificial honors degree group (although they do not formally obtain a degree with honors). The empirical model is specified as follows:

$$Y_i = \gamma_0 + \gamma_1 \text{Honors}_i + \gamma_2 \text{Law}_i + \gamma_3 (\text{Law}_i \cdot \text{Honors}_i) + X_i \delta + \varphi_i, \quad (4)$$

for $i = 1, 2, \dots, 2200$ law, medical and pharmacy graduates. The parameter of interest is γ_3 , measuring the additional contribution to the outcome variable that can be

⁹For a FILM application see for instance Battistin et al. (2012).

attributed to the interaction between an honors degree and the field of law. The main assumption of the DiD research design is the common trend assumption. In the absence of a formal honors degree in law, labor market outcomes between high-performing and lower-performing students in law, and in medicine and pharmacy should evolve equally. The main problem of analyzing the common trend in our setting is the different grading scales in law on the one hand, and medicine and pharmacy on the other hand—a common grading scale is not available. In unreported figures, we tried to investigate whether this assumption is likely to hold. For example, we graphically displayed the average value of the outcome variables per score (grade) percentile for law (medicine and pharmacy graduates). The graphs showed a common trend for the outcome variable $\log(\text{wages})$, whereas the trend was not perfect for the other three outcome variables. However, because of the grouped and rounded nature of the scores (grades) and bunching (e.g., many medicine students graduate with a 2.0), it is impossible to adequately distinguish between percentiles and to graphically assess the common trend assumption. To assess the robustness of our findings, we therefore use various comparison groups (e.g., medicine and pharmacy, economics and education graduates).

We also combine the differences-in-differences estimator with entropy balancing. Combining both methods has several advantages over using one estimation method only. The basic idea of combining difference-in-differences with matching is to reduce bias due to grade-invariant unobservables, and bias due to different distributions of covariates in the treatment and control groups (Heckman et al., 1997; Blundell et al., 2004; Abadie, 2005). In the context of this paper, we first use entropy balancing within groups so that law graduates with an honors degree are matched to law graduates without an honors degree, and medical and pharmacy graduates at the top of the grade distribution are matched to medical and pharmacy graduates with lower grades. The entropy balancing part of the estimator reduces bias due to differences in observables between the treatment and control groups. We then use the difference-in-differences part of the estimator to reduce bias due to unobservables that accompany the increase in the skill distribution, but should remain constant between the treatment and control groups.

5 Results

Our results will be presented in four steps. First, the descriptive evidence from the selection on observables models will be discussed. Next, the results from the difference-

in-differences specifications with and without entropy balancing will be presented. In subsection 5.3, we turn to the robustness and validity analysis. Finally, some limitations and potential concerns will be addressed in Section 5.4.

5.1 Selection on Observables Models

Table 2 shows the results from six different selection on observable models for the four outcome measures. The first three columns in Table 2 present OLS estimates with different sets of covariates. Column 1 presents the results of simple linear regressions with an indicator variable for having an honors degree as the only explanatory variable. The OLS regressions in column 2 additionally control for a rich set of explanatory variables such as individual’s age, gender, high school degree, and parents’ highest educational qualification, and in column 3 we also add cohort dummy variables.¹⁰ Column 4 in Table 2 contains the results obtained from the fully interacted linear models, and columns 5 and 6 report the estimates from the propensity score and entropy balancing, respectively. Each estimated coefficient presents the results of a separate regression, with robust standard errors in parentheses.

Panel 1 in Table 2 presents the earnings returns to graduating with honors. The estimates of graduating with honors are notably positive and significant in all models and specifications. In the simple OLS regression in column 1, the estimate suggests positive wage returns to graduating with honors of 24 percent ($\exp(0.218)-1$).¹¹ However, when controlling for additional explanatory variables, the estimates drop considerably. Nevertheless, they remain significantly positive at about 13 percent. These results are notable because the magnitude of the effect drops by almost 50 percent when controlling for important background variables, such as the average high school grade and parents’ highest educational degree, which are likely to be good proxies for unobserved factors, such as motivation, ability, and intelligence. Hence, the simple OLS estimates are likely to be biased upwards. The magnitude of the earnings returns is confirmed by the FILM, PSMATCH and ENTROPY estimates. These models also suggest positive and statistically significant earnings returns of around 14 to 15 percent.¹²

In addition to individual earnings, we also study alternative labor market outcomes. In particular, panels 2–4 in Table 2 show the results for the probability of being employed

¹⁰See notes to Table 2 for the full list of explanatory variables.

¹¹Note that, throughout the present article, the estimated coefficients are interpreted in terms of percentage changes in the log-level models using the formula $(\exp(\hat{\beta}_1) - 1)$ or $(\exp(\hat{\gamma}_3) - 1)$.

¹²Estimated coefficients for all explanatory variables are reported in Table A-1 in the appendix.

in the public sector, the probability of being self-employed, and the likelihood of having completed or being engaged in Ph.D. studies five to six years after graduating from university.¹³ The findings suggest that an honors degree changes labor market outcomes markedly. Students who earned an honors degree are 19–22 percentage points *more* likely to be employed in the public sector, 8–9 percentage points *less* likely to be self-employed and 25–29 percentage points *more* likely to have completed or to be engaged in Ph.D. studies (columns 2–6, panels 2–4 in Table 2). The majority of estimates are statistically different from zero at the one percent level. Moreover, these are sizable effects. For example, an increase in the likelihood of being employed in the public sector by 19–22 percentage points corresponds to an increase of around 51 to 59 percent, evaluated at the proportion of law graduates who are employed in the public sector (37 percent). Similarly, a decrease in the likelihood of being self-employed by eight to nine percentage points corresponds to a reduction in the order of 42–47 percent (19 percent of lawyer graduates are self-employed).

5.2 Difference-in-Differences Models

Table 3 shows the results of our difference-in-differences specifications. Panel 1 presents the estimates from simple difference-in-differences regressions, and panel 2 indicates the results from difference-in-differences models combined with entropy balancing. For each outcome measure, we report the results from two different specifications. In the first specification, we do not control for additional explanatory variables other than $Honors_i$, Law_i and the interaction of these two variables. In the second specification, we add a rich set of control variables and cohort-fixed effects.¹⁴ When interpreting the results, we focus our attention on the estimate of the parameter γ_3 from equation 4, i.e., the estimated coefficient on the interaction term of graduating in law with an honors degree.

For earnings, we again find sizable and significant positive effects of graduating with an honors degree. The simple DiD estimate suggests that graduating with an honors degree increases earnings by around 19 percent ($\exp(0.175)-1$). The results from our

¹³Initially, we also aimed to study graduates’ labor market participation. However, participation rates are very high, both among men and women, with an average of over 90 percent active in the labor market. Hence, there is very little variation in labor market participation among students five to six years after graduating from university.

¹⁴In the difference-in-differences with entropy balancing model, the first specification implies that the control variables and cohort-fixed effects are not used in the second stage of the estimation (DiD). However, all control variables are used in the initial entropy balancing procedures.

preferred specification—the DiD research design combined with entropy balancing—also point to positive earnings effects in the order of 14 percent. Note that the magnitude of this effect is very similar to the estimates in Table 2, columns 2 to 6. In fact, the DiD combined with entropy balancing estimates is not significantly different from any of the points estimates in column 2 to 6 in Table 2. As a benchmark for the magnitude of these effects, note that Oreopoulos (2006), for example, reports positive returns to earnings from compulsory schooling in the U.S., U.K. and Canada of between 10 and 14 percent. Hence, the economic returns to an honors degree are comparable to roughly one more year of education and are slightly higher than the returns to a doctoral degree in Germany (Mertens and Rübken, 2013).

For our three additional labor market outcomes, we also find the same pattern as before. In our preferred DiD with entropy balancing specification, we find positive and significant effects on the probability of being publicly employed and having completed or being engaged in Ph.D. studies. The probability of working in the public sector increases by around 16 percentage points (Table 3, panel 2, columns 3–4) and the likelihood of having completed or being engaged in Ph.D. studies increases by about 20 percentage points (columns 7–8). Similarly, graduates with an honors degree are less likely to be self-employed five to six years after graduation, with a decrease in the probability of this of about seven percentage points. Comparing the estimates of the simple DiD specification with those of the DiD with entropy balancing indicates that the magnitude of the estimates is generally slightly lower when the latter estimation method is applied. While these differences are not to be neglected, they remain mostly insignificant. We interpret the differences between the two research designs as evidence that combining DiD with the entropy balancing does indeed successfully reduce the within-group bias that we cannot fully control for in the simple DiD research design.

Previous studies report higher labor-market returns for women than for men. Jepsen et al. (2014) find quarterly earnings returns for associate’s degrees and diplomas of around \$2,400 for women and \$1,500 for men. Similarly, Jacobson et al. (2005) report that an additional year of community college in the US increases long-term earnings by around 13 percent for women, and nine percent for men. Table 4 reports difference-in-differences estimates by gender. In line with the existing literature, we find empirical evidence that female graduates benefit more from an honors degree than men in terms of earnings, with the difference of 20 percentage points being statistically significant at the 5 percent level. Moreover, the probability of working in the public sector increases by around 32 percentage points for women compared to 22 percentage points for men. The estimates further suggest that the decrease in the likelihood to become

self-employed is lower for women than for men in case they graduate with an honors degree. With the exception for earnings, however, these differences are not statistically significant at the 5 percent level.

5.3 Robustness and Validity

In this section, we evaluate the robustness and validity of our results. First, we present empirical evidence for the quality of the matching estimations by highlighting the common support and the moments of the entropy balancing in the selection on observable models. Second, we estimate a series of robustness models with alternative matching specifications. Third, several robustness specifications for the DiD research design combined with entropy balancing are presented. Fourth, the potential problem of selected attrition is examined. Finally, we discuss possibilities of estimating a regression discontinuity design in the present context.

Quality of Matching and Entropy Balancing. Figure A-2 and Table A-2 highlight the good quality of the propensity matching estimators and entropy balancing, respectively. The common support in our matching analysis is shown separately in Figure A-2 for each of the four outcome measures. While we need to exclude a few treated observations at the top of the propensity score distributions (indicated by the green areas), we generally have substantial common support. Table A-2 shows the first two moments of the explanatory variables in the entropy balancing models for the treated group (law graduates with an honors degree) and the control group (law graduates without an honors degree), before and after matching. Comparing the means and variances in columns 1 and 2 of Table A-2, with those in columns 5 and 6, respectively, shows that balancing is almost perfect, due to the mechanical effect of the entropy balancing algorithm. For example, before entropy balancing, law graduates with an honors degree have an average high school grade of 1.7, compared to 2.2 among law students who graduated without an honors degree. After entropy balancing, the average high school grade of both groups is exactly 1.7, with an identical variance.

To further test the robustness of the matching results, we estimated a number of additional models. Table A-4 in the appendix reports the results when smaller and larger calipers are used in the radius matching (columns 1 and 2), estimates from nearest neighbor and kernel matching (columns 3 and 4), and results from Mahalanobis distance matching (column 5).¹⁵ Also, we re-estimated the entropy balancing models by

¹⁵For a detailed overview of the various propensity score matching methods, see, for example,

condition on the means and variances (column 6) and the means only (column 7), respectively. Note that the entropy balancing results in Table 2 are based on balancing the first three moments of the control variables (e.g., mean, variance and skewness). Overall, the results in Table A-4 show that the findings are very robust across various matching implementations.

Different Moments and Threshold Definitions. For the DiD combined with entropy balancing specifications, we also ran a series of robustness tests. First, we modified the exact implementation of entropy balancing. Table A-5 presents the results when the moments in the DiD with entropy balancing models from all three moments in column 1 are limited to two moments (mean and variance) in column 2, and to just one moment (mean) in column 3. The estimates show that, even when balancing the explanatory variables only on the mean, we find almost the same results as in our main specifications.¹⁶ Second, we distinguished between different groups when defining high-performing and lower-performing graduates in medicine and pharmacy. Previously, we compared the labor market outcomes of honors degree students in law to students of law without an honors degree, relative to high-performing and lower-performing students in medicine and pharmacy. So far, we artificially assigned an honors degree to 23 percent of the best medicine and pharmacy students. Table A-6 reports whether the results change when alternative thresholds are used, i.e., defining the best 18, 22, 25, 27, 30, and 32 percent of medical and pharmacy students as high-performing graduates. Overall, the results lead to similar conclusions to those in Table 3. In particular, the estimates remain very stable when artificially defining more and more graduates as high-performing students in the control group.¹⁷

Alternative Comparison Groups. In a further test of the DiD combined with the entropy balancing approach, we compare the labor market outcomes of law graduates to those of economists and school teachers. Despite the fact that teachers in Germany also graduate with a state degree, we use them as a comparison group in the robustness exercises only, because teachers generally have a very flat wage-skill profile, are mainly employed in the public sector, are hardly ever self-employed and rarely choose to engage in Ph.D. studies. In contrast, economists do not graduate with a state bar exam, but experience a wage-skill profile that is quite similar to those of lawyers. Further, a comparison with economics graduates is interesting because both economists

Caliendo and Kopeinig (2008).

¹⁶This result may not be surprising since many of our covariates are binary.

¹⁷Note, however, that the estimates for the outcome variable self-employment are no longer statistically significant at conventional levels in columns 4 to 6 of Table A-6, and are lower in magnitude than the point estimates in columns 1 and 2.

and lawyers are likely to have careers in management and leadership positions. The estimates in Table A-7 indicate that our general findings do not change. Comparing lawyers to teachers or economists—instead of students of medicine and pharmacy—results in estimates of similar sign and magnitude to those in Table 3 above. Since the results are robust to several alternative comparison groups (and to various grade thresholds for the comparison groups), we argue that our findings strongly support the anecdotal evidence in the public press that honors degrees have high labor-market returns (SPIEGEL, 2013, 2011).

Sample Attrition. Next, we investigate possible biases due to selected sample attrition. Table A-8 shows the number of graduates participating in the two survey waves, separately for field of study and academic performance. The table documents that there is substantial attrition with only 49 (42) percent of law (medical and pharmacy) graduates participating in the second wave. Further, the unconditional means show a higher attrition rate among those without an honors degree or those who are not top performers, compared to lower-performing graduates. To test whether differences in attrition rates between treatment and comparison group might bias our estimates, Table A-9 shows results from linear probability regressions and marginal effects from probit models on graduates' likelihood of participating in the second wave. Columns 1 and 2 in Table A-9 report whether law students with an honors degree are more likely to remain in the panel than those without an honors degree, and columns 2 and 3 report potential differences in panel attrition among medical and pharmacy students according to their performance in their studies. Finally, the last column in the table shows estimates from a DiD regression for law and medicine/pharmacy graduates on the likelihood of participating in the second panel wave. None of the estimates in Table A-9 suggest significant differences in the attrition rate between treatment and comparison groups. Hence, it is very unlikely that the estimates are biased due to selected attrition.

Regression Discontinuity Design. At an early stage of the project, we contemplated using a regression discontinuity design (RDD). The idea was to use the 9.0 grade threshold as a sharp discontinuity at which treatment into the honor degree status changes discontinuously. Unfortunately, this type of analysis was not productive for two reasons. First, we observe too few observations close enough to the threshold. Within the close range of 8.5 to 9.4, we observed only 41 observations. As the RDD relies only on the variation from the sample close to the threshold, the fact that we have so few observations makes a credible RDD strategy impossible. Second, when inspecting the frequency of observations just around the honors threshold, we noted

that there seems to be some local manipulation at the cut-off point. Looking only at observations with 8.8 and 8.9 versus 9.0, we realized that there are twice as many observations just to the right compared to just to the left of the threshold. One possible explanation might be that the committee in the oral examination uses its discretion to avoid grades just below the honors degree and gives these students close to the threshold a higher grade of 9.0.¹⁸ Noteworthy, despite the apparent bunching at the threshold, we found no evidence of unbalanced observable characteristics below and above the cut-off point.

5.4 Discussion

The results point towards sizable and significant effects of obtaining an honors degree on subsequent labor market outcomes. In terms of earnings, we report estimates from the selection-on-observables models as well as from our quasi-experimental approaches in the order of 13–15 percent.

Three issues with the reported results warrant further discussion. First, we should again stress that we observe our outcome variables for the law students (only) five to six years after they passed the first state bar exam. As law students spend two to three years in legal clerkship and often pursue a Ph.D. degree after the first bar exam, this implies that many are really only at the beginning of their labor market career. Ideally, we would like to observe the individuals also later in life in order to examine longer-term labor market effects of graduating with an honors degree. However, the fact that we already observe differences in career patterns at this early stage implies that our estimates are likely to present lower bounds of the overall labor market effects.

Second, we show that the honors degree affects the careers of law students in terms of earnings as well as along other dimensions. Honors degree students are significantly more likely to be employed in public service and/or continue their academic career by pursuing and completing Ph.D. studies. Also, they are significantly less likely to start their own business in law. While these results are interesting for their own sake, they may also interact with the earnings effect. Employment in the public sector and pursuit of Ph.D. studies in particular are likely to suppress earning levels of law students with an honors degree at the beginning of their career. Even here, we presume that our reported earning differential can only serve as a lower bound to

¹⁸It is probably precisely because committee members know how important it is to graduate with an honors degree that they are reluctant to give a grade just below the threshold of nine points.

the overall life-cycle effect on earnings. In fact, if we limit the analysis to the private sector, we find that the earnings effects are indeed greater than the average effects. The estimates in the DiD specification indicate an earnings effect between 25–35 percent if we limit the analysis to graduates working in the private sector. Of course, this can only serve to provide an approximation in terms of potential interactions between earnings and type of employment because employment choices are likely to be endogenous to earnings. However, the result of this heterogeneity exercise suggests that the above interpretation is likely to be appropriate in terms of estimating lower bounds of economic returns to education.

Third, we need to critically review the fact that we only use the first state bar exam as the treatment variable. Law students are also required to take a second state bar exam (which we have no information on in our data), in which they can again obtain an honors degree. Naturally, we would assume that graduates with honors degrees in both exams fare best in the labor market, compared to those without any honors or only one honors degree. Significantly, this restriction only limits the scope of our analysis, but is not a threat to the validity of our results. Even if we had data on the second exam, a joint analysis of both exams would not be straightforward, as the outcome of the second bar exam is very likely to be linked to that of the first. Hence, the second state bar exam might be considered as an outcome of the first state bar exam.

6 Conclusions

This paper presents evidence on the labor-market returns to graduating with an honors degree. We exploit rich longitudinal data from the University Graduates Panel in Germany, which interviews students one and five to six years after graduating from university. The study examines the importance of honors degrees for future labor market success in the context of German law students who pass a state bar exam. Graduates in medicine and pharmacy, who constitute the comparison group, also obtain a formal degree from the state authorities (*Staatsexamen*). However, for these fields of study, there is no specific honors degree that can be obtained when graduating with an outstanding performance.

In the preferred specifications, we estimate the effects of an honors degree by applying a difference-in-differences estimation strategy combined with entropy balancing. By combining both methods, we argue that it is very likely that our findings are not driven by unobserved ability, family background, or different trends between treatment and

comparison groups. The estimates suggest that graduating with an honors degree has substantial effects on individuals' labor market outcomes. We find that students with an honors degree have around 14 percent higher earnings than those who do not graduate with honors. In addition, those who graduate with an honors degree are significantly more likely to work in the public sector, and to continue in higher education by pursuing Ph.D. studies. Moreover, they have a considerably lower likelihood of being self-employed five to six years after graduating from university. The results are robust to various sensitivity analyses, such as potential selected attrition, different comparison groups (e.g., economics and education graduates), alternative definitions of graduating with an excellent grade among the comparison groups (e.g., being in the top 18 to 32 percent of the grade distribution), as well as using different entropy balancing moments when applying the difference-in-differences methodology combined with entropy balancing.

Overall, the present findings complement the large body of literature on the returns to schooling exploiting changes in compulsory schooling laws over time and across regions as exogenous variation. These studies mainly identify local average treatment effects at the lower end, whereas the present study estimates the returns at the upper end of the education distribution. Thus, we contribute to and complement the relatively small body of literature on economic returns to certificates and college degrees (Kane and Rouse, 1995; Jacobson et al., 2005; Jepsen et al., 2014). Overall, this is one of the first studies documenting that an outstanding performance when graduating from university has considerable causal effects on students' labor market choices and results in significantly higher earnings later in life.

References

- ABADIE, A. (2005): “Semiparametric Difference-in-Differences Estimators,” *Review of Economic Studies*, 72, 1–19.
- ALTONJI, J. G., T. E. ELDER, AND C. R. TABER (2005): “An Evaluation of Instrumental Variable Strategies for Estimating the Effects of Catholic Schooling,” *Journal of Human Resources*, 40, 791–821.
- ANGRIST, J. D. AND A. B. KRUEGER (1991): “Does Compulsory School Attendance Affect Schooling and Earnings?” *Quarterly Journal of Economics*, 106, 979–1014.
- BATTISTIN, E., M. DE NADAI, AND B. SIANESI (2012): “Misreported Schooling, Multiple Measures and Returns to Educational Qualifications,” IZA Discussion Paper 6337, IZA, Bonn.
- BLUNDELL, R., L. DEARDEN, A. GOODMAN, AND H. REED (2000): “The Returns to Higher Education in Britain: Evidence From a British Cohort,” *The Economic Journal*, 110, 82–99.
- BLUNDELL, R., C. MEGHIR, M. C. DIAS, AND J. V. REENEN (2004): “Evaluating the Employment Impact of a Mandatory Job Search Program,” *Journal of the European Economic Association*, 2, 569–606.
- BRIEDIS, K. (2007): “Übergänge und Erfahrungen nach dem Hochschulabschluss: Ergebnisse der HIS-Absolventenbefragung des Jahrgangs 2005,” Dokumentation HIS, Hannover.
- BRUNELLO, G., M. FORT, AND G. WEBER (2009): “Changes in Compulsory Schooling, Education and the Distribution of Wages in Europe,” *Economic Journal*, 119, 516–539.
- BUNDESAMT FÜR JUSTIZ (2006): “Ausbildungsstatistik 2006,” <https://www.bundesjustizamt.de/justizstatistik>, accessed: 2013-12-18.
- CARD, D. (1993): “Using Geographic Variation in College Proximity to Estimate the Return to Schooling,” Working Paper 4483, National Bureau of Economic Research.
- (1999): “The Causal Effect of Education on Earnings,” in *Handbook of Labor Economics*, ed. by Orley C. Ashenfelter and David Card, Elsevier, vol. Volume 3, Part A, 1801–1863.

- DI PIETRO, G. (2010): “The Impact of Degree Class on the First Destinations of Graduates: A Regression Discontinuity Approach,” IZA Discussion Paper 4836, IZA, Bonn.
- FREIER, R. AND J. STORCK (2012): “The Treatment Effect of Attending a High-Quality School and the Influence of Unobservables,” SOEPpapers on Multidisciplinary Panel Data Research 530, DIW Berlin, The German Socio-Economic Panel (SOEP).
- GOLDIN, C. D. AND L. F. KATZ (2010): *The Race between Education and Technology*, Cambridge: Harvard University Press.
- GRAVE, B. S. AND K. GOERLITZ (2012): “Wage Differentials by Field of Study – The Case of German University Graduates,” *Education Economics*, 20, 284–302.
- HAINMUELLER, J. (2012): “Entropy Balancing for Causal Effects: A Multivariate Reweighting Method to Produce Balanced Samples in Observational Studies,” *Political Analysis*, 20, 25–46.
- HAINMUELLER, J. AND Y. XU (2013): “ebalance: A Stata Package for Entropy Balancing,” *Journal of Statistical Software*, 54, 1–18.
- HARMON, C. AND I. WALKER (1995): “Estimates of the Economic Return to Schooling for the United Kingdom,” *American Economic Review*, 85, 1278–1286.
- HECKMAN, J. J., H. ICHIMURA, AND P. E. TODD (1997): “Matching As An Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Programme,” *Review of Economic Studies*, 64, 605–654.
- HOEKSTRA, M. (2009): “The Effect of Attending the Flagship State University on Earnings: A Discontinuity-Based Approach,” *Review of Economics and Statistics*, 91, 717–724.
- JACOBSON, L., R. LALONDE, AND D. G. SULLIVAN (2005): “Estimating the Returns to Community College Schooling for Displaced Workers,” *Journal of Econometrics*, 125, 271–304.
- JEPSEN, C., K. TROSKE, AND P. COOMES (2014): “The Labor-Market Returns to Community College Degrees, Diplomas, and Certificates,” *Journal of Labor Economics*, 32, 95–121.

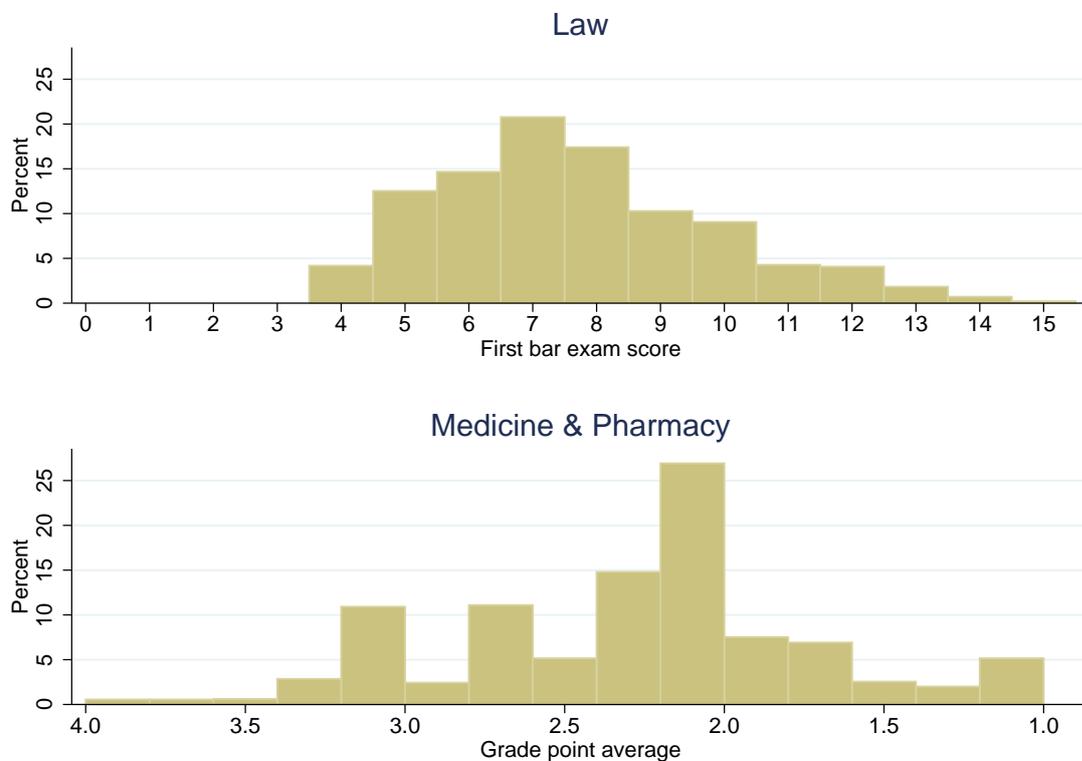
- KANE, T. J. AND C. E. ROUSE (1995): “Labor-Market Returns to Two- and Four-Year College,” *American Economic Review*, 85, 600–614.
- KULLBACK, S. (1959): *Information theory and statistics*, Wiley publications in statistics, New York, NY: Wiley [u.a.].
- LEUVEN, E. AND B. SIANESI (2012): “PSMATCH2: Stata Module to Perform Full Mahalanobis and Propensity Score Matching, Common Support Graphing, and Covariate Imbalance Testing,” Software, <http://ideas.repec.org/c/boc/bocode/s432001.html>, accessed: 2013-12-18.
- LOCHNER, L. (2011): “Nonproduction Benefits of Education: Crime, Health, and Good Citizenship,” in *Handbook of the Economics of Education*, ed. by S. M. Eric A. Hanushek and L. Woessmann, Elsevier, vol. Volume 4, 183–282.
- MERTENS, A. AND H. RÖBKEN (2013): “Does a Doctoral Degree Pay Off? An Empirical Analysis of Rates of Return of German Doctorate Holders,” *Higher Education*, 66, 217–231.
- OECD (2013): *Education at a Glance 2013: OECD Indicators*, OECD Publishing.
- OREOPOULOS, P. (2006): “Estimating Average and Local Average Treatment Effects of Education When Compulsory Schooling Laws Really Matter,” *American Economic Review*, 96, 152–175.
- OREOPOULOS, P. AND K. G. SALVANES (2011): “Priceless: The Nonpecuniary Benefits of Schooling,” *Journal of Economic Perspectives*, 25, 159–184.
- PAREY, M. AND F. WALDINGER (2011): “Studying Abroad and the Effect on International Labour Market Mobility: Evidence from the Introduction of ERASMUS,” *Economic Journal*, 121, 194–222.
- PISCHKE, J.-S. AND T. V. WACHTER (2008): “Zero Returns to Compulsory Schooling in Germany: Evidence and Interpretation,” *Review of Economics and Statistics*, 90, 592–598.
- SAAVEDRA, J. E. (2009): “The Learning and Early Labor Market Effects of College Quality: A Regression Discontinuity Analysis,” Working Paper.
- SPENCE, M. (1973): “Job Market Signaling,” *Quarterly Journal of Economics*, 87, 355–374.

SPIEGEL (2011): “Jura-Absolventen: Sklaven der Noten,” <http://www.spiegel.de/karriere/berufsstart/jura-absolventen-sklaven-der-noten-a-753598.html>, accessed: 2013-12-18.

——— (2013): “Berufsstart junger Juristen: Prädikat besonders wertvoll,” <http://www.spiegel.de/karriere/berufsstart/chancen-junger-juristen-berufsstart-ohne-praedikatsexamen-a-913430.html>, accessed: 2013-12-18.

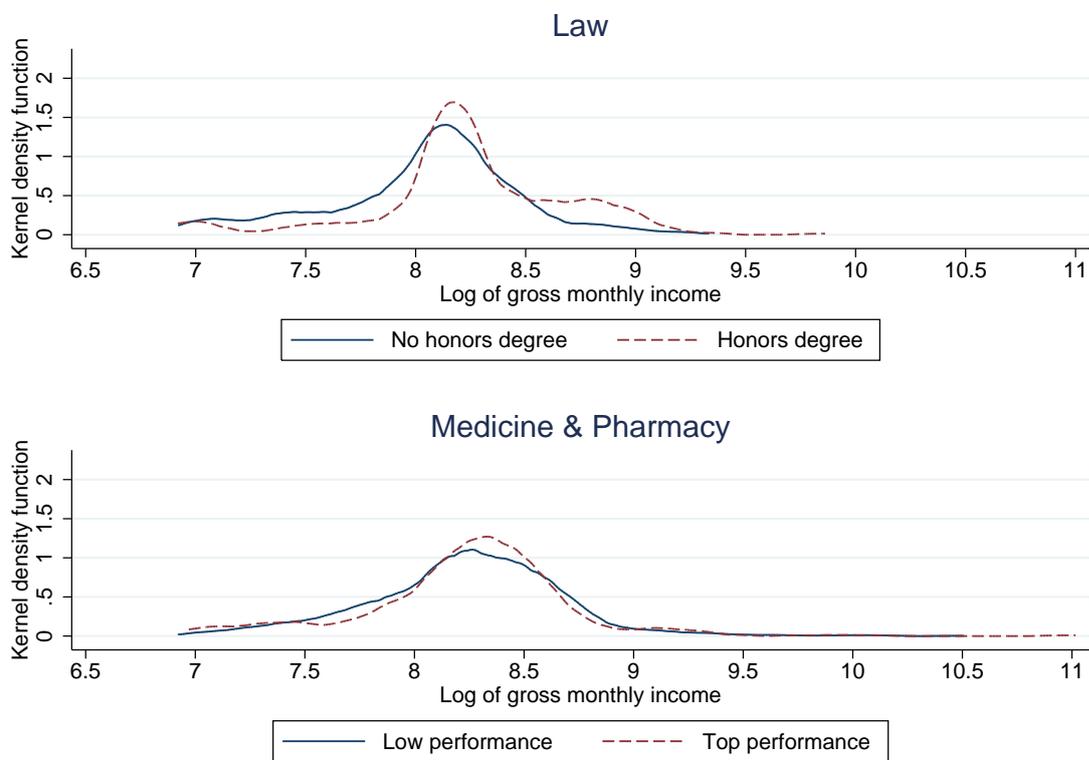
STEPHENS, MELVIN, J. AND D.-Y. YANG (2013): “Compulsory Education and the Benefits of Schooling,” *American Economic Review*, forthcoming.

Figure 1: Histogram of average grade points in the first bar exam of law graduates and medicine and pharmacy graduates



Notes: The upper (lower) panel displays the distribution of the average score (grade) of the first state bar exam of law (medicine and pharmacy) for students from the cohorts 1993, 1997, 2001 and 2005. The grading scale for lawyers is between 0-18 points. More points indicate a better performance. The grading scale for medicine and pharmacy graduates is between 4.0 and 1.0. The lower the grade, the better the performance.

Figure 2: Kernel density of the log of monthly gross earnings of law graduates and medicine and pharmacy graduates, by study performance



Notes: The upper (lower) panel in the figure shows kernel density functions of the log of monthly gross earnings separately for law graduates with an honors degree (medicine and pharmacy graduates with a top study performance, i.e. among the best 23 percent) (dashed line) and law graduates without an honors degree (medicine and pharmacy graduates without a top study performance) (solid line) using an Epanechnikov kernel.

Table 1: Descriptive statistics

	Law		Medicine & pharmacy		Difference
	Mean	Sd	Mean	Sd	
	(1)	(2)	(3)	(4)	(5)
<i>Outcomes</i>					
Monthly gross earnings ^a	3663.72	1698.83	4259.65	2780.23	-595.935***
Public employment ^a	0.37	0.48	0.56	0.50	-0.190***
Self-employment ^a	0.19	0.39	0.12	0.32	0.069***
Engaged in Ph.D. studies ^a	0.25	0.43	0.68	0.47	-0.432***
<i>Treatment</i>					
Honors degree/top performance ^b	0.30	0.46	0.23	0.42	0.076***
First bar exam score	7.70	2.22	.	.	
University grade point average	.	.	2.24	0.58	
<i>Demographics</i>					
Female	0.46	0.50	0.65	0.48	-0.185***
Age at graduation	25.82	2.28	27.35	2.51	-1.533***
Children at graduation	0.04	0.20	0.11	0.32	-0.071***
Apprenticeship completed	0.18	0.38	0.20	0.40	-0.023
University: western Germany	0.87	0.34	0.76	0.43	0.109***
University: eastern Germany	0.12	0.32	0.24	0.43	-0.120***
University: abroad	0.01	0.10	0.00	0.00	0.011***
Study length (in semesters)	10.40	1.95	12.74	2.22	-2.344***
Study choice: labor market aspects ^c	3.31	1.21	3.94	1.18	-0.629***
High school grade	2.06	0.61	1.97	0.61	0.092***
High school: western Germany	0.86	0.35	0.84	0.37	0.020
High school: eastern Germany	0.14	0.34	0.15	0.36	-0.014
High school: abroad	0.00	0.07	0.01	0.10	-0.006*
<i>Father's highest general school degree</i>					
University entrance degree	0.49	0.50	0.53	0.50	-0.038*
College entrance degree	0.10	0.30	0.12	0.32	-0.021
Intermediate-track school degree	0.18	0.38	0.14	0.34	0.041**
Low-track school degree	0.22	0.41	0.20	0.40	0.017
No school degree	0.01	0.10	0.01	0.08	0.003
<i>Mother's highest general school degree</i>					
University entrance degree	0.31	0.46	0.37	0.48	-0.062***
College entrance degree	0.05	0.21	0.06	0.24	-0.011
Intermediate-track school degree	0.36	0.48	0.31	0.46	0.050**
Low-track school degree	0.26	0.44	0.24	0.43	0.018
No school degree	0.01	0.11	0.01	0.10	0.002
<i>Father's job qualification/highest educational degree</i>					
University	0.43	0.50	0.48	0.50	-0.055**

continued on next page ...

... continued from previous page

College	0.16	0.37	0.16	0.37	0.001
Fachschule (GDR)	0.00	0.06	0.01	0.09	-0.004
Trade and technical school	0.12	0.32	0.12	0.32	0.000
Apprenticeship	0.25	0.43	0.20	0.40	0.051***
No further degree	0.02	0.15	0.02	0.14	0.003
<i>Mother's job qualification/highest educational degree</i>					
University	0.24	0.43	0.30	0.46	-0.056***
College	0.06	0.24	0.07	0.25	-0.006
Fachschule (GDR)	0.02	0.14	0.03	0.16	-0.006
Trade and technical school	0.05	0.21	0.05	0.22	-0.005
Apprenticeship	0.49	0.50	0.43	0.49	0.062***
No further degree	0.12	0.32	0.11	0.31	0.007
<i>Father's employment status</i>					
Self-employed	0.23	0.42	0.28	0.45	-0.055***
Employee	0.38	0.49	0.37	0.48	0.008
Civil servant	0.29	0.45	0.25	0.43	0.044**
Worker	0.08	0.27	0.07	0.26	0.006
Economically inactive	0.02	0.15	0.02	0.14	0.003
<i>Mother's employment status</i>					
Self-employed	0.10	0.29	0.14	0.34	-0.042***
Employee	0.57	0.50	0.57	0.50	0.000
Civil servant	0.14	0.34	0.12	0.33	0.015
Worker	0.07	0.26	0.07	0.25	0.005
Economically inactive	0.13	0.33	0.10	0.30	0.030**
<i>Cohort indicators</i>					
Cohort 2005	0.15	0.35	0.30	0.46	-0.156***
Cohort 2001	0.18	0.39	0.22	0.42	-0.039**
Cohort 1997	0.29	0.45	0.25	0.43	0.041**
Cohort 1993	0.38	0.49	0.23	0.42	0.154***
<hr/>					
Number of individuals	828		1,372		

Notes: The table reports means and standard deviations (Sd) by field of study. Column 5 reports the results from two-sample mean comparison tests. ^a The sample is restricted to observations with monthly gross earnings larger than 1000 euros. Monthly gross earnings are adjusted for prices in 2010. The outcome variables public employment, self-employment, and engaged in Ph.D. studies are indicator variables. ^b The treatment status (honors degree/top performance) is determined by the score of the first bar exam for law graduates and by the university grade point average for medicine and pharmacy graduates. Note that different grading scales are used in law and medicine and pharmacy. An honors degree is formally awarded in law only. We synthetically define an honors degree status for the very best of medicine and pharmacy graduates by comparing the distribution of the university grade point average with the distribution of the first bar exam score. ^c The variable "study choice: labor market aspects" measures how important labor market aspects were with respect to study choice, measured on a five-point scale with 1 indicating "very important" and 5 "unimportant". Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2: Baseline results - models using the selection on observables assumption

	OLS			FILM	PSMATCH	ENTROPY
	(1)	(2)	(3)	(4)	(5)	(6)
Panel 1: Log of monthly gross earnings						
Honors	0.218*** (0.035)	0.122*** (0.036)	0.125*** (0.036)	0.132*** (0.040)	0.144*** (0.051)	0.134*** (0.041)
Number of individuals	828	828	828	828	819	828
Panel 2: Employment in the public sector						
Honors	0.273*** (0.037)	0.221*** (0.042)	0.215*** (0.042)	0.190*** (0.045)	0.202*** (0.056)	0.191*** (0.045)
Number of individuals	821	821	821	821	809	821
Panel 3: Self-employment						
Honors	-0.129*** (0.026)	-0.098*** (0.029)	-0.096*** (0.029)	-0.079*** (0.029)	-0.078** (0.038)	-0.075** (0.029)
Number of individuals	813	813	813	813	805	813
Panel 4: Engaged in Ph.D. studies						
Honors	0.384*** (0.035)	0.290*** (0.039)	0.289*** (0.038)	0.287*** (0.040)	0.264*** (0.051)	0.250*** (0.044)
Number of individuals	819	819	819	819	805	819
Controls	No	Yes	Yes	Yes	Yes	Yes
Cohort dummies	No	No	Yes	Yes	Yes	Yes

Notes: Each estimated coefficient (standard error) comes from a different regression. Robust standard errors in parentheses. Columns 1-3 display the results from simple OLS regressions with different sets of control variables. Column 4 presents estimates of the fully interacted linear model and column 5 displays the propensity score matching results. Entropy balancing results are reported in column 6. For matching, radius matching with a caliper of 0.01 is used discarding observations without common support. Standard errors in column 5 are bootstrapped with 1,000 replications. For entropy balancing, law graduates without an honors degree are reweighted such that the means, variances and skewness of the control variables resemble those of law graduates with an honors degree; medicine and pharmacy graduates are reweighted accordingly. Outcome variables are measured five to six years after graduation. The control variables are measured one year after graduation and include the respondent's gender, high school grade, location of high school (eastern Germany, western Germany, abroad), completion of an apprenticeship before studying, location of university (eastern Germany, western Germany, abroad), age at graduation, child at graduation, duration of studies (in semesters), study choice with respect to labor market aspects, and the highest general school degree, job qualifications and employment status of both parents. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: Main results - difference-in-differences

Panel 1: Difference-in-differences								
	Log earnings		Public employment		Self-employment		Ph.D. studies	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Honors	0.013 (0.030)	-0.011 (0.029)	0.030 (0.032)	0.008 (0.030)	-0.024 (0.020)	0.008 (0.020)	0.092*** (0.029)	0.048* (0.028)
Law	-0.203*** (0.022)	-0.235*** (0.028)	-0.266*** (0.024)	-0.109*** (0.029)	0.102*** (0.020)	0.038 (0.025)	-0.528*** (0.020)	-0.485*** (0.024)
Honors*Law	0.206*** (0.046)	0.175*** (0.045)	0.243*** (0.049)	0.239*** (0.047)	-0.104*** (0.033)	-0.115*** (0.033)	0.292*** (0.045)	0.287*** (0.044)
N	2,200	2,200	2,187	2,187	2,145	2,145	2,183	2,183
R ²	0.040	0.160	0.060	0.190	0.020	0.080	0.230	0.290
Panel 2: Difference-in-differences & entropy balancing								
Honors	0.003 (0.034)	0.003 (0.030)	0.033 (0.036)	0.034 (0.031)	-0.009 (0.022)	-0.009 (0.021)	0.056* (0.032)	0.055* (0.029)
Law	-0.128*** (0.042)	-0.190*** (0.045)	-0.182*** (0.048)	0.032 (0.047)	0.064** (0.031)	-0.019 (0.033)	-0.434*** (0.049)	-0.398*** (0.046)
Honors*Law	0.131** (0.058)	0.131** (0.054)	0.159** (0.064)	0.158*** (0.058)	-0.066* (0.040)	-0.065* (0.037)	0.198*** (0.063)	0.196*** (0.056)
N	2,200	2,200	2,187	2,187	2,145	2,145	2,183	2,183
R ²	0.010	0.150	0.030	0.180	0.010	0.080	0.140	0.260
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Cohort dummies	No	Yes	No	Yes	No	Yes	No	Yes

Notes: The table presents the results from 16 separate difference-in-differences specifications comparing law graduates to medicine and pharmacy graduates. Panel 1 displays the results from simple difference-in-differences specifications, and panel 2 shows the results from the difference-in-differences combined with entropy balancing specifications. For each regression, the estimates of obtaining an honors degree in law or being among the best graduates in medicine or pharmacy, respectively (Honors), being a law graduate (Law) and the interaction term of both variables (Honors*Law) are reported. In panel 2, law graduates without an honors degree are reweighted by using entropy balancing such that the means, variances and skewness of the control variables resemble those of law graduates with an honors degree, and medicine and pharmacy graduates are reweighted accordingly. Standard errors are reported in parentheses. Robust standard errors are reported in panel 1, and linearized standard errors are reported in panel 2. Outcome variables are measured five to six years after graduation. The control variables are measured one year after graduation and include the respondent's gender, high school grade, location of high school (eastern Germany, western Germany, abroad), completion of an apprenticeship before studying, location of university (eastern Germany, western Germany, abroad), age at graduation, child at graduation, duration of studies (in semesters), study choice with respect to labor market aspects, and the highest general school degree, job qualifications and employment status of both parents. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Difference-in-differences by gender

	Panel 1: Log earnings		Panel 2: Public employment	
	Male	Female	Male	Female
	(1)	(2)	(3)	(4)
Honors	0.119** (0.057)	-0.060* (0.033)	-0.026 (0.052)	0.029 (0.036)
Law	-0.346*** (0.044)	-0.156*** (0.037)	-0.245*** (0.045)	-0.009 (0.039)
Honors*law	0.054 (0.071)	0.257*** (0.062)	0.219*** (0.072)	0.320*** (0.066)
N	934	1,266	929	1,258
	Panel 3: Self-employment		Panel 4: Ph.D. studies	
	Male	Female	Male	Female
	(1)	(2)	(3)	(4)
Honors	0.070 (0.045)	-0.027 (0.022)	0.072 (0.047)	0.047 (0.036)
Law	0.026 (0.042)	0.033 (0.031)	-0.508*** (0.040)	-0.492*** (0.031)
Honors*law	-0.175*** (0.060)	-0.075* (0.040)	0.275*** (0.066)	0.230*** (0.064)
N	922	1,223	928	1,255
Control variables	Yes	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes	Yes

Notes: The table presents the results of various difference-in-differences specifications comparing law graduates to medicine and pharmacy graduates by splitting the sample with respect to gender. Each column shows the estimate of obtaining an honors degree in law or being among the best graduates in medicine or pharmacy respectively (Honors Degree), being a law graduate (Law) and the interaction term of both (Honors Degree*Law). Outcome variables are measured five to six years after graduation. The control variables are measured one year after graduation and include the respondent's gender, high school grade, location of high school (eastern Germany, western Germany, abroad), completion of an apprenticeship before studying, location of university (eastern Germany, western Germany, abroad), age at graduation, child at graduation, duration of studies (in semesters), study choice with respect to labor market aspects, and the highest general school degree, job qualifications and employment status of both parents. Robust standard errors are reported in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

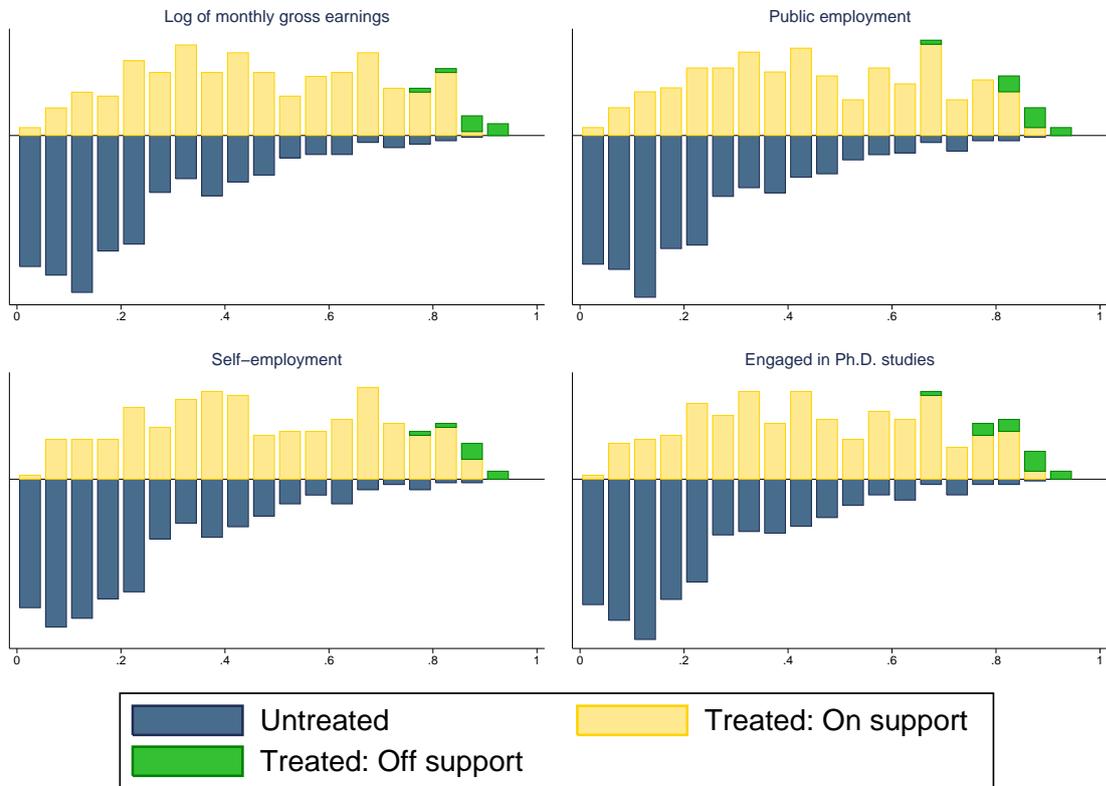
A Appendix. Supplementary Figures and Tables (intended as Online Appendix)

Figure A-1: DZHW panel survey of graduates

Graduate cohort	Year																		
	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11
1993	Exam	1. wave			→	2. wave													
1997					Exam	1. wave			→	2. wave									
2001									Exam	1. wave			→	2. wave					
2005													Exam	1. wave			→	2. wave	

Notes: The figure highlights the data structure of the DZHW panel survey of graduates. Graduates are interviewed about their studies and other topics one year after graduation. They are interviewed again five to six years after graduation about their labor market experience and several other topics. In the analysis, the graduate cohorts of the years 1993, 1997, 2001 and 2005 are used. Own illustration based on Briedis (2007).

Figure A-2: Matching quality - Common support



Notes: The figure displays the propensity score histograms for the four outcome measures of the propensity score matching specifications as reported in Table 2, column 5. The histograms show how many individuals are on and off the common support based on the estimated propensity score. The blue and yellow bars indicate how many observations in the treated and untreated groups could be successfully matched with each other. The green bars indicate how many observations could not be matched, i.e. how many observations are off the common support.

Table A-1: Baseline results - OLS with covariates

	Log earnings	Public employment	Self- employment	Ph.D. studies
	(1)	(2)	(3)	(4)
Honors degree	0.125*** (0.036)	0.215*** (0.042)	-0.096*** (0.029)	0.289*** (0.038)
Female	-0.128*** (0.032)	0.035 (0.035)	-0.045 (0.029)	-0.182*** (0.028)
Age at graduation	-0.062 (0.042)	-0.148*** (0.048)	0.123*** (0.042)	-0.062* (0.036)
Age at graduation squared	0.001 (0.001)	0.002*** (0.001)	-0.002*** (0.001)	0.001 (0.001)
Children at graduation	-0.080 (0.062)	-0.048 (0.082)	0.212** (0.085)	-0.056 (0.052)
Apprenticeship completed	0.202*** (0.047)	-0.022 (0.051)	-0.072 (0.045)	-0.013 (0.041)
University: eastern Germany	-0.295*** (0.086)	-0.044 (0.095)	-0.002 (0.068)	0.105 (0.080)
Study length	-0.047 (0.029)	-0.082 (0.068)	-0.073** (0.032)	-0.044 (0.027)
Study length squared	0.002* (0.001)	0.003 (0.003)	0.002** (0.001)	0.001 (0.001)
Study choice: labor market relevance	-0.015 (0.012)	0.009 (0.013)	0.022* (0.011)	0.015 (0.012)
High school grade	-0.298* (0.164)	-0.342** (0.171)	0.194 (0.127)	-0.146 (0.145)
Squared high school grade	0.053 (0.036)	0.064* (0.038)	-0.034 (0.031)	0.015 (0.031)
High school: eastern Germany	0.030 (0.084)	0.039 (0.091)	0.075 (0.063)	-0.136* (0.080)
High school: abroad	0.572*** (0.075)	-0.257 (0.167)	0.408 (0.265)	0.673*** (0.145)
<i>Father's highest general school degree</i>				
University entrance degree	0.009 (0.065)	0.051 (0.073)	-0.094 (0.058)	0.014 (0.058)
College entrance degree	-0.082 (0.066)	-0.072 (0.075)	-0.027 (0.065)	-0.020 (0.060)
Intermediate-track school degree	-0.021 (0.050)	-0.058 (0.058)	-0.012 (0.051)	0.058 (0.046)
<i>Mother's highest general school degree</i>				
University entrance degree	0.083 (0.063)	-0.025 (0.081)	-0.006 (0.058)	-0.050 (0.056)

continued on next page ...

... continued from previous page

	Log earnings	Public employment	Self- employment	Ph.D. studies
	(1)	(2)	(3)	(4)
College entrance degree	0.009 (0.100)	-0.101 (0.085)	0.081 (0.080)	-0.169*** (0.064)
Intermediate-track school degree	0.061 (0.040)	-0.049 (0.047)	0.053 (0.041)	-0.008 (0.036)
<i>Father's job qualific./highest edu. degree</i>				
University	0.042 (0.066)	-0.132* (0.069)	0.033 (0.055)	0.031 (0.057)
College	0.014 (0.055)	-0.010 (0.064)	-0.026 (0.051)	0.048 (0.052)
Fachschule (GDR)	0.096 (0.132)	0.217 (0.319)	-0.236*** (0.089)	-0.066 (0.106)
Trade and technical school	0.034 (0.049)	-0.052 (0.055)	-0.055 (0.048)	0.026 (0.046)
<i>Mother's job qualific./highest edu. degree</i>				
University	0.072 (0.067)	0.011 (0.084)	0.018 (0.059)	0.160*** (0.059)
College	-0.069 (0.081)	0.144* (0.083)	0.024 (0.068)	-0.006 (0.067)
Fachschule (GDR)	-0.095 (0.133)	0.384*** (0.141)	-0.014 (0.108)	-0.010 (0.067)
Trade and technical school	0.089 (0.076)	0.013 (0.080)	0.024 (0.068)	-0.004 (0.062)
<i>Father's employment status</i>				
Self-employed	0.046 (0.061)	-0.139** (0.069)	0.026 (0.059)	0.009 (0.056)
Employee	0.072 (0.056)	-0.041 (0.065)	-0.023 (0.054)	-0.028 (0.050)
Civil servant	0.021 (0.059)	0.066 (0.069)	-0.032 (0.059)	-0.024 (0.055)
<i>Mother's employment status</i>				
Self-employed	-0.054 (0.063)	0.031 (0.068)	-0.027 (0.057)	-0.002 (0.052)
Employee	0.007 (0.038)	0.026 (0.047)	-0.006 (0.039)	0.028 (0.036)
Civil servant	-0.035 (0.061)	-0.041 (0.069)	0.044 (0.055)	0.000 (0.056)
<i>Cohort indicators</i>				
Cohort 2005	-0.043	0.165***	-0.117***	0.042

continued on next page ...

... continued from previous page

	Log earnings	Public employment	Self- employment	Ph.D. studies
	(1)	(2)	(3)	(4)
Cohort 2001	(0.045) -0.064	(0.055) 0.055	(0.039) -0.023	(0.046) -0.062*
Cohort 1997	(0.045) -0.031	(0.047) -0.011	(0.041) -0.080**	(0.037) -0.084**
Constant	(0.039) 9.835*** (0.680)	(0.042) 3.419*** (0.812)	(0.035) -1.461** (0.663)	(0.034) 1.815*** (0.596)
Observations	828	821	813	819
R ²	0.19	0.16	0.11	0.30

Notes: OLS regressions. Robust standard errors in parentheses. Each column reports all estimated coefficients (standard errors) from the OLS regressions in Table 2, column 3. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A-2: Entropy balancing moments - law graduates

	Treatment group		Control group			
	Mean	Variance	Before balancing		After balancing	
			Mean	Variance	Mean	Variance
	(1)	(2)	(3)	(4)	(5)	(7)
<i>Demographics</i>						
Female	0.39	0.24	0.49	0.25	0.39	0.24
Age at graduation	25.42	2.52	26.00	6.27	25.42	2.52
Children at graduation	0.03	0.03	0.05	0.05	0.03	0.03
Apprenticeship completed	0.18	0.15	0.18	0.15	0.18	0.15
University: western Germany	0.89	0.10	0.86	0.12	0.89	0.10
University: eastern Germany	0.09	0.08	0.13	0.12	0.09	0.08
Study length (in semesters)	9.86	1.81	10.64	4.50	9.86	1.81
Study choice: labor market aspects	3.36	1.41	3.29	1.49	3.36	1.41
High school grade	1.69	0.27	2.23	0.33	1.69	0.27
High school: western Germany	0.89	0.10	0.84	0.13	0.89	0.10
High school: eastern Germany	0.10	0.09	0.16	0.13	0.10	0.09
<i>Father's highest general school degree</i>						
University entrance degree	0.53	0.25	0.47	0.25	0.53	0.25
College entrance degree	0.07	0.07	0.11	0.10	0.07	0.07
Intermediate-track school degree	0.17	0.14	0.18	0.15	0.17	0.14
Low-track school degree	0.22	0.17	0.21	0.17	0.22	0.17
No school degree	0.00	0.00	0.01	0.01	0.00	0.00
<i>Mother's highest general school degree</i>						
University entrance degree	0.37	0.23	0.29	0.20	0.37	0.23
College entrance degree	0.04	0.04	0.05	0.05	0.04	0.04
Intermediate-track school degree	0.34	0.22	0.37	0.23	0.34	0.22
Low-track school degree	0.25	0.19	0.27	0.20	0.25	0.19
No school degree	0.01	0.01	0.01	0.01	0.01	0.01
<i>Father's job qualification/highest educational degree</i>						
University	0.50	0.25	0.40	0.24	0.50	0.25
College	0.13	0.11	0.18	0.15	0.13	0.11
Fachschule (GDR)	0.00	0.00	0.00	0.00	0.00	0.00
Trade and technical school	0.09	0.08	0.13	0.11	0.09	0.08
Apprenticeship	0.25	0.19	0.25	0.19	0.25	0.19
No further degree	0.01	0.01	0.03	0.03	0.01	0.01
<i>Mother's job qualification/highest educational degree</i>						
University	0.28	0.20	0.23	0.18	0.28	0.20
College	0.07	0.06	0.06	0.06	0.07	0.06
Fachschule (GDR)	0.02	0.02	0.02	0.02	0.02	0.02
Trade and technical school	0.04	0.04	0.05	0.05	0.04	0.04

continued on next page ...

... continued from previous page

	Treatment group		Control group			
	Mean	Variance	Before balancing		After balancing	
			Mean	Variance	Mean	Variance
	(1)	(2)	(3)	(4)	(5)	(7)
Apprenticeship	0.47	0.25	0.50	0.25	0.47	0.25
No further degree	0.12	0.11	0.12	0.10	0.12	0.11
<i>Father's employment status</i>						
Self-employed	0.20	0.16	0.24	0.18	0.20	0.16
Employee	0.34	0.23	0.40	0.24	0.34	0.23
Civil servant	0.36	0.23	0.26	0.19	0.36	0.23
Worker	0.08	0.07	0.08	0.07	0.08	0.07
<i>Mother's employment status</i>						
Self-employed	0.09	0.08	0.10	0.09	0.09	0.08
Employee	0.55	0.25	0.58	0.24	0.55	0.25
Civil servant	0.07	0.06	0.08	0.07	0.07	0.06
Worker	0.12	0.11	0.13	0.11	0.12	0.11
<i>Cohort indicators</i>						
Cohort 2005	0.15	0.13	0.15	0.13	0.15	0.13
Cohort 2001	0.21	0.16	0.17	0.14	0.21	0.16
Cohort 1997	0.31	0.22	0.28	0.20	0.31	0.21

Notes: The table shows the control variables' means and variances for law graduates. The means and variances of the control variables are reported for graduates with an honors degree, for graduates without an honors degree before balancing, and for graduates without an honors degree after balancing. Law graduates without an honors degree are reweighted such that their group means, variances and skewness resemble the means, variances and skewness of the group of law graduates with an honors degree. The skewness of the control variable is not reported. The variables "University: abroad", "High school: abroad", "Father's employment status: economically inactive" and "Mother's employment status: economically inactive" are excluded from balancing because of collinearity.

Table A-3: Entropy balancing moments - medicine & pharmacy graduates

	Treatment group		Control group			
	Mean	Variance	Before balancing		After balancing	
			Mean	Variance	Mean	Variance
	(1)	(2)	(3)	(4)	(5)	(7)
<i>Demographics</i>						
Female	0.69	0.22	0.63	0.23	0.69	0.22
Age at graduation	26.58	3.75	27.59	6.83	26.58	3.75
Children at graduation	0.07	0.07	0.13	0.11	0.07	0.07
Apprenticeship completed	0.15	0.13	0.22	0.17	0.15	0.13
University: western Germany	0.76	0.18	0.76	0.18	0.76	0.18
Study length (in semesters)	12.35	4.27	12.86	5.09	12.35	4.27
Study choice: labor market aspects	3.89	1.31	3.96	1.42	3.89	1.31
High school grade	1.68	0.27	2.06	0.37	1.68	0.27
High school: western Germany	0.84	0.14	0.84	0.14	0.84	0.13
High school: eastern Germany	0.15	0.13	0.15	0.13	0.15	0.13
<i>Father's highest general school degree</i>						
University entrance degree	0.59	0.24	0.51	0.25	0.59	0.24
College entrance degree	0.13	0.11	0.12	0.10	0.13	0.11
Intermediate-track school degree	0.12	0.11	0.14	0.12	0.12	0.11
Low-track school degree	0.16	0.14	0.21	0.17	0.16	0.13
No school degree	0.00	0.00	0.01	0.01	0.00	0.00
<i>Mother's highest general school degree</i>						
University entrance degree	0.45	0.25	0.35	0.23	0.45	0.25
College entrance degree	0.05	0.04	0.06	0.06	0.05	0.04
Intermediate-track school degree	0.32	0.22	0.31	0.21	0.32	0.22
Low-track school degree	0.19	0.15	0.26	0.19	0.19	0.15
No school degree	0.00	0.00	0.01	0.01	0.00	0.00
<i>Father's job qualification/highest educational degree</i>						
University	0.54	0.25	0.47	0.25	0.54	0.25
College	0.15	0.13	0.16	0.14	0.15	0.13
Fachschule (GDR)	0.01	0.01	0.01	0.01	0.01	0.01
Trade and technical school	0.08	0.07	0.13	0.11	0.08	0.07
Apprenticeship	0.20	0.16	0.20	0.16	0.20	0.16
No further degree	0.01	0.01	0.02	0.02	0.01	0.01
<i>Mother's job qualification/highest educational degree</i>						
University	0.38	0.24	0.28	0.20	0.38	0.24
College	0.07	0.07	0.07	0.06	0.07	0.07
Fachschule (GDR)	0.03	0.03	0.03	0.03	0.03	0.03
Trade and technical school	0.04	0.03	0.06	0.05	0.04	0.03
Apprenticeship	0.38	0.24	0.44	0.25	0.38	0.24

continued on next page ...

... continued from previous page

	Treatment group		Control group			
	Mean	Variance	Before balancing		After balancing	
			Mean	Variance	Mean	Variance
	(1)	(2)	(3)	(4)	(5)	(7)
No degree	0.09	0.08	0.12	0.11	0.09	0.08
<i>Father's employment status</i>						
Self-employed	0.25	0.19	0.29	0.21	0.25	0.19
Employee	0.40	0.24	0.37	0.23	0.40	0.24
Civil servant	0.28	0.20	0.24	0.18	0.28	0.20
Worker	0.06	0.06	0.08	0.07	0.06	0.06
Economically inactive	0.01	0.01	0.02	0.02	0.01	0.01
<i>Mother's employment status</i>						
Self-employed	0.12	0.10	0.14	0.12	0.12	0.10
Employee	0.61	0.24	0.56	0.25	0.61	0.24
Civil servant	0.15	0.13	0.11	0.10	0.15	0.13
Worker	0.05	0.05	0.07	0.07	0.05	0.05
Economically inactive	0.06	0.05	0.11	0.10	0.06	0.05
<i>Cohort indicators</i>						
Cohort 2005	0.35	0.23	0.29	0.21	0.35	0.23
Cohort 2001	0.24	0.18	0.22	0.17	0.24	0.18
Cohort 1997	0.27	0.20	0.24	0.18	0.27	0.20

Notes: The table shows the control variables' means and variances for medicine and pharmacy graduates. The means and variances of the control variables are reported for graduates with a pseudo honors degree (top performance), for graduates without a pseudo honors degree before balancing, and for graduates without a pseudo honors degree after balancing. Medicine and pharmacy graduates without a pseudo honors degree are reweighted such that their group means, variances and skewness resemble the means, variances and skewness of the group of medicine and pharmacy graduates with a pseudo honors degree. The skewness of the control variable is not reported. The variables "University: eastern Germany", "University: abroad" and "High school: abroad" are excluded from balancing because of collinearity.

Table A-4: Robustness of matching and entropy balancing results

	Rad 0.05	Rad 0.15	NN-5	Kernel	Mahal	Entropy-I	Entropy-II
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel 1: Log of monthly gross earnings							
Honors	0.144*** (0.051)	0.150*** (0.049)	0.145*** (0.052)	0.150*** (0.049)	0.146*** (0.049)	0.138*** (0.042)	0.146*** (0.040)
N	791	822	819	823	828	828	828
Panel 2: Public employment							
Honors	0.189*** (0.058)	0.206*** (0.055)	0.182*** (0.058)	0.202*** (0.055)	0.264*** (0.054)	0.189*** (0.045)	0.187*** (0.045)
N	789	814	809	816	821	821	821
Panel 3: Self-employment							
Honors	-0.086** (0.043)	-0.089** (0.037)	-0.076* (0.041)	-0.087** (0.036)	-0.104*** (0.039)	-0.072** (0.029)	-0.069** (0.029)
N	779	807	805	807	813	813	813
Panel 4: Engaged in Ph.D. studies							
Honors	0.284*** (0.053)	0.264*** (0.052)	0.272*** (0.053)	0.266*** (0.052)	0.325*** (0.050)	0.255*** (0.044)	0.267*** (0.044)
N	779	813	805	816	819	819	819

Notes: Columns 1 and 2 show results for radius matching in which we have subtracted and added 0.005 to our baseline caliper of 0.01. In column 3, nearest-neighbor matching using up to 5 neighbors within a caliper of 0.01 is deployed. Results in column 4 use a kernel matching procedure with a bandwidth of 0.02 and a Epanechnikov kernel. In column 5 Mahalanobis distance matching is used. In columns 6 and 7, the results for entropy balancing are shown using the mean and variance only, and the mean only, respectively, when balancing covariate moments between the treatment and the control group. Standard errors for the matching estimators in columns 1 to 5 are bootstrapped with 1,000 replications; standard errors in columns 6 and 7 are linearized. Note that the number of observations varies because each specification differs in the common support. The control variables are measured one year after graduation and include the respondent's gender, high school grade, location of high school (eastern Germany, western Germany, abroad), completion of an apprenticeship before studying, location of university (eastern Germany, western Germany, abroad), age at graduation, child at graduation, duration of studies (in semesters), study choice with respect to labor market aspects, and the highest general school degree, job qualifications and employment status of both parents. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A-5: Difference-in-differences and entropy balancing - Alternative numbers of entropy balancing moments

	Entropy I	Entropy II	Entropy III
	(1)	(2)	(3)
Log of monthly gross earnings			
Honors	0.003 (0.030)	0.005 (0.031)	0.001 (0.030)
Law	-0.190*** (0.045)	-0.192*** (0.045)	-0.209*** (0.041)
Honors*law	0.131** (0.054)	0.133** (0.054)	0.149*** (0.052)
Employment in the public sector			
Honors	0.034 (0.031)	0.036 (0.031)	0.032 (0.030)
Law	0.032 (0.047)	0.038 (0.047)	0.033 (0.045)
Honors*law	0.158*** (0.058)	0.154*** (0.058)	0.156*** (0.056)
Self-employment			
Honors	-0.009 (0.021)	-0.011 (0.021)	-0.009 (0.021)
Law	-0.019 (0.033)	-0.026 (0.032)	-0.025 (0.031)
Honors*law	-0.065* (0.037)	-0.060 (0.037)	-0.061* (0.037)
Engaged in Ph.D. studies			
Honors	0.055* (0.029)	0.055* (0.029)	0.060** (0.029)
Law	-0.398*** (0.046)	-0.403*** (0.045)	-0.406*** (0.043)
Honors*law	0.196*** (0.056)	0.201*** (0.055)	0.206*** (0.053)
Control variables	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes

Notes: The table presents the results from difference-in-differences with entropy balancing estimators comparing law graduates to medicine and pharmacy graduates. Linearized standard errors are reported in parentheses. In column 1, the means, variances, and skewness of the control variables are used for entropy balancing. In column 2, the means and variances are used, and in column 3, only the means are used for balancing. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A-6: Difference-in-differences & entropy balancing - alternative treatment coding in control group

	Share of treated persons in control group					
	0.18	0.22	0.25	0.27	0.30	0.32
	(1)	(2)	(3)	(4)	(5)	(6)
Panel 1: Log of monthly gross earnings						
Honors	0.019 (0.032)	0.003 (0.030)	-0.003 (0.029)	0.004 (0.028)	-0.013 (0.027)	-0.021 (0.027)
Law	-0.179*** (0.044)	-0.190*** (0.045)	-0.192*** (0.045)	-0.190*** (0.045)	-0.197*** (0.045)	-0.200*** (0.046)
Honors*law	0.115** (0.055)	0.131** (0.054)	0.137*** (0.053)	0.130** (0.053)	0.147*** (0.052)	0.155*** (0.053)
Panel 2: Public employment						
Honors	0.039 (0.033)	0.034 (0.031)	0.038 (0.029)	0.065** (0.029)	0.065** (0.028)	0.057** (0.028)
Law	0.021 (0.048)	0.032 (0.047)	0.039 (0.047)	0.051 (0.046)	0.052 (0.047)	0.053 (0.047)
Honors*law	0.153*** (0.059)	0.158*** (0.058)	0.154*** (0.058)	0.127** (0.057)	0.127** (0.057)	0.134** (0.057)
Panel 3: Self-employment						
Honors	-0.009 (0.022)	-0.009 (0.021)	-0.019 (0.020)	-0.026 (0.020)	-0.030 (0.020)	-0.040** (0.020)
Law	-0.007 (0.033)	-0.019 (0.033)	-0.024 (0.033)	-0.028 (0.034)	-0.035 (0.035)	-0.043 (0.036)
Honors*law	-0.065* (0.038)	-0.065* (0.037)	-0.056 (0.037)	-0.048 (0.037)	-0.045 (0.037)	-0.035 (0.037)
Panel 4: Engaged in Ph.D. studies						
Honors	0.056* (0.032)	0.055* (0.029)	0.072*** (0.028)	0.063** (0.028)	0.069** (0.027)	0.047* (0.027)
Law	-0.403*** (0.046)	-0.398*** (0.046)	-0.382*** (0.046)	-0.385*** (0.046)	-0.382*** (0.046)	-0.387*** (0.046)
Honors*law	0.196*** (0.057)	0.196*** (0.056)	0.179*** (0.055)	0.189*** (0.055)	0.183*** (0.055)	0.205*** (0.055)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table presents the results from difference-in-differences combined with entropy-balancing estimators comparing law graduates to medicine and pharmacy graduates using alternative treatment codings for the control group. Linearized standard errors are reported in parentheses. In each column, a different cutoff based the relative distribution of the graduation grade is used. Column 1 reports the same estimates than in Table 3, panel 2. Each column shows the estimates of obtaining an honors degree in law or being among the best graduates in medicine or pharmacy respectively (Honors Degree), being a law graduate (Law) and the interaction term of both variables (Honors Degree*Law). Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A-7: Difference-in-differences & entropy balancing - other control groups

	Difference-in-differences & entropy balancing					
	Med-Pharm	Teaching	Economics	Med-Pharm	Teaching	Economics
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel 1: Log earnings			Panel 2: Public employment		
Honors	0.003 (0.030)	-0.040** (0.019)	0.046** (0.022)	0.034 (0.031)	0.027* (0.015)	0.028 (0.023)
Law	-0.190*** (0.045)	0.101*** (0.036)	-0.251*** (0.038)	0.032 (0.047)	-0.514*** (0.041)	0.172*** (0.040)
Honors*law	0.131** (0.054)	0.174*** (0.048)	0.088* (0.050)	0.158*** (0.058)	0.166*** (0.052)	0.163*** (0.054)
N	2,200	2,648	2,997	2,187	2,636	2,976
R2	0.150	0.160	0.150	0.180	0.330	0.150
	Panel 3: Self-employment			Panel 4: Ph.D. studies		
Honors	-0.009 (0.021)	-0.010 (0.009)	-0.016 (0.011)	0.055* (0.029)	0.088*** (0.018)	0.119*** (0.019)
Law	-0.019 (0.033)	0.147*** (0.025)	0.122*** (0.026)	-0.398*** (0.046)	0.103*** (0.039)	0.083** (0.036)
Honors*law	-0.065* (0.037)	-0.065** (0.033)	-0.059* (0.034)	0.196*** (0.056)	0.163*** (0.050)	0.133*** (0.051)
N	2,145	2,574	2,941	2,183	2,633	2,971
R2	0.080	0.100	0.070	0.260	0.280	0.260
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table presents the results from difference-in-differences combined with entropy balancing estimators, comparing law graduates to economic graduates, and education graduates. Linearized standard errors are reported in parentheses. Each column displays the estimates of obtaining an honors degree in law or being among the best graduates in the respective field (Honors Degree), being a law graduate (Law) and from the interaction term of both variables (Honors Degree*Law). Outcome variables are measured five to six years after graduation. The control variables are measured one year after graduation and include the respondent's gender, high school grade, location of high school (eastern Germany, western Germany, abroad), completion of an apprenticeship before studying, location of university (eastern Germany, western Germany, abroad), age at graduation, child at graduation, duration of studies (in semesters), study choice with respect to labor market aspects, and the highest general school degree, job qualifications and employment status of both parents. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A-8: Sample attrition

Field of study	Honors degree	N		Attrition in %
		Wave 1	Wave 2	
(1)	(2)	(3)	(4)	(5)
Law	No honors degree	1,238	605	51.13
	Honors degree	462	261	43.51
	Total	1,700	866	49.06
Medicine & pharmacy	No top performance	1,920	1,087	43.39
	Top performance	512	316	38.28
	Total	2,432	1,403	42.31

Notes: The table shows how many individuals participated in the first survey waves after graduation, and the number of individuals who also participated in the second wave.

Table A-9: Sample attrition - likelihood to participate in the second survey wave

	Dependent variable: likelihood to participate				
	Panel 1: Law		Panel 2: Med-Pharm		Panel 3: DiD
	LPM	Probit	LPM	Probit	LPM
	(1)	(2)	(3)	(4)	(5)
Honors	0.035 (0.031)	0.035 (0.030)	0.031 (0.026)	0.031 (0.026)	0.024 (0.025)
Law					-0.070*** (0.022)
Honors*law					0.015 (0.037)
Control variables	Yes	Yes	Yes	Yes	Yes
Cohort indicators	No	No	No	No	No
Observations	1,700	1,700	2,432	2,432	4,132
R ²	0.028	0.021	0.015	0.011	0.025
F (Chi2)	1.670	48.690	1.130	37.470	2.900
Prob > F (Chi2)	0.009	0.049	0.281	0.313	0.000

Notes: The dependent variable is an indicator variable equal to one if respondents of the first wave participate in the second wave, and zero otherwise. For the probit models, average partial effects are reported. Standard errors are in parentheses. Robust standard errors are used in columns 1, 3 and 5. Column 5 includes law, medicine and pharmacy graduates. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.