Freie Universität Berlin

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School of Business & Economics
Discussion Paper

Economics

2017/11

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LABOR MARKET OUTCOMES OF ACADEMIC VERSUS VOCATIONAL EDUCATION AFTER BOLOGNA

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(April 2017)

Abstract: Academic education is generally rewarded by employers, but what happens to graduates if they are trained for two years less and have to compete with vocationally trained labor market entrants in a similar field of study? Focusing on Germany, we analyze labor market entries of individuals eligible for higher education, who either opted for newly introduced short bachelor's degrees, or for well-established vocational degrees. Based on Microcensus data, we find that bachelor's degrees from classical universities are associated with higher earnings and more prestigious jobs than initial vocational training degrees, and with higher prestige (but similar earnings) than further vocational degrees. However, bachelor's degrees from universities are also related to higher risks of unemployment or fixed-term employment. Universities of applied sciences, which combine academic and practical training, offer both high earnings and prestigious jobs as well as low risks of unemployment or fixed-term employment at the bachelor's and the master's level. Overall, 'general' academic education provides advantages over vocational education, despite these structural changes. Variations by field of study are reported.

JEL: I26, I23, J24, J31
Keywords: Labor market outcomes, Bologna Process, vocational education, higher education, Germany

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1. Introduction

Many countries, headed by Germany's dual system, emphasize vocational education and training (VET). Education systems with a strong VET component are known to ease school-to-work-transitions by providing occupation-specific skills and close links between students and employers (e.g. Shavit & Müller, 1998). In fact, most empirical studies suggest that VET facilitates youth integration into the labor market, in terms of diminishing risks of unemployment or fixed-term employment (Klein, 2015; McGinnity, Mertens, & Gundert, 2005; Müller & Gangl, 2003; Wolter & Ryan, 2011). However, critics argue that more general academic education has advantages over vocational education, especially later in the career, because graduates are more flexible and adapt to rapidly changing job demands in the course of technological change (Hanushek, Schwerdt, Woessmann, & Zhang, 2016). Academic education also tends to provide advantages over vocational education at the start of the career in terms of occupational prestige or earnings, with some variations by country, field of study, and type of vocational qualification (Glocker & Storck, 2014; Klein, 2016; Stüber, 2016). Furthermore, later in the working career, academically trained workers have lower unemployment risks than vocationally trained workers because general skills are more adaptable to skill-based technological change (Forster, Bol, & Werfhorst, 2016; Hampf & Woessmann, 2016; Hanushek et al., 2016).

The motivation to re-investigate the labor market integration of academically versus vocationally trained labor market entrants stems from the fact that all previous findings pertain to outdated conditions. In the course of the Bologna Process, European societies have moved towards a coordinated higher education system. Countries characterized by 4-6 yearlong one-cycle academic degrees, such as Austria, Belgium, Germany, Italy, Portugal, or Switzerland, re-arranged them to fit the Bologna two-cycle structure – a bachelor's (~3 years) and a subsequent master's degree (~2 years).[1] By the end of each cycle, students should be equipped with skills that enable them to fit into different segments of the labor market. The introduction of a novel tertiary degree type – shortened by about 2 years and thus clearly below the degrees previously available – is a rare reform. It raises the question about how these new graduates compete in labor markets with a strong vocational orientation. Do bachelor's degree holders find jobs as easily as VET graduates? Do VET graduates experience advantages in terms of earnings or occupational prestige because employers are skeptical regarding the skills of shortly

[1] A detailed description of the Bologna Process can be found on the official European Higher Education Area website: http://www.ehea.info/. In recent years, a doctoral degree was officially incorporated as a third-cycle in the Bologna degree structure.

trained academics? Because the cohorts that went entirely through the new higher education system graduated only recently, empirical evidence is sparse. None of the abovementioned studies observes labor market outcomes under these new conditions.

We focus on Germany to answer these questions, which is a country case that is both typical of a shift from long, one-cycle programs to the new, common degree structure and a strong and recognized VET system. Germany provides an interesting framework for various reasons: Here, a substantive proportion of those who passed a university entrance qualification opt for vocational training instead. To exemplify, among the ~ 50 % of an age cohort that attained a degree which entitles for higher education studies in 2010, 22 % were enrolled in VET two years after graduation (Spangenberg & Quast, 2016, p. 12). As a consequence, German data provides us with the unique possibility to compare individuals of similar scholastic performance, who chose between VET and academic education. Furthermore, the duration of initial vocational education and the newly introduced bachelor's degrees is similar. In addition, a person interested in business, computer, technical, or design, can study these fields at the vocational or the academic level. Thus, we can investigate how labor market outcomes differ between vocational and academic education for persons of similar ability, training time, and interest in a vocational field. Advantages of VET over academic education should, if they exist at all, become visible here.

Evidence on the German education system is interesting at an international level. During the recent economic crisis, the German VET system was internationally appraised and promoted as a policy solution to tackle youth unemployment, and several countries considered adopting at least certain elements.[2] Our findings are also important for national debates. Despite its international recognition, the German VET system is under pressure, as more and more school-leavers choose academic over vocational postsecondary education. As a consequence, not all apprenticeship training positions can be filled (Autorengruppe Bildungsberichterstattung, 2016; Weiss, 2014). The shift from vocational to academic education receives not only scientific attention (e.g. Baethge & Wolter, 2015), but also criticism in public debates. According to some commentators, the rising number of higher education graduates will, once the market is saturated, be unable to find well paid jobs, whereas employers are desperately seeking vocationally-trained workers (e.g. Nida-Rümelin, 2015). However, the labor market opportunities of recent academically versus vocationally trained workers must be

[2] See for example: Fuhrmans, Vanessa: "Germany's new export: jobs training", *The Wall Street Journal*, 14. 6. 2012, or the homepage of the German Office for International Cooperation in VET www.bibb.de/govet/en/index.php

examined empirically in order to continue this debate in a fruitful way. Similar skepticism is rising against the bachelor-master structure, making bold claims on the consequences of these reforms. Critics describe bachelor's graduates' employability as poor and labeled them as 'lightweight academics', too young and underqualified to compete in the labor market (e.g. Olbrisch, 2010; for academic accounts see Hörner, 2014; Teichler, 2011). But just as with the shift towards academic education, the debate widely lacks empirical evidence on the employment situation of post-Bologna graduates to be continued constructively. This study takes a step to provide such evidence. Public debates aside, empirical knowledge on labor market outcomes associated with the different education options is important for individuals planning their educational careers. Furthermore, policy makers need empirical evidence to monitor the situation of the new graduates and promote, for instance, master's or VET programs if the bachelor's degree turns out to be incompatible with the needs of employers. Based on the 2010-2013 waves of the German Microcensus, the most comprehensive data base available to date, we analyze how the available educational options are associated with different returns (earnings and occupational prestige) and risks (unemployment and fixed-term employment).

The paper proceeds as follows: Section 2 describes the current postsecondary educational options, theorizes on the returns to these different options, and summarizes the few existing studies that consider the new degree types. Sections 3 and 4 describe the data and the estimation strategy. Section 5 shows our results. Section 6 concludes.

2. Post-Bologna vocational and academic education

2.1. The institutional environment

Students who successfully graduate from upper secondary school in Germany can choose between vocational and academic education (for details on the education system see KMK, 2014). Vocational programs are open to all secondary school graduates, while academic programs require a higher education entrance certification ('Abitur'- or 'Fachhochschulreife'-degree). Such entrance certificates are obtained by 53 % of an age group (Autorengruppe Bildungsberichterstattung, 2016, p. 96). Among this group, about 22 % choose vocational training (*VET*), some in a school-based setting, but most of them in the dual system (Spangenberg & Quast, 2016). In this system, firm-based training on the job is combined with course-work at vocational schools, and apprentices are trained for typically 3 years in one of over 300 officially recognized occupations with a highly standardized curriculum regulated jointly by employer associations and the state (for details see Brzinsky-Fay, Ebner, & Seibert, 2016; Eichhorst, Rodríguez-Planas, Schmidl, & Zimmermann, 2012). This close link to

employers facilitates labor market entry; 68 % continue to work in the training firm upon graduation from VET (Autorengruppe Bildungsberichterstattung, 2016, p. 116). After initial training and a few years of work experience, about a quarter of the vocationally trained continue their training and obtain an officially regulated further vocational training certificate, such as a Master craftsman, or technician degree (*M. Craftsman*, henceforth) (BIBB, 2015; Federal Statistical Office, 2011-2014, own calculations). Such a degree typically qualifies workers to start their own businesses or for team leadership positions in industry and commerce.

About two-thirds of those with a higher education entrance certification enter an academic program either at a research-oriented university (*Uni*, henceforth) or at a more practically-oriented university of applied sciences (Fachhochschule, abbreviated as *FH*, henceforth) (Autorengruppe Bildungsberichterstattung, 2016). FHs are academically less demanding, but put a stronger emphasis on the practical application of knowledge. They often collaborate with employers and implement practical components or mandatory internships in their curricula. In this sense, FHs are somewhat more similar to vocational training than Unis. In the course of the Bologna Process, traditional long, one-cycle degree programs (4-6 years) at both types of institutions have been re-arranged into two successive cycles, bachelor's (~3 years, with the exception of FHs that sometimes offer programs up to 4 years) and master's (~2 years). Thus, initial academic training now has approximately the same length as initial vocational training, while a M. Craftsman certificate requires more training time, as well as additional work experience.

The underlying goals of the Bologna Process were to harmonize educational structures across Europe and to equip graduates with the ability to successfully enter the labor market after a shorter time in education (e.g. KMK, 2003). However, only 32 % of all bachelor's graduates enter the labor market, while the majority continues with a master's (Neugebauer, Neumeyer, & Alesi, 2016).[3] The crucial question is, how these new graduates compete in the labor market.

2.2. Theoretical expectations, existing evidence and own contribution

Any theory of the school–work linkage (see e.g. Bills, 2003) would assume that master's graduates, who have the highest level of schooling, outperform the other groups in terms of labor market outcomes. However, it is less clear how bachelor's graduates fare in comparison

[3] The probability to leave the higher education system with a bachelor's degree is higher among students from lower social origins, who are more likely to finance their studies through own employment, receive lower grades at the high school and bachelor's level, and are more likely to come from FHs (Neugebauer et al., 2016).

to initial VET and M. Craftsman degree holders. In comparison with an initial VET degree, a bachelor's degree has approximately the same duration. Nevertheless, bachelor's degree programs may convey more marketable abilities (Becker, 1964) or they may be seen as a stronger signal for trainability, reducing expected training costs of the employer (Arrow, 1973; Spence, 1973). Moreover, bachelor's graduates may have access to rewarding occupations that are closed for vocationally trained personnel. On the other hand, the apprenticeship time can be used as a screening period for the employer and thus reduce the hiring risk. Moreover, VET may be able to provide precisely certified, occupational-specific human capital (Van de Werfhorst, 2011). Thus, a mismatch between employer and employee is less likely. In addition, the 'hands-on' training in vocational schools and in the firm may reduce training costs for employers. All of these circumstances improve the predictability of the productivity of VET over higher education graduates (Breen, 2005). Note, however, that this argument is less applicable to the FHs, which combine academic credentials with readily applicable skills and collaborations with employers. In addition, FH bachelor's degree programs are often somewhat longer with a duration of up to four years, which implies more theoretical instruction and potentially more human capital. Hence, FH graduates may be particularly attractive for employers. In comparison with M. Craftsman degrees, bachelor's degrees require less years of education. Following human capital theory (Mincer, 1974), M. Craftsman degrees may thus lead to higher payoffs. Other scholars theorize that bachelor's graduates and persons holding M. Craftsman degrees compete for the same jobs, because their task profiles overlap (Weiss, 2014). As a consequence, their labor market outcomes may be rather similar.

Empirical evidence about the returns of the new academic degrees, in comparison to vocational education, is sparse. Some descriptive reports compare bachelor's to master's graduates based on employer surveys (DIHK, 2015; Konegen-Grenier, Placke, & Schröder-Kralemann, 2015) or higher education graduate surveys (Alesi, Schomburg, & Teichler, 2010; Fabian, Hillmann, Trennt, & Briedis, 2016; Rehn, Brandt, Fabian, & Briedis, 2011), but they do not compare them to vocationally trained workers. Generally, these studies find that bachelor's degree holders earn on average 20–26 % less than master's graduates. Furthermore, according to Fabian et al. (2016), graduates from FHs at the bachelor's and the master's level earn more and are less often employed fixed-term than their counterparts from universities. To our knowledge, only three publications compare vocational and academic education after Bologna. Based on an employer survey, Flake, Werner, and Zibrowius (2016) find that employers state they often pay similar earnings to M. Craftsman and bachelor's degree holders,

but higher earnings to master's degree holders.[4] A second piece of evidence is the most recent national report on education (Autorengruppe Bildungsberichterstattung, 2016, p. 120). Based on data from social security registries (IAB Beschäftigtenhistorik), bivariate comparisons for eight selected occupational groups show a clear earnings hierarchy with 'initial VET' < 'M. Craftsman' < 'bachelor's' < 'master's', for occupations in business, IT, and technical sectors. No clear hierarchy is found within media design, preschool education, and social administration/insurance; other occupational groups are not considered. Some occupational groups, namely civil servants and self-employed, are missing in the sample. Lastly, Spangenberg and Quast (2016) draw on a recent Panel Study of School Leavers, and find that, after adjusting for a range of covariates, bachelor's degree holders from FHs earn 21-27 % more than entrants with a bachelor's from universities, VET, or M. Craftsman degree. Master's graduates are not in their sample. Their findings also suggest that Uni-bachelor's are more often employed in part-time and fixed-term contracts than the other groups. The authors point out that their survey was carried out four and a half years after high school graduation, when 70 % of the participants were still in (vocational or academic) education. Thus, their estimates are based on a special sub-group of labor market entrants, which has to be kept in mind when interpreting the results.[5]

We complement and extend this line of research in several ways: First, by relying on large representative data with very low non-response rates, we are able to provide robust estimates on the association of vocational and academic degrees with labor market outcomes in the post-Bologna era. Second, following Spangenberg and Quast (2016), we separate between Uni and FH at the academic level, and VET and M. Craftsman at the vocational level. These degrees, which are often collapsed in previous research, are associated with different returns, as we show below. In addition to Spangenberg and Quast, we also provide estimates for master's degree holders from both, Uni and FH. Third, to gain a comprehensive picture of the current situation, we include non-pecuniary returns. Arguably, the most important labor market outcomes besides earnings are, for most individuals, occupational prestige and security. Thus, in addition to earnings, we analyze prestige, as well as two security related factors: unemployment and fixed-term employment risks. Fourth, we acknowledge the fact that returns to education depend not

[4] The authors emphasize that field of study, as well as occupation, are important aspects when comparing returns on vocational and academic education. In another part of their study, Flake et al. rely on an employee survey in which they have to combine bachelor's, master's, and traditional academic degree holders and are unable to explore differences among these groups. However, they show that the earnings of M. Craftsman lie in between initial VET degree holders and academic degree holders.

[5] Like other surveys, the DZHW data is plagued with low response rates. Of the ~ 6000 school graduates that were sampled at the end of secondary school, only 5200 responded five years later.

only on degree type, but also on the field of study (for an overview on recent studies see Altonji, Arcidiacono, & Maurel, 2016; for Germany see Glocker & Storck, 2014). Some fields are genuine to a certain level (e.g. literature at universities), while other fields, such as business or computer science, can be studied at all degree levels. For these fields, we provide sub-sample analysis to test if differences in returns by degrees remain when restricting the sample to persons who graduated from the same field, and to test for effect heterogeneity across fields.

3. Data and descriptives

Our estimates are based on the 2010 to 2013 waves of the German Microcensus, which covers one percent of all German households.[6] One particular strength of this survey for official statistics is the fact that participation is compulsory for the major part of the questionnaire, i.e. non-response issues are negligible. Another strength is the large number of respondents. Along with the availability of detailed information on employment and education in the data, this allows us to derive estimates with high precision and to perform sub-group analysis, e.g. by field of study.[7]

We limit our sample to individuals who obtained a higher education entrance qualification and who subsequently completed an academic or a vocational degree. Bachelor's and master's graduates have only recently entered the labor market, which is why we restrict the sample to labor market entrants, i.e. respondents who graduated 6 or less year ago and who are aged 20-35 at the time of the survey. The age restriction excludes students with very untypical educational careers. Different age or time since graduation limits (plus/minus 1-2 years) do not alter the results in any substantive way. We further exclude persons who are in education or compulsory military/civilian service, and who work merely in a side job, as an unpaid family helper, or less than 10 hours per week. Among the remaining respondents, many have completed a traditional pre-Bologna degree. The earliest graduates in the sample completed education in 2004 (6 years from the time of our oldest survey conducted in 2010). In this year, only 2.6 % of all higher education graduations in Germany were Bachelors. The share increased quickly to 31 % in 2010 and to almost 49 % in 2013, our last observation year (Federal Statistical Office, 2015, p. 10, own calculations). Hence, we capture the first cohorts which were affected by the reform with our observation window. Because we are interested in the

[6] Source: RDC of the Federal Statistical Office and Statistical Offices of the Länder, Microcensus, survey years 2010, 2011, 2012, 2013, own calculations.
[7] An alternative data source would have been the GSOEP; however, the substantially smaller samples make robust analysis yet impossible.

labor market outlook of the new tertiary degrees, we exclude traditional degree holders (Diploma-, Staatsexamen- or Magister-degrees, and doctoral degrees).

As mentioned above, we consider four outcome variables: earnings, occupational prestige, unemployment, and fixed-term employment. Instead of a direct earnings measure, the Microcensus contains a question on personal net monthly income. To approximate earnings, we restrict the sample to those who are working and who report income from their own labor to be their main source of income. Other sources of income, such as pensions or income from rent and lease, are uncommon for labor market entrants. Thus, our measure – which we will refer to as earnings, henceforth – should not lead to other findings than a more direct earnings measure. Married taxpayers in Germany can file a joint tax return, which can reduce the tax burden and increase net earnings. Furthermore, children and part-time work can lower the tax-rate. In order to account for such potential tax induced distortions in the net earnings measure, we control for marital status, having at least one child, and for part-time work. Earnings are measured in 24 intervals. To derive a point estimate for each individual's earning, we rely on a procedure provided by the Federal Statistical Office (2014), which calculates a point estimate that places each individual on a random distribution within his or her interval brackets. We adjust this measure based on the consumer price index for 2010 and take the natural logarithm. As a robustness check, we re-ran our models controlling for working hours instead of a part-time dummy, and with log hourly earnings. Results do not differ in any substantive way (see Appendix A for this and other specification checks). The second outcome variable is occupational prestige, measured by the Magnitude Prestige Scale (Wegener, 1985), which is constructed based on the 3 digit 'KldB92'-classification, the national classification of occupations used by official statistics (Frietsch & Wirth, 2001). The scale maps the social hierarchy of occupational positions. For example, a cleaning person has a value of 21 and a medical doctor a value of 191. Prestige scores are standardized to a mean of zero and a standard deviation of one. For the earnings and prestige analyses, the sample consists of 31,559 labor market entrants, 14,588 men and 16,971 women, as shown in table 1. For unemployment, the third outcome variable, unemployed individuals are included, which leads to n = 34,940 cases for both genders. All persons without jobs who are actively seeking work are defined as unemployed. In extension to the 'ILO convention', we include the non-employed who actively seek work, but are not available to start a new job within two weeks. Our fourth outcome dimension is fixed-term employment, which is directly asked in the Microcensus. We are aware that the answers will include respondents who are in their probation period; because VET graduates have more work experience than academic graduates at a given age, the share of

fixed-term employees in this group will be lower. To account for this, we control for time since graduation and time since graduation squared. For the fixed-term employment analyses, self-employed have to be excluded, resulting in n = 30,137.

Table 1: Sample by degree

	Men		Women	
Degree	Freq.	%	Freq.	%
Vocational Education and Training				
'VET': initial voc. education and training	7,393	50.68	9,939	58.56
'M.Craftsm': Further voc. qualification, such as master craftsman, technical degree, nursing school	2,539	17.40	2,580	15.20
University of Appl. Sciences (FH)				
'BA-FH': Bachelor's degree	1,955	13.40	1,819	10.72
'MA-FH': Master's degree	624	5.53	421	2.48
University				
'BA-Uni': Bachelor's degree	807	4.28	954	5.62
'MA-Uni': Master's degree	1,270	8.71	1,258	7.41
Total	14,588	100	16,971	100

Note: Sample size for income and occupational prestige analyses (total n = 31,559). For the unemployment analyses, non-employed individuals are included, which leads to n = 34,940 cases. For the fixed-term employment analyses, self-employed are excluded, which leaves n = 30,137. Uni of Appl. Sciences includes universities of cooperative education (Duale Hochschule).

4. Estimation strategy

We analyze the association between labor market outcomes using either linear Ordinary Least Squares (OLS) or – for the binary outcomes unemployment and fixed-term employment –logit models. Results from logit models are reported as linear percentage point changes. All models include dummies for federal state, survey year, migration background, and type of university entrance qualification. To capture the tax effects mentioned in the previous section, we further include indicator variables for being married, for having at least one child, and for working part-time. Since educational programs differ both in duration and in the historic period of graduation (due to the gradual shift towards the new higher education degrees), our graduates differ in age and experience. We thus control for time since graduation (from one of the various degrees) and time since graduation squared. We do not control for variables that are themselves caused by education, such as occupation or tenure at current job. Due to the known differences in the educational and employment careers of men and women, we estimate the models separately by gender.

As shown by previous research, field of study has a strong impact on earnings (Glocker & Storck, 2014). The inclusion of field of study as a covariate is not straightforward. Some fields are only available at certain degree levels, such as mathematics, which can be studied at

universities only. Other fields, however, can be studied at all degree levels, such as business or computer science. Those interested in these fields can choose to enroll at all postsecondary levels. In this case, returns to the degree-level can be estimated given the field. We estimate the overall associations of degree level and outcomes twice, once without a field of study covariate, and once including 10-category field of study covariate that resembles the ISCED broad fields classification. Results do not differ much, as documented in the results section. In a second step, we estimate models separately by fields for those subjects that are offered at all levels, and for which the sample contains at least 50 observations at each degree level. Based on a detailed 96-category field-variable available in the Microcensus, we selected the fields business, computer, technical, and design/arts for this analysis. Table 2 provides illustrative examples for the fields we identified.

Table 2: Example fields by degree type

	Vocational (VET and M.Craftsm.)	**Academic (BA and MA)**
Business	Merchant, tax expert	Business administration
Computer	IT specialist	Computer science
Technical	Electrician, chemical lab. assistant	Electric engineering, chemistry
Design/Arts	Graphic design, dancing teacher	Graphic design, dance/theatre studies

In order to gain statistical power for the field specific analysis, we pool men and women, and include gender interaction terms with marital status, at least one child, and part-time employment. In light of the very similar patterns that we find in our overall models with respect to gender, this approach seems warranted. Descriptive statistics for the variables in our analysis are in table 3.

What might be seen as the strongest limitation to our design is the difficulty to properly account for selection into the different educational programs. The available variables do not capture all systematic differences. Most obviously, the Microcensus data lacks a measure of cognitive ability or previous scholastic performance, which is likely to be correlated with both, choice of educational type and labor market outcomes. In addition, selection bias might be caused by selective opting out of the population. While withdrawals from the labor market are uncommon among graduates from postsecondary education, continuation of education in a master's, a bachelor's, or a M. Craftsman program does not occur at random.

Table 3: Sample descriptives

	Men		**Women**	
Dependent variables	*Mean*	*SD*	*Mean*	*SD*
Net monthly earnings (ln)	7.42	0.40	7.22	0.37
Std. magnitude prestige scale (MPS)[a]	-0.44	0.65	-0.49	0.61
Unemployment (%)	4.89		4.05	
Fixed-term employment (%)	17.21		22.09	
Independent Variables				
Time since graduation	2.80	1.88	2.81	1.86
Part-time employment (%)	4.21		13.09	
Abitur (unrestricted HE entrance qualification, %)	60.21		66.01	
Married (%)	17.82		16.16	
At least one child (%)	32.51		26.32	
Migration background (%)	17.04		15.70	
Survey year (%)				
2010	19.91		21.19	
2011	23.21		24.12	
2012	27.13		26.00	
2013	29.76		28.69	
Field of study (%)				
Education	0.58		1.67	
Arts and humanities	5.50		7.03	
Social sciences, administration	5.81		8.83	
Business, law	21.44		31.29	
Natural sciences, mathematics	2.34		1.47	
Computer sciences	12.19		1.47	
Technical, Engineering, Manufact.	29.37		5.56	
Agriculture, Nutrition	4.62		3.25	
Health and welfare	9.85		30.17	
Services	8.29		9.27	
Academic job (requires ISCO skill level 4) (%)	35.45		25.86	
Samples for field specific analysis (Men + Women)	N			
Business/Economics	7,827			
Computer Sciences	2,027			
Technical	3,264			
Design/Arts	1,395			

Note: Values based on the analytical sample for the income and prestige analysis (n = 31,559), except for unemployment (n = 34,940, includes the non-employed) and fixed-term employment (n = 30,137, self-employed are excluded). [a] MPS was Z-standardized with diploma and doctoral degree holders in the sample.

Most studies on returns to education handle endogeneity problems by using instrumental variables (IV), which we could not implement due to the lack of good IVs. For example, distance to university at the time of high school completion could be an IV. However, we only observe place of residence at the time of the survey, and thus at a time when many respondents have moved. Another potential instrument could be tuition fees for higher education that have been introduced and abolished with variation across federal states. However, previous research

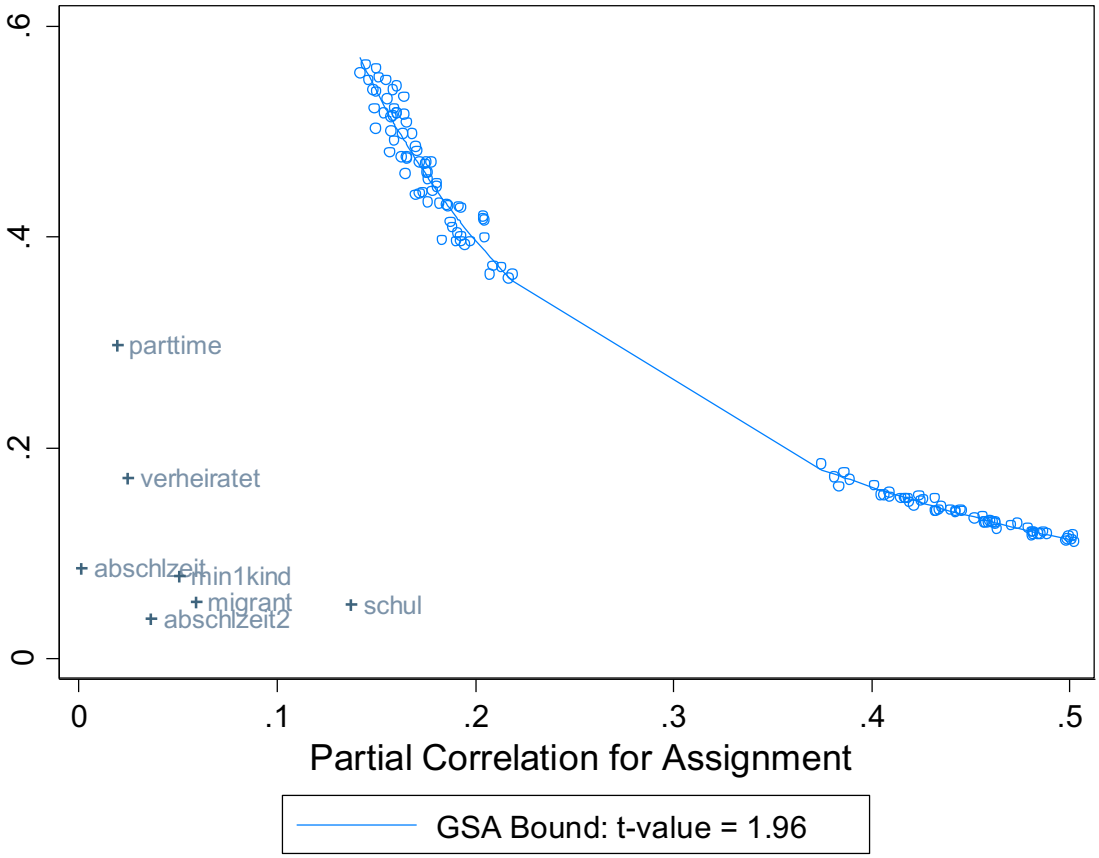
has demonstrated that tuition fees in Germany were too low to impact educational decisions to a substantive degree (Helbig, Baier, & Kroth, 2012).

We take several steps to mitigate unobserved heterogeneity bias. First, we constrain our sample to those who are eligible for higher education studies, which ensures that all educational options were available to everybody in the sample and reduces heterogeneity in unobserved abilities and motivation. Second, we excluded persons with 'Fachhochschulreife'-entrance certificates as a robustness check. Results do not differ substantively (see figures A1 and A2 in the appendix). Third, we control for observed variables, such as migration background, which are predictive for the selection into VET or higher education. Fourth, we conduct sub-sample analyses by fields of study, as explained above. This further reduces unobserved heterogeneity because unobserved abilities and preferences are related to field of study choice, and because we focus on fields of study which are not the most selective in terms of previous scholastic performance (e.g. business, not medicine). Fifth, we perform sensitivity analysis on the vulnerability of our estimates to potential bias through simulated omitted variables. To this end, we employ the generalized sensitivity analysis (GSA) Stata ado by Harada (2012), which provides Imbens (2003) type sensitivity parameters (see Harada, 2013 for details). Imbens considers two parameters, the partial effect of an unobserved confounder on the treatment (α) and on the outcome (δ); the product of the two is the omitted variable bias. GSA seeks combinations of α and δ, which change the treatment effect to a certain target criterion. We set this target criterion to t=1.96. That is to say, we identify the strength of the confounding by a continuous unobservable, such as cognitive ability, that makes the treatment effect statistically insignificant at the 5%-level. We limit the sensitivity analysis to the comparison of bachelor's studies at a university versus VET.[8] To illustrate, figure 1 shows a contour curve for earnings that marks all combinations of α and δ for which the effect turns insignificant. The partial effects of the observed covariates are added to the figure to demonstrate the relative scale of the confounding effect. It shows that a confounder with the power to 'explain away' the earnings difference would have to be more highly correlated with both the assignment (BA-Uni versus VET) and the outcome (earnings) than any of the included control variables. We believe this is very unlikely, even if several unobservables jointly reduce the difference. Sensitivity analysis with contour plots for the other outcomes are in Appendix B; they confirm this finding. In summary, we are confident that statistically significant causal effects exist, even though the

[8] In principle, other types of confounders or other comparisons can be modeled in a similar fashion. Because the procedure is computationally expensive, we restrict it to the most meaningful comparison.

absence of truly exogenous variation limits a conclusion about the precise magnitude of the effect. This should be kept in mind when interpreting the findings below.

Figure 1: Contour plot of sensitivity analysis for earnings (BA-Uni vs. VET)



5. Results

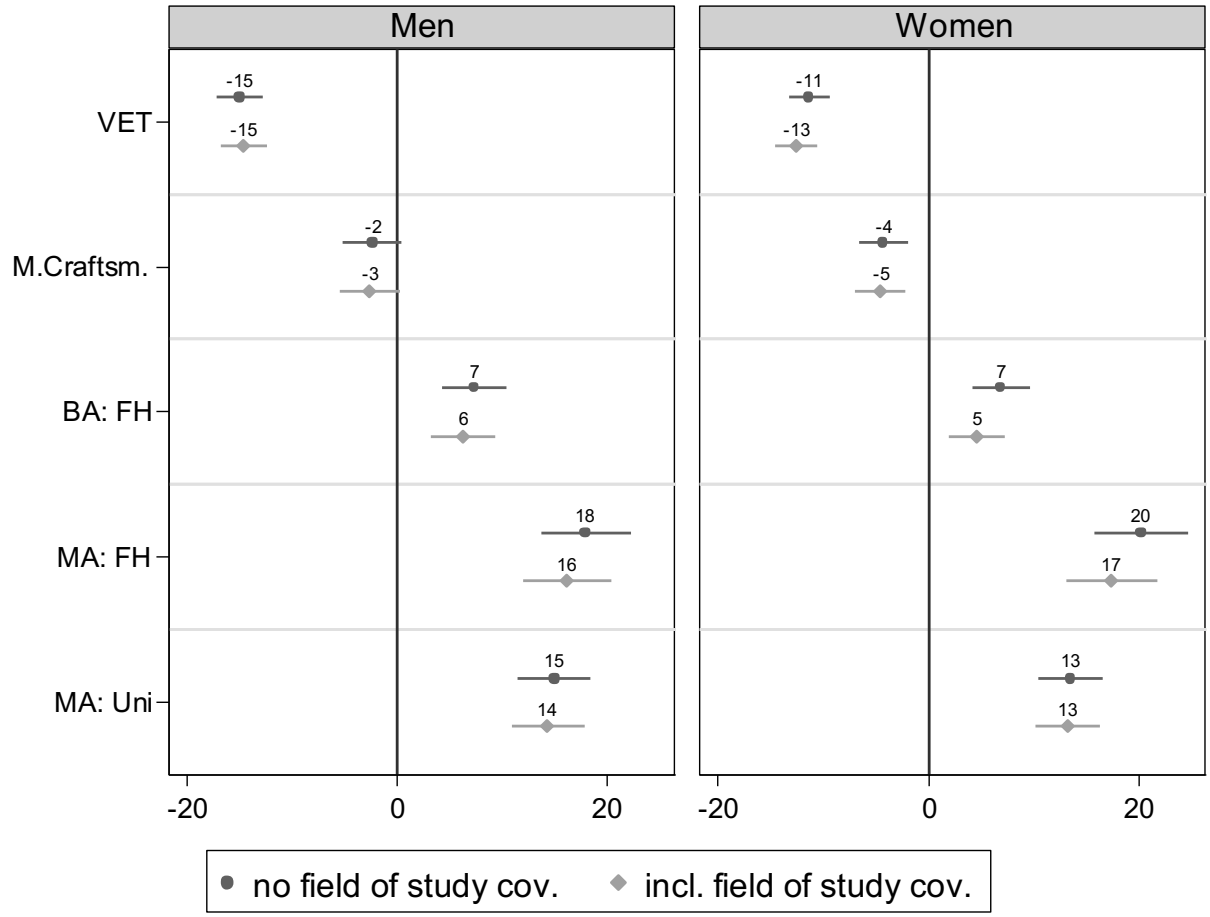
In light of the great number of regression models, we rely on graphical representations of the major findings (Jann, 2013). Several of the full regression tables are displayed in Appendix C.

5.1. Income

Figure 2 shows the regression coefficients of degree type on log monthly earnings, along with 95% confidence intervals. The coefficients are transformed $(100 * (e^{\hat{b}} - 1))$ to denote percentage point differences. As in all coefficient plots to follow, the vertical line of each panel represents the point estimate of the reference category, which are bachelor's from universities (BA-Uni). We estimate separate models for men and women. The darker symbols show the coefficients of a model without controlling for field of study. The lighter symbols depict the

same coefficients, but adjusted for field of study differences. Both specifications lead to very similar findings. In our description, we focus on the specification with field of study adjustment.

Figure 2: Log monthly earnings by degree



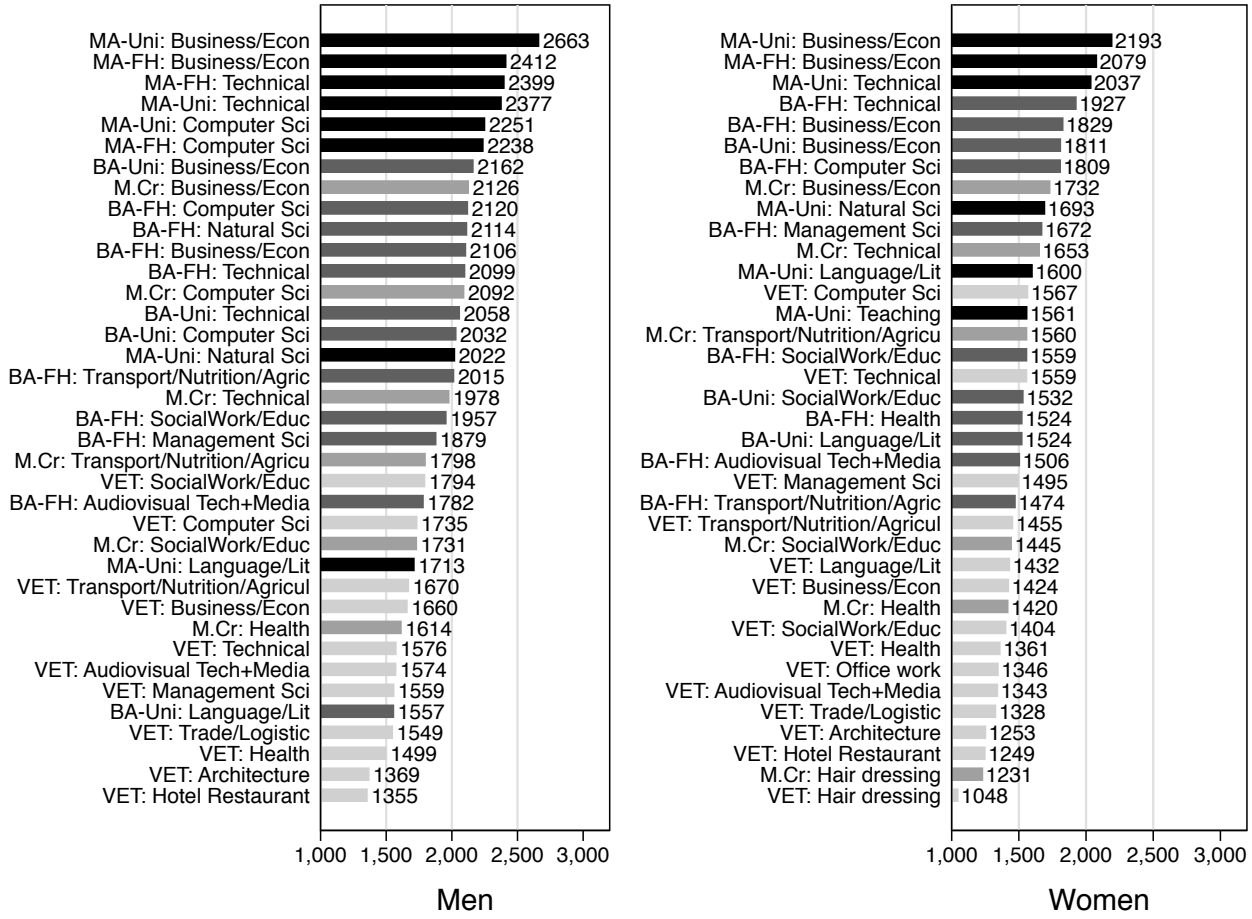
Note: Reference = BA-Uni. Coefficients are expressed as percentage point differences.

Compared to BA-Uni, VET graduates earn on average 15 % (men) to 13 % (women) less. Thus, academic training leads to substantially higher earnings, despite a similar amount of training time. Furthermore, labor market entrants with M. Craftsman degrees, who have received more training, earn 3 % (men) to 5 % (women) less than BA-Uni graduates. Note that in the case of men, this difference is only marginally significant at the 10%-level. Earnings also differ by higher education institutions. Bachelor's graduates from FHs earn 5 % (men) to 6 % (women) more than bachelor's graduates from Unis. Master's graduates from FHs followed by Unis receive the highest earnings, their monthly earnings lay 14 to 17 % above the reference group. Overall, findings for men and women differ only slightly; the broad pattern and the hierarchy of the different degrees is the same for both sexes.

These average estimates hide a great deal of variability. To illustrate, we display in figure 3 average earnings (without any control variables) for all field*degree-combinations with at

least 50 observations (full time workers only). For example, a young man with a VET in computer science earns €178 more than one with a university bachelor's in languages.

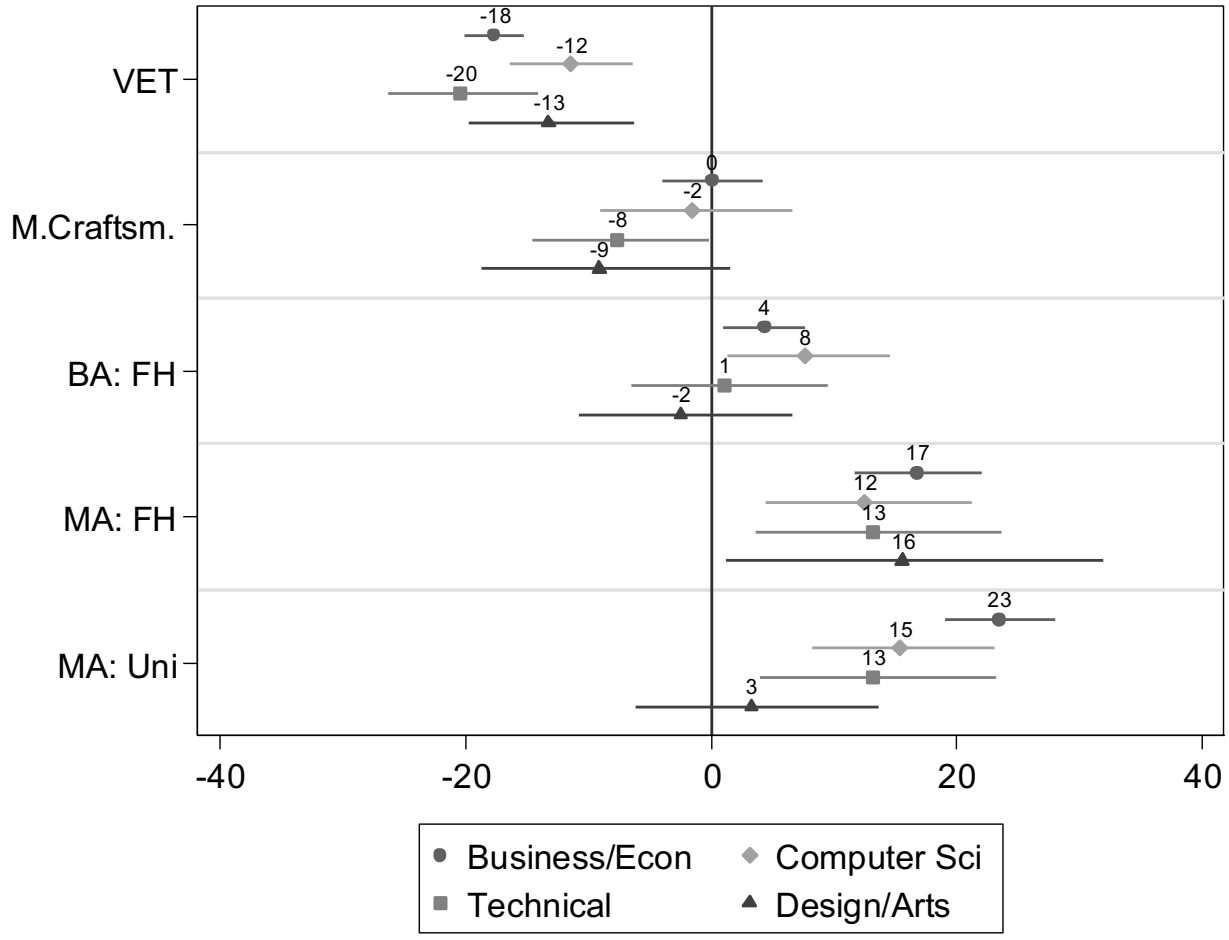
Figure 3: Monthly earnings for full-time workers, by degree and detailed field of study



The general pattern is that academic education (darker bars) is associated with higher earnings than vocational education (lighter bars). This also becomes visible if we compare degrees within a single field of study available at all degree levels, e.g., business. Here, we observe the same earnings hierarchy as reported above: MA > BA > M. Craftsman. > VET.

We investigated the latter phenomenon more systematically in field-specific sub-sample analysis. The fields that can be studied at all degree-levels and for which we have at least 50 observations at each level are 'Business', 'Computer', 'Technical', and 'Design/Arts'. In these sub-sample analysis, we also get rid of the differences between vocational oriented content and liberal arts education, as these subjects are occupational specific even if taught in higher education. As the overall results were very similar across gender, we collapse men and women for these analyses to increase statistical power.

Figure 4: Log monthly earnings by degree and selected fields of study, men and women combined



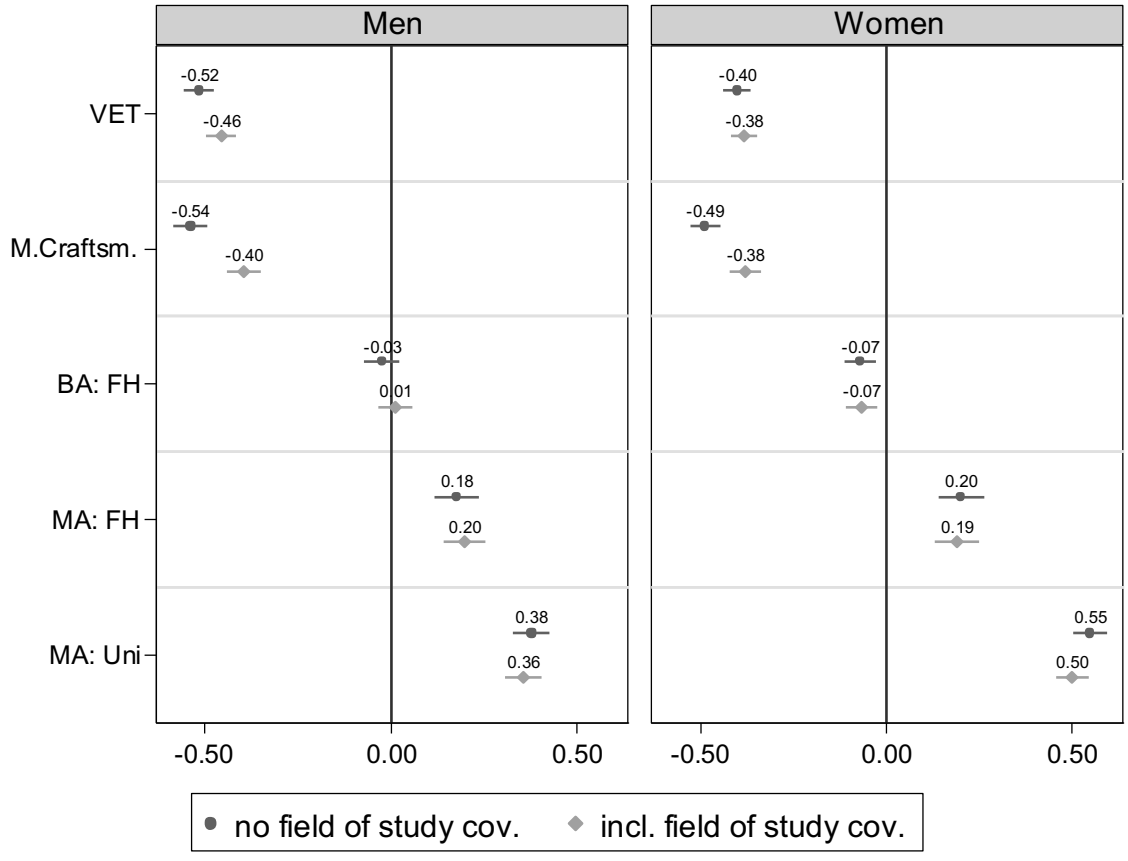
Note: Reference = BA-Uni. Coefficients are expressed as percentage point differences.

As shown in figure 4, the overall pattern is quite similar for the four fields. Those with a VET earn 12 - 20 % less than BA-Uni or BA-FH graduates. However, there are also some notable differences: Earnings of M. Craftsman in business/economics and computer science match those of bachelor's graduates (from Unis and FHs), while they tend to be 8-9 % lower in technical and design/arts fields ($p<0.1$). It is also noteworthy that we find a significant advantage of BA-FH over BA-Uni graduates in business and computer sciences, but not in technical or design/arts fields. This suggests that at least a part of the advantage for the FH found in figure 2 can be attributed to the different subjects taught there. Finally, a master's (from a Uni or FH) leads to an earnings premium compared to the reference category in all fields except for design/arts. Among designers, degree type seems to matter less than among business professionals.

5.2. Occupational prestige

Extending the returns to education beyond monetary pay-offs, we investigate differences in occupational prestige between the different degrees in figure 5. Results are similar for women and men, and clear-cut: Vocational education is associated with lower occupational prestige than academic education. Interestingly, a further vocational qualification is not related to more prestigious jobs than initial VET. The difference between VET/M. Craftsman and a bachelor's from Uni or FH is around 0.4 standard deviations – a medium size effect. Master's degree holders reach the most prestigious positions. While the MA-Uni leads to more prestigious jobs than the MA-FH, this institutional distinction is absent among male bachelor's and small in the case of women. That is to say, the difference between Uni and FH is not important for the labor market that bachelor's graduates enter, but visible for the master's level.

Figure 5: Occupational prestige by degree and gender

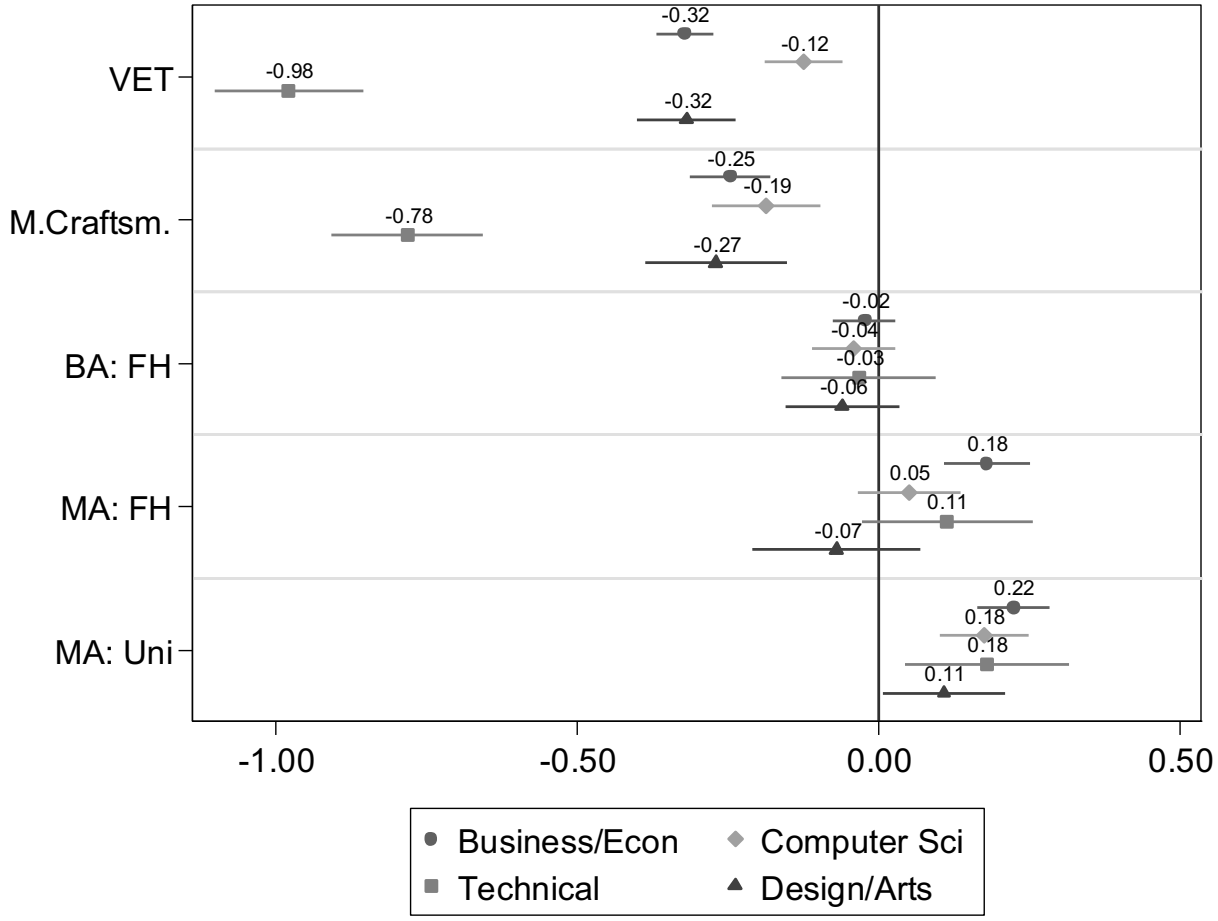


Note: Reference = BA-Uni. The coefficients depict differences in standard deviations.

Again, we estimate models separately for selected fields (cf. figure 6). While all VET degrees yield significantly lower occupational prestige, the gains from higher education are by far largest in the technical fields. Here, differences between BA-Uni and VET amount to 1

standard deviation, while they are between 0.3 and 0.1 standard deviations for the other fields. Hence, occupational destinations of VET graduates from technical programs are clearly less prestigious compared to those of bachelor's graduates. Among the other fields, the 'occupational divide' is considerably smaller. Within higher education, the differences between Uni and FH graduates are small and largely insignificant on the BA and MA level, given a certain field.

Figure 6: Occupational prestige by degree and selected fields of study, men and women combined



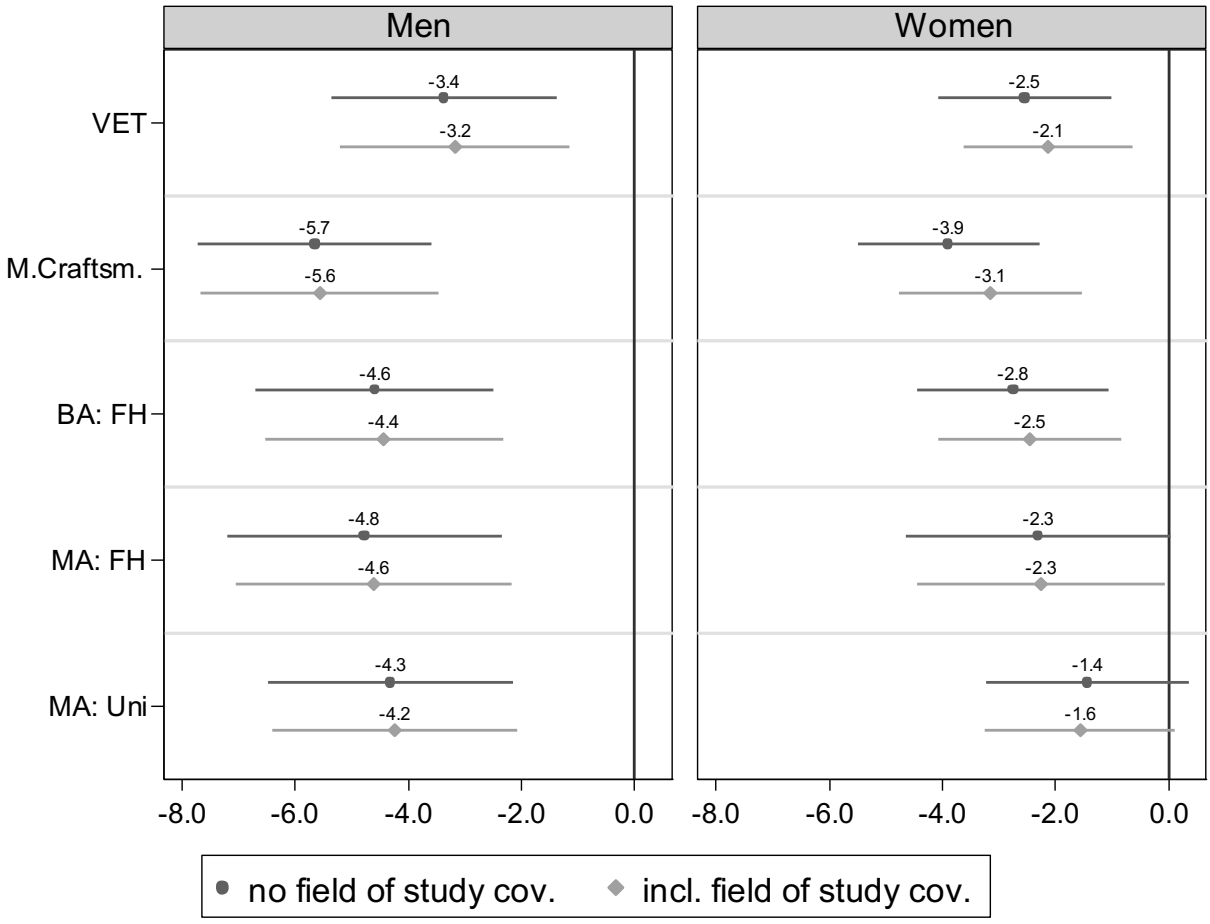
Note: Reference = BA-Uni. The coefficients depict differences in standard deviations.

5.3. Unemployment

Arguably, job security is of major importance for most individuals. One of the main arguments of opponents of educational expansion is an oversupply of academically trained graduates,

which would lead to higher unemployment rates. Figure 7 shows the predicted probabilities of being unemployed, along with the 95% confidence intervals.[9]

Figure 7: Unemployment risk by degree and gender



Note: Reference = BA-Uni. Coefficients are average marginal effects multiplied by 100 to depict percentage point differences.

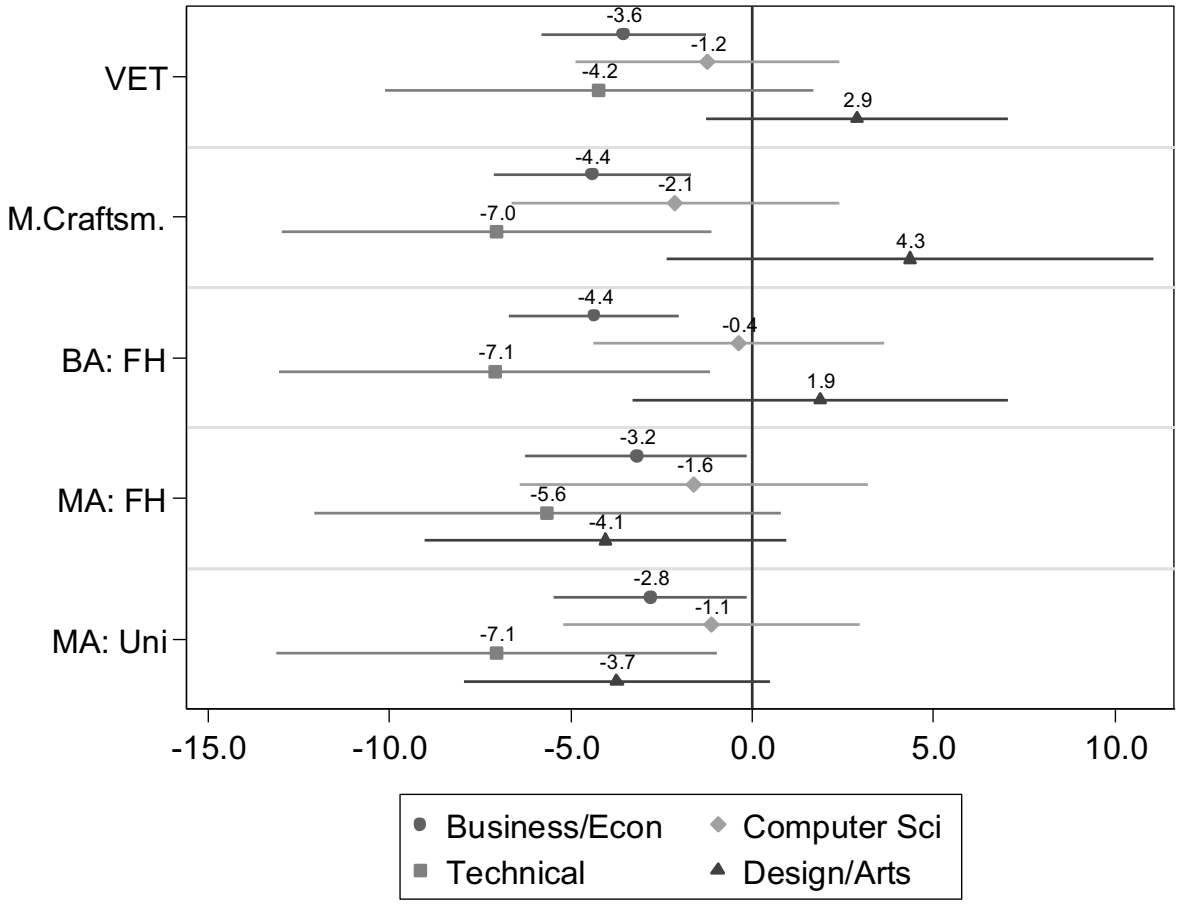
Compared to all other degrees, BA-Uni graduates have the highest unemployment risk, men and women alike. Although the percentage point differences seem to be small, they have to be evaluated against the background of generally low unemployment rates of young people with postsecondary education. Note that in our sample, only 4.89 % of men and 4.05 % of women are unemployed (see table 3). BA-Uni graduates have an unemployment rate of 7.4 %. For VET graduates, logistic regression models predict a 3.2 percentage points lower unemployment risk for men and 2.1 for women. Note that graduates from the FHs at the BA and MA level come out just as good as those with university master's. It may be that bachelor's graduates from

[9] Average marginal effects are calculated from logistic regression models. All values are multiplied by 100 to allow for a percentage point interpretation.

universities are more likely than other groups to take a gap year before re-entering university or beginning to work, which raises their unemployment figure. To test this, we repeated the analysis but excluded graduates who finished their degree within the current or the year prior to the survey, i.e. respondents finished education 2 to 6 years before the survey (see figure A3). We find that differences are reduced, and VET and BA-Uni graduates do not differ significantly anymore in a sample without gap-year takers. However, compared to all other groups, BA-Uni graduates continue to have a significantly higher unemployment risk of about 2-5 percentage points.

In figure 8, we report the differences in unemployment risks by fields. Even though confidence intervals are large, which is to be expected given the rather low unemployment rate of our sample, differences are statistically significant in several cases. We find significant differences in technical and business/economics programs. For these fields, we can confirm higher unemployment risks of BA-Uni graduates compared to all other degree types, except for VET in technical fields, where the point estimate of -4.2 is insignificant. These results may be driven by the fact that the technical and economic fields offer larger samples than the other two fields. Thus, while some variation by field of study in the overall unemployment risk is likely, further data sources need to be consulted for a more precise description of degree effects on unemployment risks by field of study.

Figure 8: Unemployment risk by degree and selected fields of study, men and women combined

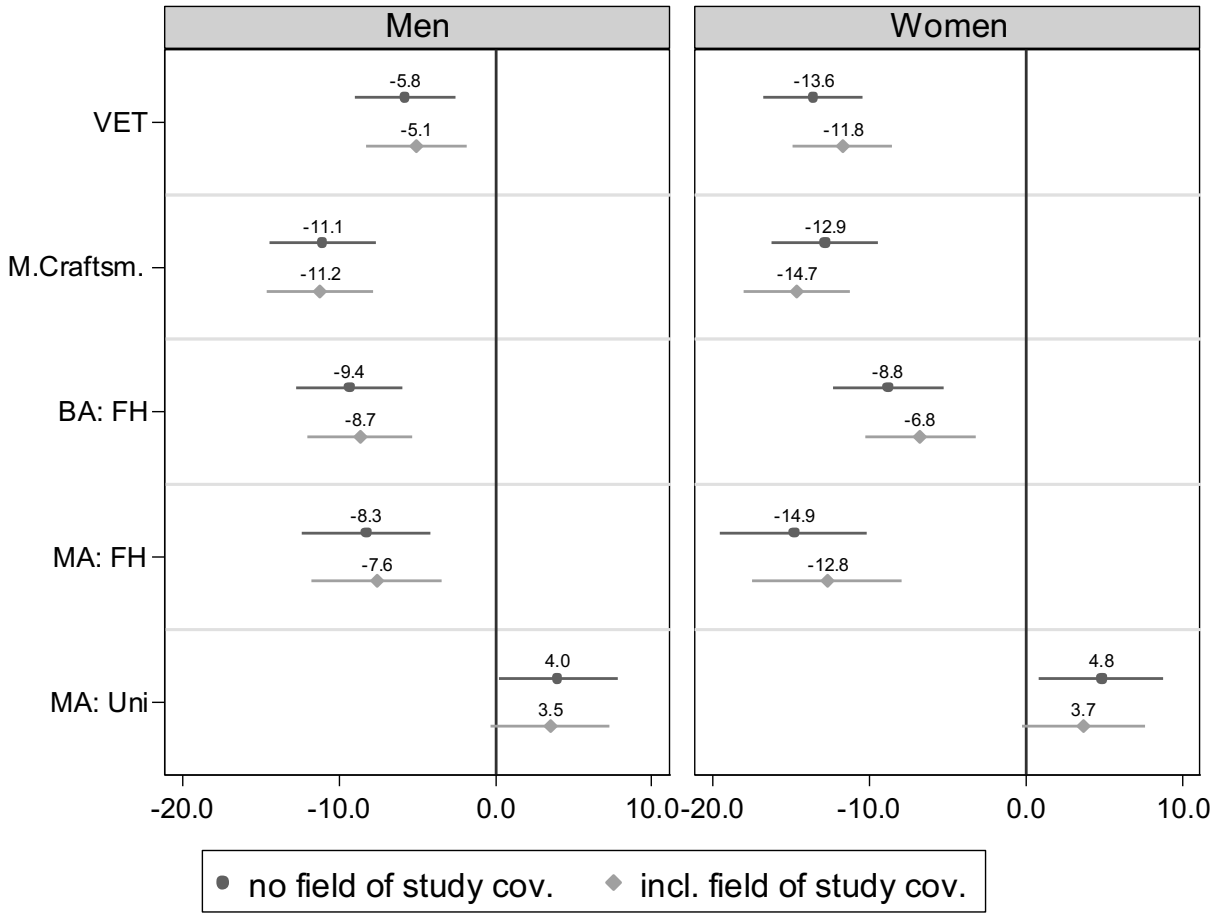


Note: Reference = BA-Uni. Coefficients are average marginal effects multiplied by 100 to depict percentage point differences.

5.4. Fixed-term employment

A second security-related outcome is access to permanent employment. Of all bachelor's graduates from universities who enter the labor market, 29.8 % (combined for both genders) work in fixed-term contracts, as opposed to tenured contracts. Figure 9 shows how other labor market entrants in our sample compare to them. Both vocational degree types are associated with lower fixed-term contract risks. With 5 to 15 percentage points, the differences are non-trivial. A comparison with the FH reveals that graduates from these more vocationally oriented higher education institutions are also less likely to receive fixed-term contracts towards the beginning of their working career. The only group with an even higher fixed-term rate than BA-Uni graduates are MA-Uni graduates. This is due to the sub-group of MA graduates who work at universities on their PhD thesis. Once this group is excluded, BA-Uni and MA-Uni graduates do not differ, as can be seen in figure A4.

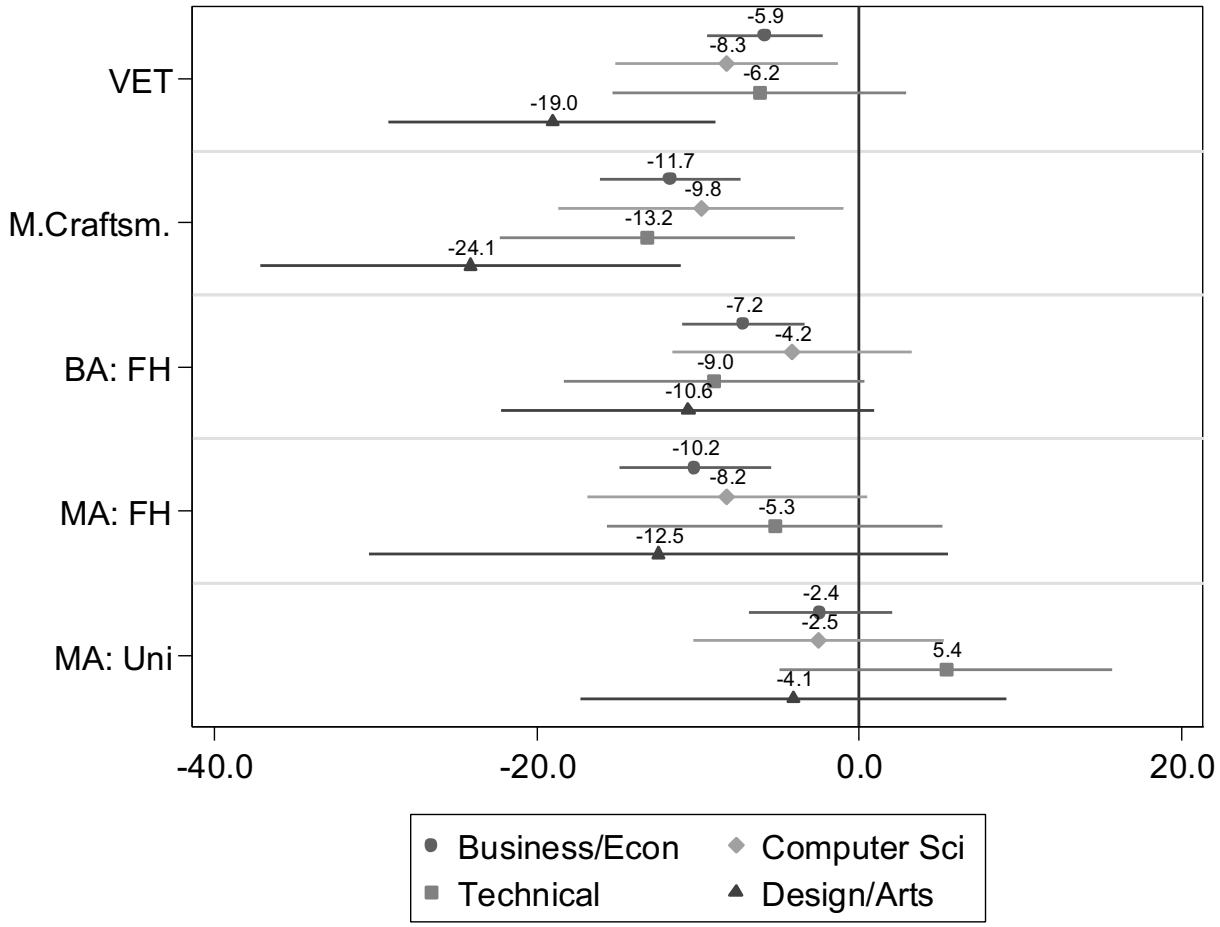
Figure 9: Fixed-term employment by degree



Note: Reference = BA-Uni. Coefficients are average marginal effects multiplied by 100 to depict percentage point differences.

Figure 10 reports the results for fixed-term employment by fields of study. In all fields, both vocational degree types are associated with lower fixed-term employment risks than BA-Uni graduates, except for VET-technical, where the difference of 6.2 percentage points is not significant. The patterns are similar across fields and confirm the overall analysis. Note, however, that the advantages of the two FH degrees over BA-Uni graduates are not always statistically significant.

Figure 10: Fixed-term employment by degree and selected fields of study, men and women combined



Note: Reference = BA-Uni. Coefficients are average marginal effects multiplied by 100 to depict percentage point differences.

6. Summary and Discussion

In the course of the Bologna Process, a range of European countries have introduced bachelor's degrees which are considerably shorter than the tertiary degrees previously available in these countries. At the same time, higher educational expansion has shifted the supply of vocationally trained to academically trained labor market entrants. These developments, which are unaccounted for by previous research, raise the question, how the new 'short tertiary' graduates compete on labor markets with a strong vocational orientation. We focus on Germany, one of the countries were vocational training is accepted as a solid alternative to academic education. German data provides us with the unique possibility to compare individuals of similar scholastic performance, training time, and professional interests, who chose between VET and academic education. To gain a comprehensive picture of the current situation, we analyzed different

indicators of labor market integration, use a nuanced measure of degree type, and take field of study differences into account.

Based on the best data base available to date, we find that graduates with bachelor's degrees from both universities and universities of applied sciences end up in occupations with higher earnings and prestige than graduates with initial vocational training degrees, against public criticism. The completion of a M. Craftsman degree requires more training time than a bachelor's, and it usually also requires a certain period of labor force experience. However, a M. Craftsman (or another further vocational training certificate) is associated with similar earnings as a bachelor's from university, and somewhat lower earnings than a bachelor's from universities of applied sciences. Moreover, compared to both initial VET and M. Craftsman, bachelor´s graduates from both higher education institutions work in more prestigious jobs with higher skill requirements. A job, and consequently occupational prestige, is more stable than earnings. While we are limited to labor market entrants, this finding may give some indication for medium-term advantages of academic education. Career processes unfold slowly and cannot be observed yet. This hypothesis is supported by recent findings showing that adaptability over time is a strength of general education (Hanushek et al., 2016). The most favorable earnings and prestige scores are found for master's graduates. In sum, academic education remains to be associated with earnings and prestige premiums, despite expansion and, in the case of bachelor's graduates, a shorter training time. On the other hand, a bachelor's degree from a university is related to higher risks of unemployment or fixed-term employment than vocational degrees. Similarly, many master's graduates from universities work in fixed-term contracts. Interestingly, this is not true for graduates from universities of applied sciences (FH), which put a stronger emphasis on the practical application of knowledge. Bachelor's and master's graduates from these institutions have low unemployment and fixed-term employment risks, as well as high earnings and prestige.

Altogether, concerns about the employability or a lack of skills among bachelor's graduates seem to be unjustified. The somewhat higher risks to be unemployed for higher education graduates from universities may be an indication of academic oversupply. However, unemployment rates are very low overall, which makes them look much less problematic. Much more widespread than unemployment is fixed-term employment, which affects the bachelor's and master's from universities at significantly higher rates. Since FH graduates fare much better in this regard, the new degrees are unlikely to account for these results.

Advantages of FH graduates over university graduates are a relatively novel finding, but they are in line with recent policy reports that focus on tertiary graduates only (Fabian et al.,

2016). We can exclude the explanation that the specific fields taught at the FH account entirely for this finding. Moreover, positive selection by abilities into the FHs is unlikely, as entry criteria are lower (Schindler & Reimer, 2011, p. 268). Another possible explanation is that a large proportion of FH graduates have completed a VET program before their higher education. This could facilitate re-entry into the labor market. To test this hypothesis, we control for double qualification (VET before HE) in sub-sample analysis among higher education graduates. Results as shown in table A2 suggest this is not the mechanism at work. Unemployment risks are lower for FH graduates even after controlling for VET before HE. It seems that the more practically oriented curriculum, including placements and a close connection with employers, ensures a smooth transition into the labor market, and thus successfully combines the strengths of vocational and academic education. Moreover, the longer duration of some bachelors programs at FHs may additionally contribute to the good labor market prospects of these graduates.

Our results have additional implications for the debate on social inequality in educational opportunities. They document that such inequality is very likely to turn into inequalities in the labor market. Moreover, it has been argued that the tradeoff between a smooth labor market entry from VET on the one side, and higher but more risky returns from higher education on the other side, diverts potential students from lower social origin away from academic education (Hillmert & Jacob, 2003; Mayer, Müller, & Pollak, 2007). We found confirming evidence for the assumption of a risk-return tradeoff in the choice between academic education and VET, although the risks of becoming unemployed are not very high for higher education graduates either. Thus, perceived rather than substantive risks should be the reason for the low enrolment rates of disadvantaged students.

In this paper, we analyzed Microcensus data from official statistics. Its major strengths are a large sample size which allows for a precise selection of subsamples and negligible issues with non-response. As a drawback, it does not contain measures for ability or motivation, which clearly limits a causal interpretation. We acknowledge this problem, although we would like to stress that many of the effects are large and thus only large unobserved heterogeneity could alter the main findings. Moreover, we performed a number of sensitivity checks that demonstrate the stability of our findings. In addition, previous studies that were able to control for ability found that the inclusion of such measures did not change the effect of education (Forster et al., 2016, p. 12). In sum, we feel fairly safe to conclude that higher education is associated with higher labor market outcomes among labor market entrants, even though the Bologna Reform has introduced degree programs that take barely longer than VET training.

Acknowledgement

We thank Katja Görlitz, Markus Klein and Heike Spangenberg for helpful suggestions on an earlier draft of this manuscript. We also received valuable comments from participants at the 2015 annual conference of the ECSR, the DZHW research symposia, the 2016 summer meeting of the ISA RC28, the 2016 annual conference of the GEBF, Heike Solga's WZB AAM/NEPS colloquium, and the BIEN Lunchtime Seminar. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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Appendix A – Additional specifications

Table A1: Different earnings specifications

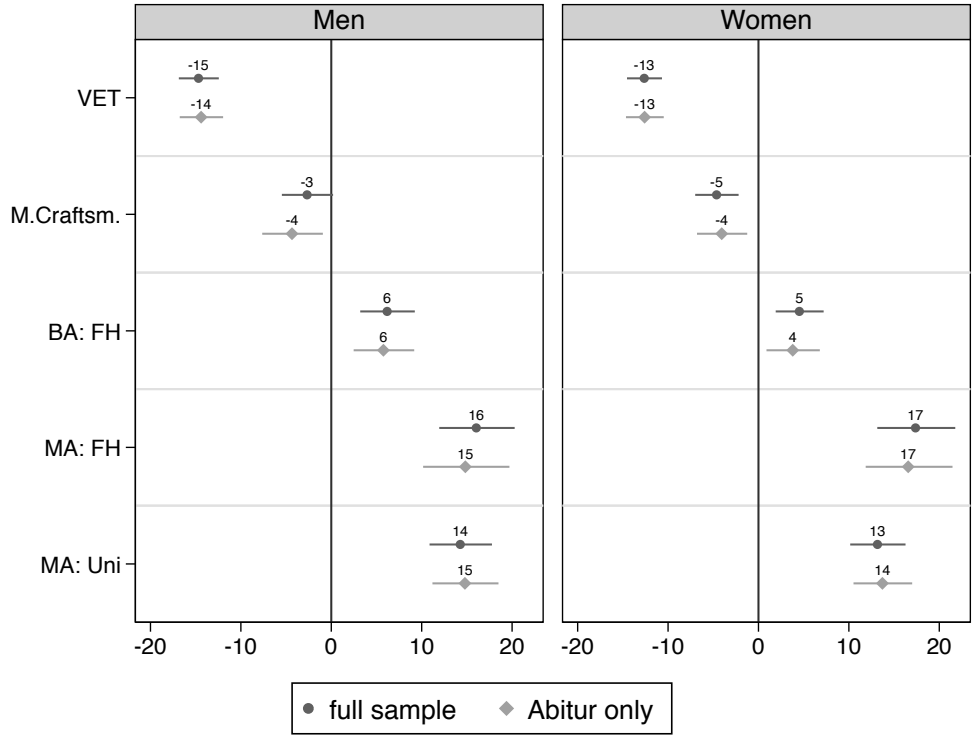
	Men						Women					
	(1) DV: log monthly earnings, Cov: parttime		(2) DV: log monthly earnings, Cov: working hours		(3) DV: log hourly earnings		(4) DV: log monthly earnings, Cov: parttime		(5) DV: log monthly earnings, Cov: working hours		(6) DV: log hourly earnings	
VET	-0.16***	(0.01)	-0.13***	(0.01)	-0.13***	(0.01)	-0.14***	(0.01)	-0.11***	(0.01)	-0.13***	(0.01)
M.Craftsm.	-0.03+	(0.01)	-0.02	(0.01)	-0.02	(0.01)	-0.05***	(0.01)	-0.04**	(0.01)	-0.06***	(0.01)
BA- FH	0.06***	(0.01)	0.07***	(0.01)	0.07***	(0.01)	0.04***	(0.01)	0.05***	(0.01)	0.04**	(0.01)
MA- FH	0.15***	(0.02)	0.16***	(0.02)	0.15***	(0.02)	0.16***	(0.02)	0.15***	(0.02)	0.14***	(0.02)
MA- Uni	0.13***	(0.02)	0.13***	(0.02)	0.13***	(0.02)	0.12***	(0.01)	0.12***	(0.01)	0.11***	(0.01)
time since grad.	0.05***	(0.01)	0.05***	(0.01)	0.05***	(0.01)	0.05***	(0.00)	0.04***	(0.00)	0.04***	(0.00)
time since grad.²	-0.00***	(0.00)	-0.00***	(0.00)	-0.00***	(0.00)	-0.00***	(0.00)	-0.00***	(0.00)	-0.00**	(0.00)
married	0.18***	(0.01)	0.18***	(0.01)	0.18***	(0.01)	-0.01	(0.01)	-0.00	(0.01)	0.04***	(0.01)
children	-0.06***	(0.01)	-0.05***	(0.01)	-0.05***	(0.01)	-0.08***	(0.01)	-0.07***	(0.01)	-0.03***	(0.01)
Abitur	0.02***	(0.01)	0.02***	(0.01)	0.02***	(0.01)	0.02***	(0.01)	0.03***	(0.01)	0.02***	(0.01)
mig. backgr.	-0.06***	(0.01)	-0.05***	(0.01)	-0.04***	(0.01)	-0.04***	(0.01)	-0.03***	(0.01)	-0.03***	(0.01)
part-time	-0.49***	(0.01)					-0.36***	(0.01)				
Education	-0.14***	(0.04)	-0.15***	(0.04)	-0.10**	(0.04)	-0.10***	(0.02)	-0.09***	(0.02)	-0.06**	(0.02)
Arts and human.	-0.18***	(0.01)	-0.20***	(0.01)	-0.18***	(0.01)	-0.15***	(0.01)	-0.15***	(0.01)	-0.12***	(0.01)
Social sci., admin	-0.07***	(0.01)	-0.05***	(0.01)	-0.05***	(0.01)	0.01	(0.01)	0.02*	(0.01)	0.02*	(0.01)
Nat. sci., math	-0.03	(0.02)	-0.02	(0.02)	0.01	(0.02)	-0.07**	(0.02)	-0.06**	(0.02)	-0.04+	(0.02)
Computer sciences	0.00	(0.01)	0.02*	(0.01)	0.03*	(0.01)	0.06**	(0.02)	0.07***	(0.02)	0.07***	(0.02)
Tech. (eng./manuf.)	-0.03**	(0.01)	-0.00	(0.01)	0.01	(0.01)	-0.03*	(0.01)	-0.02*	(0.01)	-0.01	(0.01)
Agricult/Nutrition	-0.05***	(0.01)	-0.06***	(0.01)	-0.06***	(0.01)	-0.06***	(0.01)	-0.07***	(0.01)	-0.07***	(0.01)
Health and welfare	-0.07***	(0.01)	-0.08***	(0.01)	-0.06***	(0.01)	-0.05***	(0.01)	-0.05***	(0.01)	-0.02***	(0.01)
Services	-0.12***	(0.01)	-0.12***	(0.01)	-0.12***	(0.01)	-0.12***	(0.01)	-0.12***	(0.01)	-0.10***	(0.01)
working hours			0.01***	(0.00)					0.02***	(0.00)		
Constant	7.40***	(0.02)	6.76***	(0.03)	2.20***	(0.02)	7.28***	(0.02)	6.51***	(0.02)	2.12***	(0.02)
Observations	14588		14588		14588		16971		16971		16971	
R^2	0.276		0.273		0.194		0.267		0.278		0.136	

Note: The estimated education coefficients are robust to different measures of earnings.

Standard errors in parentheses, Models include federal state and survey year dummies. Base levels: BA-Uni; Business/Econ.

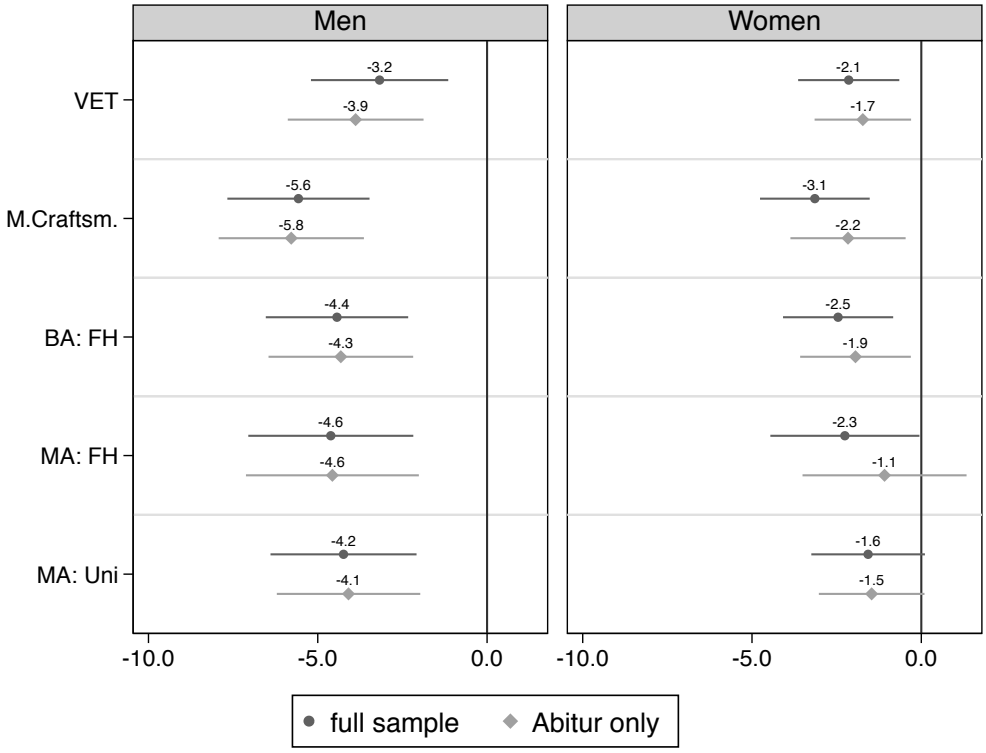
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure A1: Log monthly earnings by degree, full sample compared to a sample in which persons with a 'Fachhochschulreife'-degree are excluded.



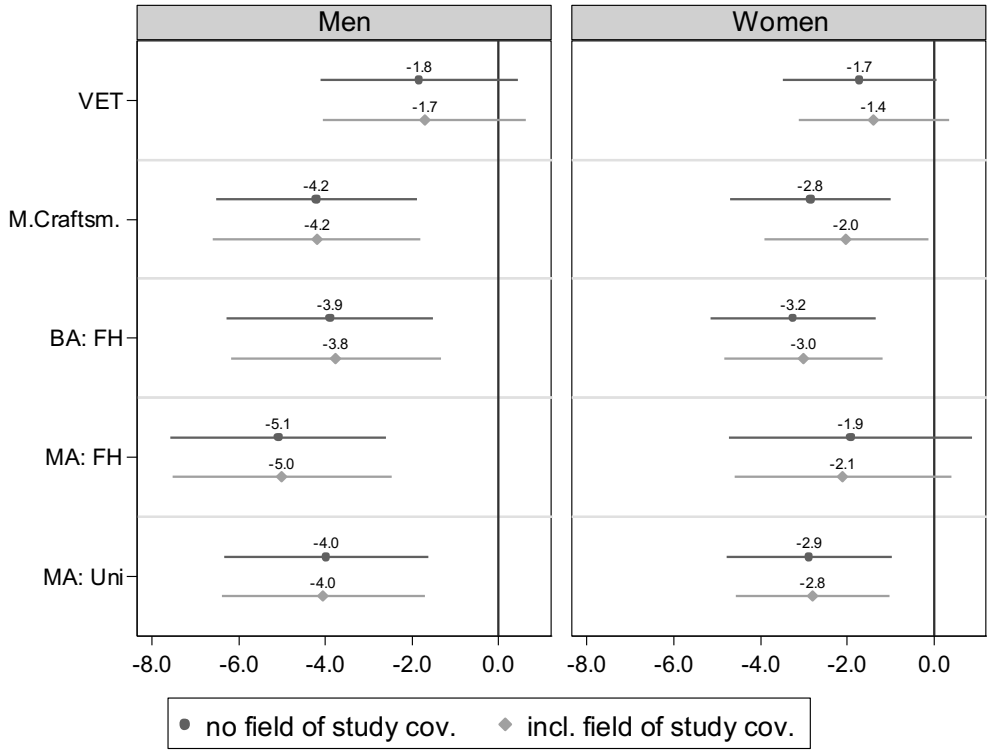
Note*: Reference = BA-Uni. Coefficients are expressed as percentage point differences.*

Figure A2: Unemployment risk by degree, full sample compared to a sample in which persons with a 'Fachhochschulreife'-degree are excluded.



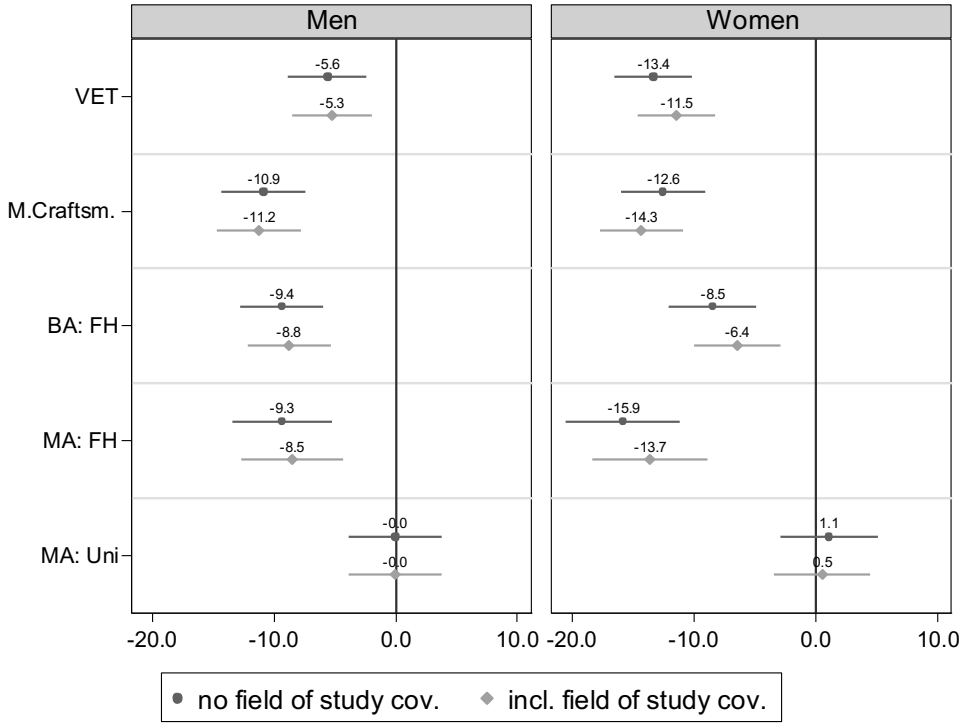
Note: Reference = BA-Uni. Coefficients are average marginal effects multiplied by 100 to depict percentage point differences.

Figure A3: Unemployment risk by degree and gender (2-6 years after graduation only)



Note: Reference = BA-Uni. Coefficients are average marginal effects multiplied by 100 to depict percentage point differences.

Figure A4: Fixed-term employment risk by degree and gender (excluding those who aim for a PhD)



Note: Reference = BA-Uni. Coefficients are average marginal effects multiplied by 100 to depict percentage point differences.

VET before higher education studies

One may assume that graduates from universities of applied sciences (FH) are less likely to be unemployed because they are more likely to have completed a vocational training before completing a bachelor's – a so-called double qualification. This may facilitate entry into the labor market, often with the same employer. To test this hypothesis, we control for double qualification (VET before HE) in sub-sample analysis among higher education graduates. Results as shown in table A2 suggest this is not the mechanism at work. Unemployment risks are lower for FH graduates even after controlling for VET before HE.

Table A2: Unemployment risk for FH and Uni graduates (AME), controlling for VET before HE studies

	(1) Men		(2) Men		(3) Women		(4) Women	
BA- FH	-0.04***	(0.01)	-0.04***	(0.01)	-0.03**	(0.01)	-0.03**	(0.01)
MA- FH	-0.04***	(0.01)	-0.04**	(0.01)	-0.03*	(0.01)	-0.03*	(0.01)
MA- Uni	-0.04***	(0.01)	-0.04***	(0.01)	-0.02+	(0.01)	-0.02+	(0.01)
time since grad.	-0.04***	(0.01)	-0.04***	(0.01)	-0.04***	(0.01)	-0.04***	(0.01)
time since grad.²	0.00***	(0.00)	0.00***	(0.00)	0.01***	(0.00)	0.01***	(0.00)
married	-0.02+	(0.01)	-0.01+	(0.01)	0.02**	(0.01)	0.02**	(0.01)
children	0.03***	(0.01)	0.03***	(0.01)	0.03***	(0.01)	0.03***	(0.01)
Abitur	-0.00	(0.01)	-0.01	(0.01)	-0.01	(0.01)	-0.01	(0.01)
mig. backgr.	0.03***	(0.01)	0.03***	(0.01)	0.03***	(0.01)	0.03***	(0.01)
Education	-0.00	(0.02)	-0.01	(0.02)	-0.01	(0.01)	-0.01	(0.01)
Arts and humanities	0.01	(0.01)	0.01	(0.01)	0.01	(0.01)	0.01	(0.01)
Social sci., admin	-0.02*	(0.01)	-0.03**	(0.01)	0.01	(0.01)	0.01	(0.01)
Natural sci., math	-0.01	(0.01)	-0.01	(0.01)	0.03+	(0.02)	0.03+	(0.02)
Computer sci.	-0.00	(0.01)	-0.01	(0.01)	0.01	(0.02)	0.01	(0.02)
Tech.	0.01	(0.01)	0.01	(0.01)	0.01	(0.01)	0.01	(0.01)
Agricult./Nutrition	0.04*	(0.02)	0.05*	(0.02)	0.03	(0.02)	0.03	(0.02)
Health and welfare	0.00	(0.01)	-0.00	(0.01)	-0.00	(0.01)	-0.00	(0.01)
Services	-0.03+	(0.02)	-0.03+	(0.02)	-0.00	(0.02)	-0.00	(0.02)
VET before HE			-0.01+	(0.01)			-0.01	(0.01)
Observations	5161		5161		4965		4965	
Pseudo R^2	0.119		0.121		0.107		0.108	

Standard errors in parentheses

Models include federal state and survey year dummies. Base levels: BA-Uni; Business/Econ.

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix B – Imbens type sensitivity analyses

The figure for earnings is in the main text; here we report the sensitivity analyses for the remaining outcomes.

Figure B1: Contour plot of sensitivity analysis for occ. prestige (BA-Uni vs. VET)

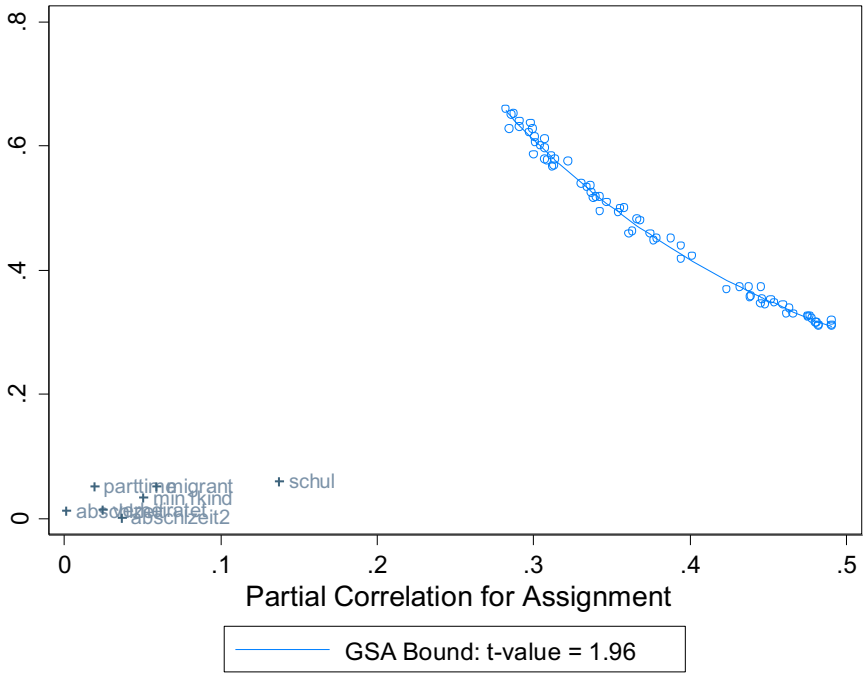


Figure B2: Contour plot of sensitivity analysis for unemployment (BA-Uni vs. VET)

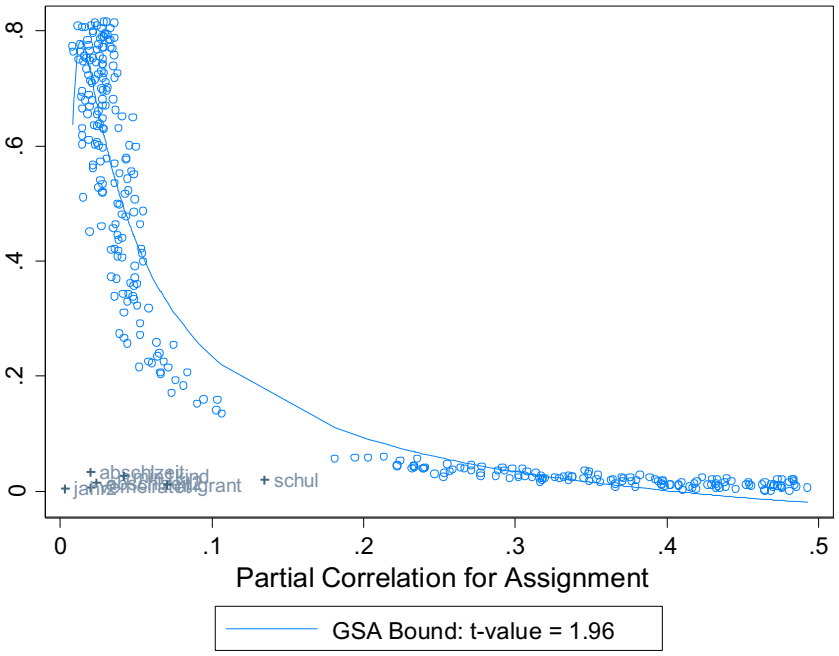
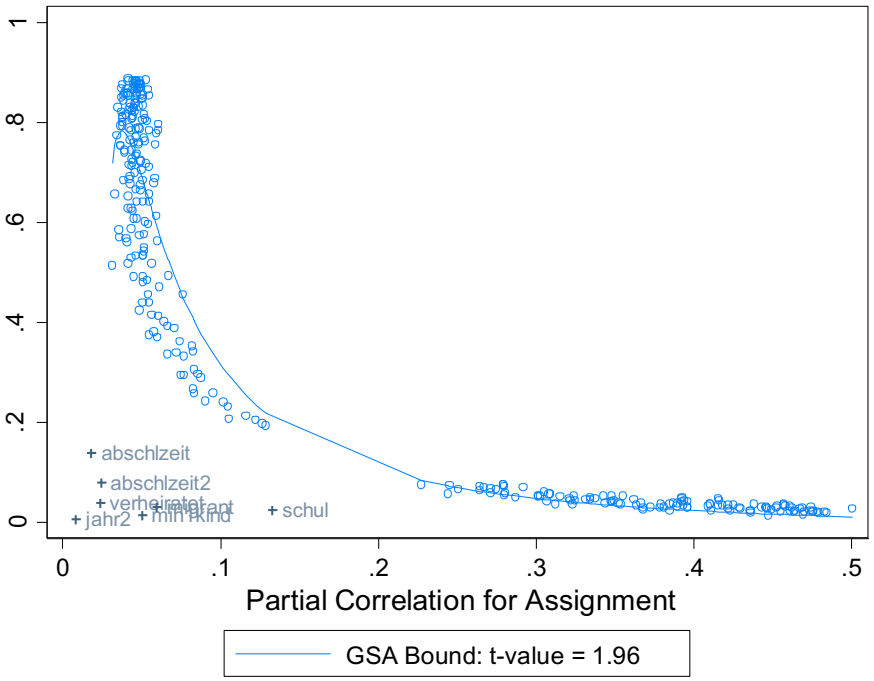


Figure B3: Contour plot of sensitivity analysis for fixed-term employment (BA-Uni vs. VET)



Appendix C – Regression tables corresponding with the figures displaying the full sample analyses

Table C1: Log monthly earnings by degree

	(1) Men		(2) Women		(3) Men		(4) Women	
VET	-0.16***	(0.01)	-0.12***	(0.01)	-0.16***	(0.01)	-0.14***	(0.01)
M.Craftsm.	-0.02+	(0.01)	-0.04***	(0.01)	-0.03+	(0.01)	-0.05***	(0.01)
BA- FH	0.07***	(0.01)	0.07***	(0.01)	0.06***	(0.01)	0.04***	(0.01)
MA- FH	0.16***	(0.02)	0.18***	(0.02)	0.15***	(0.02)	0.16***	(0.02)
MA- Uni	0.14***	(0.02)	0.13***	(0.01)	0.13***	(0.02)	0.12***	(0.01)
time since grad.	0.05***	(0.01)	0.05***	(0.00)	0.05***	(0.01)	0.05***	(0.00)
time since grad.²	-0.00***	(0.00)	-0.00***	(0.00)	-0.00***	(0.00)	-0.00***	(0.00)
part-time	-0.52***	(0.01)	-0.38***	(0.01)	-0.49***	(0.01)	-0.36***	(0.01)
married	0.18***	(0.01)	-0.00	(0.01)	0.18***	(0.01)	-0.01	(0.01)
children	-0.05***	(0.01)	-0.07***	(0.01)	-0.06***	(0.01)	-0.08***	(0.01)
Abitur	0.02***	(0.01)	0.03***	(0.01)	0.02***	(0.01)	0.02***	(0.01)
mig. backgr.	-0.06***	(0.01)	-0.04***	(0.01)	-0.06***	(0.01)	-0.04***	(0.01)
Education					-0.14***	(0.04)	-0.10***	(0.02)
Arts and human.					-0.18***	(0.01)	-0.15***	(0.01)
Social sci., admin					-0.07***	(0.01)	0.01	(0.01)
Natural sci., math					-0.03	(0.02)	-0.07**	(0.02)
Computer sci.					0.00	(0.01)	0.06**	(0.02)
Tech.					-0.03**	(0.01)	-0.03*	(0.01)
Agricult./Nutrition					-0.05***	(0.01)	-0.06***	(0.01)
Health and welfare					-0.07***	(0.01)	-0.05***	(0.01)
Services					-0.12***	(0.01)	-0.12***	(0.01)
Constant	7.36***	(0.02)	7.23***	(0.01)	7.40***	(0.02)	7.28***	(0.02)
Observations	14588		16971		14588		16971	
R^2	0.262		0.250		0.276		0.267	

Standard errors in parentheses

Models include federal state and survey year dummies. Base levels: BA-Uni; Business/Econ.

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table C2: Occupational prestige (STD) by degree

	(1) Men		(2) Women		(3) Men		(4) Women	
VET	-0.52***	(0.02)	-0.40***	(0.02)	-0.46***	(0.02)	-0.38***	(0.02)
M.Craftsm.	-0.54***	(0.02)	-0.49***	(0.02)	-0.40***	(0.02)	-0.38***	(0.02)
BA- FH	-0.03	(0.02)	-0.07**	(0.02)	0.01	(0.02)	-0.07**	(0.02)
MA- FH	0.18***	(0.03)	0.20***	(0.03)	0.20***	(0.03)	0.19***	(0.03)
MA- Uni	0.38***	(0.03)	0.55***	(0.02)	0.36***	(0.02)	0.50***	(0.02)
time since grad.	0.01	(0.01)	0.02*	(0.01)	0.02*	(0.01)	0.02**	(0.01)
time since grad.²	-0.00	(0.00)	-0.00*	(0.00)	-0.00*	(0.00)	-0.00**	(0.00)
part-time	-0.04+	(0.02)	-0.11***	(0.01)	-0.02	(0.02)	-0.07***	(0.01)
married	0.04**	(0.01)	0.04**	(0.01)	0.04**	(0.01)	0.03*	(0.01)
children	-0.05***	(0.01)	0.02+	(0.01)	-0.04***	(0.01)	0.02	(0.01)
Abitur	0.08***	(0.01)	0.07***	(0.01)	0.06***	(0.01)	0.05***	(0.01)
mig. backgr.	-0.07***	(0.01)	-0.04***	(0.01)	-0.06***	(0.01)	-0.05***	(0.01)
Education					0.46***	(0.06)	0.26***	(0.03)
Arts and human.					-0.21***	(0.02)	-0.17***	(0.02)
Social sci., admin					-0.13***	(0.02)	-0.15***	(0.02)
Natural sci., math					0.32***	(0.03)	0.30***	(0.03)
Computer sci.					0.03	(0.02)	0.03	(0.03)
Tech.					-0.25***	(0.01)	-0.18***	(0.02)
Agricult./Nutrition					-0.34***	(0.02)	-0.21***	(0.02)
Health and welfare					-0.28***	(0.02)	-0.26***	(0.01)
Services					-0.07***	(0.02)	-0.08***	(0.02)
Constant	-0.19***	(0.03)	-0.25***	(0.02)	-0.12***	(0.03)	-0.15***	(0.02)
Observations	14588		16971		14588		16971	
R^2	0.266		0.236		0.314		0.276	

Standard errors in parentheses

Models include federal state and survey year dummies. Base levels: BA-Uni; Business/Econ.

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table C3: Unemployment risk by degree (AME)

	(1) Men		(2) Women		(3) Men		(4) Women	
VET	-0.03***	(0.01)	-0.03**	(0.01)	-0.03**	(0.01)	-0.02**	(0.01)
M.Craftsm.	-0.06***	(0.01)	-0.04***	(0.01)	-0.06***	(0.01)	-0.03***	(0.01)
BA- FH	-0.05***	(0.01)	-0.03**	(0.01)	-0.04***	(0.01)	-0.02**	(0.01)
MA- FH	-0.05***	(0.01)	-0.02+	(0.01)	-0.05***	(0.01)	-0.02*	(0.01)
MA- Uni	-0.04***	(0.01)	-0.01	(0.01)	-0.04***	(0.01)	-0.02+	(0.01)
time since grad.	-0.02***	(0.00)	-0.02***	(0.00)	-0.02***	(0.00)	-0.02***	(0.00)
time since grad.²	0.00***	(0.00)	0.00***	(0.00)	0.00***	(0.00)	0.00***	(0.00)
married	-0.02**	(0.01)	0.01**	(0.00)	-0.02**	(0.01)	0.01**	(0.00)
children	0.02***	(0.00)	0.03***	(0.00)	0.02***	(0.00)	0.03***	(0.00)
Abitur	-0.02***	(0.00)	-0.01**	(0.00)	-0.02***	(0.00)	-0.01**	(0.00)
mig. backgr.	0.02***	(0.00)	0.03***	(0.00)	0.02***	(0.00)	0.03***	(0.00)
Education					0.00	(0.02)	-0.01	(0.01)
Arts and human.					0.03**	(0.01)	0.02**	(0.01)
Social sci., admin					-0.01+	(0.01)	-0.00	(0.01)
Natural sci., math					0.00	(0.01)	0.03+	(0.01)
Computer sci.					-0.00	(0.01)	0.00	(0.01)
Tech.					0.01+	(0.01)	0.02**	(0.01)
Agricult./Nutrition					0.01	(0.01)	0.02+	(0.01)
Health and welfare					-0.01+	(0.01)	-0.01*	(0.00)
Services					0.01	(0.01)	0.01	(0.01)
Observations	16127		18813		16127		18813	
Pseudo R^2	0.055		0.060		0.060		0.067	

Standard errors in parentheses

Models include federal state and survey year dummies. Base levels: BA-Uni; Business/Econ.

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table C4: Fixed-term employment risk by degree (AME)

	(1) Men		(2) Women		(3) Men		(4) Women	
VET	-0.06***	(0.02)	-0.14***	(0.02)	-0.05**	(0.02)	-0.12***	(0.02)
M.Craftsm.	-0.11***	(0.02)	-0.13***	(0.02)	-0.11***	(0.02)	-0.15***	(0.02)
BA- FH	-0.09***	(0.02)	-0.09***	(0.02)	-0.09***	(0.02)	-0.07***	(0.02)
MA- FH	-0.08***	(0.02)	-0.15***	(0.02)	-0.08***	(0.02)	-0.13***	(0.02)
MA- Uni	0.04*	(0.02)	0.05*	(0.02)	0.03+	(0.02)	0.04+	(0.02)
time since grad.	-0.06***	(0.01)	-0.07***	(0.01)	-0.06***	(0.01)	-0.07***	(0.01)
time since grad.²	0.01***	(0.00)	0.00***	(0.00)	0.01***	(0.00)	0.01***	(0.00)
married	-0.05***	(0.01)	-0.05***	(0.01)	-0.05***	(0.01)	-0.05***	(0.01)
children	-0.00	(0.01)	-0.01+	(0.01)	-0.00	(0.01)	-0.01+	(0.01)
Abitur	-0.00	(0.01)	-0.04***	(0.01)	-0.00	(0.01)	-0.03***	(0.01)
mig. backgr.	0.05***	(0.01)	0.03**	(0.01)	0.05***	(0.01)	0.03***	(0.01)
Education					0.11*	(0.04)	0.11***	(0.03)
Arts and human.					0.11***	(0.02)	0.13***	(0.01)
Social sci., admin					0.06***	(0.01)	0.04***	(0.01)
Natural sci., math					0.16***	(0.02)	0.18***	(0.03)
Computer sci.					0.01	(0.01)	0.02	(0.02)
Tech.					0.04***	(0.01)	0.06***	(0.01)
Agricult./Nutrition					0.01	(0.02)	0.09***	(0.02)
Health and welfare					0.10***	(0.01)	0.12***	(0.01)
Services					0.04***	(0.01)	0.05***	(0.01)
Observations	13734		16403		13734		16403	
Pseudo R^2	0.061		0.065		0.072		0.080	

Standard errors in parentheses

Models include federal state and survey year dummies. Base levels: BA-Uni; Business/Econ.

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Discussion Paper - School of Business and Economics - Freie Universität Berlin

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