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Overeducation among Swiss university graduates: determinants and consequences

Andrea Diem · Stefan C. Wolter

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Abstract This study uses the Swiss Graduate Survey data to investigate the determinants of job-education mismatch and the associated consequences on earnings while controlling for various ability and motivation factors, as well as socio-demographic, labor market and institutional characteristics. The results indicate that the likelihood of a job-education mismatch is significantly influenced by individual performance factors, such as final grades and study duration, and that the phenomenon affects approximately 15 % of university graduates. The study also shows that more than one-quarter of the individuals with a job-education mismatch 1 year after graduation are still working in a job that does not require a university degree 4 years later. In monetary terms, job-education mismatch is associated with a yearly wage penalty of approximately 4–10 % in the short to medium term.

Keywords Job-education mismatch · Overeducation · Wage returns · University graduates

JEL codes I21 · J24 · J31

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Nicht ausbildungsadäquate Beschäftigung bei Universitätsabsolventinnen und -absolventen – Determinanten und Konsequenzen

Zusammenfassung Diese Studie untersucht auf Basis der Schweizer Hochschulabsolventenbefragungen die Determinanten einer nicht ausbildungsadäquaten Beschäftigung und die Konsequenzen auf den Lohn, die sich daraus unter Berücksichtigung von verschiedenen Fähigkeits- und Motivationsfaktoren sowie soziodemografischen, arbeitsmarktlichen und institutionellen Merkmalen ergeben. Die Resultate zeigen, dass die Wahrscheinlichkeit einer nicht ausbildungsadäquaten Beschäftigung signifikant von individuellen Leistungsfaktoren wie der Abschlussnote oder der Studiendauer beeinflusst wird und dass das Phänomen rund 15 Prozent der Absolventinnen und Absolventen betrifft. Weiter zeigt sich, dass über ein Viertel der Personen, welche ein Jahr nach Studienabschluss nicht ausbildungsadäquat beschäftigt sind, auch vier Jahre später noch keine Tätigkeit ausüben, bei der hochschulspezifische Qualifikationen verlangt werden. Eine inadäquate Beschäftigung schlägt sich kurz- bis mittelfristig in einem jährlichen Lohnnachteil von rund 4 bis 10 Prozent nieder.

1 Introduction

One year after graduation, descriptive statistics indicate that approximately one-fifth of young academics in Switzerland say they do not have a job that requires a university degree. Five years after graduation, approximately 13 % of university graduates still do not have a job that matches their education (see BFS 2011). However, no detailed analyses were available for Switzerland regarding the exact determinants and possible effects of job-education mismatch (overeduca-

tion) for academics. However, these analyses would also be interesting outside Switzerland because access to a university education in Switzerland is much more restricted (in quantitative terms) than in most other industrialised countries, which should influence not only the level but also the consequences of overeducation of university graduates.

A certain level of (formal) overqualification among the workforce for the job they perform (i.e., overeducation) is observed in all countries and does not only apply to academics. The latest meta-study by Leuven and Oosterbeek (2012) puts the proportion of overeducated workers in Europe at approximately 30%. Unlike education-job match, overeducation carries penalties both in terms of earnings and job satisfaction (for a review, see Quintini 2011). For income, the results of earlier and more recent meta-analyses (Groot and Maassen van den Brink 2000; Leuven and Oosterbeek 2012; Rubb 2003) indicate that overeducated people generally earn less than people with the same education whose job matches their education but more than people with an equivalent job who are not overeducated. The same applies in reverse to people with too little education (undereducation).

The difficulty with many studies that investigate the consequences of under- and overeducation is that the results may be biased due to unobserved characteristics of the subjects concerned, e.g., in terms of abilities and motivation (see, e.g., Hartog 2000). Hence, it is likely that some people who, in formal terms, have too many years of education for the job they perform have fewer abilities and skills than people with the same level of education whose job matches their qualifications. The wage differential between these two populations overrates the wage penalties of overeducation because people with the same formal qualifications but who have less aptitude would have earned less even if they had found a job to match their education.

This study investigates the determinants of overeducation in four cohorts of university graduates of Swiss universities and looks at the correlations between overeducation and wages. Job-education mismatch can be investigated both 1 year and 5 years after university graduation. As with any non-experimental study, the correlation between overeducation and labour market disadvantages is not necessarily causal. However, we have a very rich set of data on students' background and on their study behaviour, which should help to minimise the impact of potential bias on the results. Additionally, regarding wage estimates 5 years after graduation, we have observational data for both switchers from mismatched to matched jobs and switchers in the opposite direction, and we are able to take into account the wages in the first job (1 year after graduation). This should enable us to control for most of the unobservable differences between graduates and allow us to do a better job of judging the causality of the wage effect.

The paper is structured as follows: Section 2 reviews the theory in the literature and the research findings available to date. Section 3 describes the database and methods. Section 4 presents the empirical data. Conclusions are presented in Section 5.

2 Background theory and empirical research findings

2.1 Theoretical approaches

The literature on overeducation is hard to place in terms of theory because it is located between the two extremes of a simple interpretation of the human capital theory and the job competition model.

According to the theory of human capital (Becker 1964) and Mincer's earnings function based upon it (1974), workers are always paid in accordance with the productivity of their labour. This is determined by formally accumulated human capital (years of education completed) and the human capital that is acquired on the job (experience and continuing professional education). In other words, individuals endowed with the same amount of human capital should always earn the same because they are equally productive and pay is predicated solely upon productivity. Hence, this original special theoretical framework makes no provision for a mismatch between education demand (required education) and supply (human capital). To take it further, there is no such thing as over- or undereducation but merely more productive and less productive workers.

Thurow's job competition model (1975) contrasts with the human capital theory. The job competition model argues that earnings are determined solely by the characteristics and requirements of the job. Hence, wages are not paid according to education but job productivity. According to this theory, individuals who differ in terms of education but have one and the same job would earn the same amount. The automatic conclusion is that the return on surplus qualifications (for instance, additional years of education) is zero. However, the qualifications of the workers determine the allocation of the jobs. The model assumes that higher qualified people also have more education, which implies that better qualified individuals also have more ability on average and therefore need less time to learn the job. For job allocation, jobs and workers are sorted according to their qualifications, and the jobs are allocated top down to the most educated person available. This results in people with more years of education earning more on average than people with less education because they tend to have jobs that are more productive. According to this model, qualification mismatch reflects an imbalance between supply and demand for jobs with various qualification requirements.

The empirical findings on the impact of overeducation on wages cannot be explained by either conventional human capital theory, which makes no provision for wage penalties in the event of qualification mismatch, or the job competition model, which does not provide a base for wage benefits for surplus years of education.

The empirical over-required-under-education model (ORU model) put forward by Duncan and Hoffman (1981) is situated somewhere between the human capital theory and the job competition model. This model says that productivity (and hence earnings) depend both on qualifications (human capital) and the requirements and productivity of the job. Human capital cannot be deployed equally productively regardless of a specific job (job competition model); at the same time, productivity in each job depends on individual human capital (human capital theory). This is why not all people with the same human capital earn the same amount (because not all of them are working in equally productive jobs) and why not all people with the same job earn the same amount (because not all of the people doing the job have the same human capital). Hence, people with a job-education mismatch can earn less than people with the same level of education who have a matched job (that is, a job with higher productivity) but nonetheless earn more than people with the same job as themselves but a lower level of formal education. These are the possibilities the empirical specification of the overeducation literature had in mind when the original wage regression model in terms of human capital (Mincer 1974) was augmented by adding the number of years of education that are either superfluous to the job performed (overeducation) or missing (undereducation).¹

2.2 Empirical research

A review of the available research literature on the incidence and persistence of overeducation, the determinants of job-education mismatch and correlations between job-education mismatch and income earned is given below.

¹The ORU model has also been criticized for its static view of overeducation and undereducation. The critics argue that, although it is understandable that human capital cannot be deployed equally at any given job no matter what and that an increase in human capital in any specific job might be an advantage, this does not explain why the jobs in an economy simply do not adapt to meet the available human capital. In other words, surplus human capital should result in the creation of highly qualified jobs (and in that way reduce overeducation), and conversely, a lack of human capital should result in a reduction of highly qualified jobs (and in that way reduce undereducation). This criticism can be countered by arguing that any such adjustment of the economy would require time and resources and that a mismatch in the supply of and demand for qualifications might well be highly persistent because of disincentives on the part of those supplying and those demanding education.

2.2.1 Incidence and persistence of overeducation

The proportion of overqualified workers (of all educational levels) in Europe is approximately 30% (Leuven and Oosterbeek 2012). Swiss statistics put the proportion of overqualified workers (again of all educational levels) at 15% (Frei and Sousa-Poza 2012, based on the Swiss Household Panel survey, 1999–2006), which is a much lower figure.

However, various studies show (Groot and van Maassen den Brink 2000; Leuven and Oosterbeek 2012; McGuinness 2006; Verhaest and Omeij 2010) that the proportion of overqualified workers depends heavily on the measurement method employed. Three disparate measurement methods are used in the literature to investigate the required level of education. The first (subjective) method is based on the self-assessment of the respondents. Questions on such a survey include which level of education the employer required for the job or which educational qualification would be the best preparation for the job. The second (objective) method (called job analysis) draws the information from classifications of occupations (e.g., the ISCO-88 3-digit code), allocates the required duration of education to each occupation and compares this with the education of the job holder. The third (objective) method generates information about required education levels straight from data (realised matches). This method classifies a person to be overqualified if, for example, his or her duration of education deviates from the mean by more than one standard deviation or if the education differs from the mode. However, this approach can result in bias if companies were unable to recruit individuals with the right qualifications for a protracted period due to a shortage of suitable persons on the labour market. Overall, the incidence of overeducation comes out higher with self-assessment methods than with more objective approaches (Groot and Maassen van den Brink 2000; McGuinness 2006). The lowest proportions are found by calculating the arithmetic mean number of years of education per occupation and restricting education-job mismatch status to people whose years of education deviate from the mean by more than two standard deviations (see Leuven and Oosterbeek 2012). However, the cut-offs employed with such a method are arbitrary and, in extreme cases, may be chosen in a manner that practically eliminates mismatches. Other studies show that the estimates are also affected by the specific operationalisation, i.e., how the questions are worded. The correlations calculated by Verhaest and Omeij (2010) between the incidences measured using disparate methods underline these differences. The correlation between the two objective methods of measurement (job analysis and realised matches based on mode) is relatively high ($r \approx 0.7$), but the correlation between objective and subjective approaches tends to be smaller ($r \approx 0.4$).

Further investigations (Allen and van der Velden 2001; Green and McIntosh 2007) show that the correlation between formal overqualification (mismatch between formal education and job requirements) and actual overqualification (mismatch between competencies, abilities or skills and job requirements) is not very close. The calculated coefficients of correlation range from 0.2 (Green and McIntosh 2007) to 0.5 (Verhaest and Omey 2010). The Green and McIntosh (2007) study showed that only somewhat less than half of overqualified people also reported a skills mismatch, but as many as 28% of people with no mismatch reported that they lacked skills for their job. This confirms earlier findings (Allen and van der Velden 2001) that suggest that skills match is not a necessary or sufficient condition for a formal educational qualifications match.

The evidence on the *persistence* of overeducation is mixed. A Swiss study by Frei and Sousa-Poza (2012) found evidence that the phenomenon of overqualification tends to be transitory: half of those individuals who were overqualified in a given year had a job that matched their qualifications 1 year later.² In contrast, foreign studies for countries including Canada (Frenette 2004), the UK (Dolton and Vignoles 2000) and Australia (McGuinness and Wooden 2009) indicated that a significant proportion of workers remain overqualified for a lengthy period. Dolton and Silles (2001) showed that overqualification in a graduate's first job permanently restricts graduates to lesser qualified jobs. Baert et al. (2012) used Belgian data and addressed selection processes in their studies of how overqualification at the start of a career affects a person's chances for a later job-education match and found evidence that unemployed young people who accept a job that does not match their education have sustained difficulty in transitioning to a matched job.³

Moreover, persistence varies by social group. For Australia, Mavromaras and McGuinness (2012) observed that over-skilling is not a purely transient phenomenon for people with a higher education qualification as opposed to individuals with vocational training. Finally, on the basis of

²The high incidence of transient overeducation might also be explained by the career model developed by Sicherman and Galor (1990). According to this model, people initially accept a job for which they are formally overqualified because of the associated higher likelihood of being promoted later. This model might be particularly useful in explaining why overeducation is more common among younger workers.

³As with the impact of overeducation on wages, statements regarding the persistence of overeducation tend to be subject to strong assumptions in terms of causality. If people have unobservable disadvantages in terms of skills and motivation and other factors relevant to employers, then these same unobservable factors may be the reason for the persistence of overeducation. This would imply that overeducation in the first job is not causally responsible for overeducation in subsequent jobs but that there is a selection problem attributable to factors that the researcher is unable to observe.

Swedish data, Andersson Joona et al. (2012) have shown that the risk of remaining in an overqualified position is higher for immigrants than for natives.

2.2.2 Determinants of overeducation

Like the analyses of incidence and persistence, the factors that influence overeducation depend to a significant extent on how overeducation is operationalised (see Verhaest and Omey 2010). However, the findings are largely consistent for the various indicators used to measure abilities. Numerous studies show that a good (final) grade significantly reduces the probability of job-education mismatch (Battu et al. 1999; Büchel and Pollmann-Schult 2004; Chevalier 2003; Di Pietro and Urwin 2006; Dolton and Silles 2003; García-Espejo and Ibáñez 2006; Verhaest and Omey 2010). Other factors that point to poor college performance, such as repeating a year (Verhaest and Omey 2010) or requiring more than the average number of years to complete a degree (Aina and Pastore 2012), are likewise associated with an increased probability of overeducation. There is also evidence that educational standards and the type of (academic) program are factors that affect the likelihood of being overqualified (Büchel and Pollmann-Schult 2004; Dolton and Silles 2003; Frenette 2004; Verhaest and Omey 2010). These findings indicate that people who are similar only in terms of the number of years of education or in their qualifications are not all at equal risk of overeducation but that the risk is crucially determined by the quality and not just the quantity of accumulated human capital.

Apart from quality, the type of accumulated human capital affects the probability of being overqualified. Studies among university graduates show that the chosen department is a major determining factor (Battu et al. 1999; Chevalier 2003; Frenette 2004; Dolton and Silles 2003). For instance, an arts degree is significantly associated with an increased risk of overeducation.⁴

As far as socioeconomic characteristics are concerned, the main factors that are predictive of overqualification are age and ethnicity (Andersson Joona et al. 2012; Chevalier 2003; Green and McIntosh 2007; Groot and Maassen van den Brink 2000; Mavromaras et al. 2009; Sloane 2003). However, a Swiss study identified no differences between Swiss natives and non-Swiss-natives (Wirz and Atukeren

⁴This may be a reason for the persistence of overeducation on the macro level. Although potential students may be aware of the risk that certain subject areas are likely to result in overeducation and hence reduce the monetary return on education, the non-monetary return (consumptive value) of certain degree courses may be so high that a decision in their favour may be worth it from the point of view of individual preference. Decisions that result in permanent job mismatch may be rational from the individual point of view but are questionable from a societal perspective given that education is largely funded out of the public purse.

2005). In most empirical studies, gender tends not to be associated with major differences (Aina and Pastore 2012; Chevalier 2003; García-Espejo and Ibáñez 2006; Green and McIntosh 2007; Groot and Maassen van den Brink 2000; Mavromaras et al. 2009; Sloane 2003; Wirz and Atukeren 2005); however, a few studies in the literature observe a higher incidence of overeducation for women (Di Pietro and Urwin 2006; Leuven and Oosterbeek 2012).

The extent of overeducation also depends on structural factors such as the general labour market situation, labour supply and economic situation. A heavy increase in the supply of labour increases the incidence of overeducation (Groot and Maassen van den Brink 2000). The economy (unemployment) tends to have more of an effect on wages (Kahn 2010, and Oreopoulos et al. 2012, demonstrate long-term wage effects of the economic situation at the time of entering the labour force) but less of an effect on the incidence of overeducation. However, there are studies that indicate the contrary (Brunner and Kuhn 2010; Liu et al. 2012; Verhaest and Omeij 2010).

Before proceeding to a presentation of study findings on the potential consequences of overeducation, it is worth remembering that the measured probability or incidence of overqualification also depends on the decision to accept a job (Cutillo and Di Pietro 2006; Di Pietro and Urwin 2006). If jobseekers have trouble finding a well-qualified job, they face the choice of accepting a more poorly qualified job or a prolongation of unemployment. Albrecht and Vroman (2002) developed a theoretical model that shows that the likelihood of well qualified workers rejecting less qualified jobs in favour of unemployment depends both on the productivity differential (and hence the wage differential) between qualified and unqualified jobs and on the supply of qualified workers. According to this model, in the presence of a large wage differential, good unemployment benefits and a relative scarcity of highly qualified workers, well qualified individuals are more likely to be unemployed than poorly qualified individuals with identical formal qualifications. Failing to address the fact that a person can choose to refuse a job they would be overqualified for would result in a biased estimation of the factors that influence overeducation in such a case.

2.2.3 Correlation between overeducation and earnings

As indicated in the introduction, the results of meta-studies (Groot and Maassen van den Brink 2000; Leuven and Oosterbeek 2012; McGuinness 2006; Rubb 2003) show that people in a job for which they are overqualified tend to earn less than people with the same education and no mismatch but more than people in an equivalent job who are not overqualified. The same applies in reverse for people who are underqualified. A study by Mavromaras et al. (2013) shows

that wage penalties tend to be largest for higher educated people because these individuals should really be working in better paid occupations and therefore have the most to lose from a job-education mismatch.

The average return per required year of schooling in the various meta-studies is approximately 9%. The return per surplus year (overeducation) is approximately 4%. Conversely, people with 1 year of undereducation earn approximately 4% less than people in the same job with appropriate formal schooling (Leuven and Oosterbeek 2012). Applied to the case of a graduate with a master's degree in a job that does not require a university qualification, this would mean that, although the person would earn 20% (5 years x 4%) more than a person in the same job whose highest educational attainment is high school graduation, they would still be earning 25% (5 x [9–4%]) less than fellow graduates in jobs that require a university qualification.

Alongside the individual effects of over- and undereducation, Kampelmann and Rycx's analyses (2012) of Belgian corporate data demonstrate that companies with a work force that is overqualified on average are more productive than companies with a work force that is appropriately qualified on average, and the opposite applies to companies with a work force that is undereducated on average.

All these data need to be interpreted in light of the fact that the observed results are in fact amenable to a causal interpretation. However, few papers exist that do not merely estimate correlations while controlling for observable differences but use panel data, for instance, to estimate fixed effects or random effects models or employ instrumental variables. However, it should be added that the few papers that estimate wage effects with the stated models do not present significantly disparate results in most cases.⁵

3 Database and methodology

3.1 Database and variables

The current study is based on data from Swiss graduate surveys. The census-type survey is conducted by the Federal Statistical Office (FSO) every 2 years. Graduates are interviewed 1 and 5 years after graduation in each case. The respondents in our study are graduates from 2002 to 2008 but these do not include the department of medicine

⁵This is also the conclusion reached by studies that control for both the bias that may occur in measuring overeducation and the bias arising from differences in abilities. Although the bias from differences in ability tends to overstate the wage bonus of overeducation, the opposite applies for the bias through measurement errors. If both errors are controlled for, the effects balance out approximately (see Dolton and Silles 2008) or in part (see Verhaest and Omeij 2012).

Table 1 Overview of surveys and sample sizes

	Number of observations of study population	
	First-wave survey: 1 year after graduation	Second-wave survey: 5 years after graduation
Graduates 2002	3931	2798
Graduates 2004	4659	3297
Graduates 2006	3305	
Graduates 2008	2575	
Pooled sample	14470	6095
Pooled sample, only employed	12073	5608

and law.⁶ The analyses from the follow-up survey (5 years after graduation) relate to only the 2002 and 2004 graduate cohorts. An overview of the surveys and sample sizes is given in Table 1.

The main variable in our analyses is overeducation. It is constructed on both the appropriateness of the level of education and the competence match. We assume that a definition based solely on the question of required university qualification would erroneously identify too many graduates as being overeducated. This is particularly the case for jobs in which a university education may not be mandatory in formal terms but which nonetheless makes significant demands on the worker's competences. Therefore, in line with Chevalier's method (2003), we define people to be appropriately qualified if they report that their qualifications are a good match for the demands of the job and even if they also say that a university degree is not a formal requirement for their job.

The questions that underlie the construction of our overeducation variable are a) "Did your employer require a university qualification for your current main job (for self-employed: Do you require a university degree to do your job)?" and b) "In your opinion, how well does your current job match your education in terms of the professional qualifications you acquired during your studies?" The response categories for the second question are based on a scale from 1, "not at all," to 5, "to a great extent." A person is deemed to be overeducated and hence in a job-education mismatch situation if the job does not require a university degree and the qualification match is low to moderate (responses 1 to 3) (see Table 2).

Based on insights from earlier studies (Aina and Casalone 2011; Aina and Pastore 2012; Chevalier 2003; Geel and Backes-Gellner 2012; Messer and Wolter 2007), vari-

⁶We exclude medicine because overeducation is virtually non-existent here because of the numerus clausus and the shortage of medical doctors, and we exclude law because the mandatory internships for prospective lawyers and notaries means that the first years of a career after a law degree are hard to compare with the initial post-graduation years in other subject areas.

Table 2 Level of education and skills match (percentages in columns). Pooled sample of employed graduates 1 year after graduation ($N=11,776$)

Appropriateness of employment in terms of competence acquired during university education	Appropriateness of level of education	
	University qualification not required	University qualification required
1 Not at all	26.0	2.8
2	25.3	9.3
3	22.6	19.7
4	17.4	36.6
5 To a great extent	8.7	31.7

ous proxy variables are used for individual abilities and motivation:

- *Final grade*: The grades are described with five dummy variables that are based on the quintiles of the final grades in the actual department, university and year of graduation. In other words, the grades were standardised based on the descriptive statistics of 129 cells.
- *Study duration*: The study duration is described by two variables: one for the number of years of study above the median and one for the number of years of study below the median. As with the final grades, the variables were standardised by department, university and graduation cohort.
- *Study job*: The first dummy variable describes whether a person was in a paid employment related in content to their university education during their studies (on a regularly basis or occasionally). The second dummy variable describes whether a person was in a paid employment unrelated in content to their university education during their studies (on a regularly basis or occasionally).
- *Mobility semester*: This dummy variable describes whether a person undertook studies at a host university in Switzerland or abroad while studying for their degree.

Although the first and—to a slightly lesser extent—the second variables have to do with people's academic qualifications, the other two variables show differences in other professionally relevant qualifications and motivation. We assume that students who already found a job with a tie-in to their studies while still at university have already proven their professional aptitude with that first dip into the labour market. Given that almost three-quarters of the students analysed here worked during their studies, this is an important control variable. Regarding mobility semesters, we assume they will suggest higher motivation and dedication to employers because mobility semesters are associated with monetary and non-monetary costs.

To take possible structural and cyclical influences into account, the unemployment rate addresses the demand side and the changes in the numbers of graduates addresses the supply side. Because we observe a rather low geographic

mobility of Swiss academics, we define the unemployment rate as the regional unemployment rate in the area where the attended university is located. The change in the number of graduates is calculated as a function of time in the same department and at the same university.

In the wage equation, income is measured by the natural logarithm of the contractual gross annual income from main employment (including 13th month salary) or gross income from self-employment in full-time equivalents.⁷ Fixed effects for departments, universities and year of graduation were used in all the analyses. The descriptive information on all of the variables addressed is given in Table 7 in the Appendix.

3.2 Estimation models

The determinants of overeducation and non-employment are estimated using multinomial logistic regression models. This estimation method enables researchers to investigate which factors are predictive of education-job mismatch and non-employment simultaneously with one regression. Therefore, the dependent variable has three states: education-matched job (graduate job), non-education-matched job (non-graduate job), and non-employment. The reference category is people whose job requirements match their education.

Wage estimations are based on a simple OLS equation which controls for various characteristics to take observed individual heterogeneity into account. Similar to the method described by Verdugo and Verdugo (1989), we specify the wage equation as:

$$\ln Y_{it} = \alpha_0 + \alpha_1 OV_{it} + \alpha_2 A_{it} + \alpha_3 AX_{it} + \varepsilon_{it} \quad (1)$$

where $\ln Y_{it}$ is the natural logarithm of annual income in full-time equivalents of an individual i in year t , OV_{it} is a dummy variable whose value is 1 for a person with job-education mismatch and is otherwise 0, A_{it} is a vector made up of various explanatory variables that describe abilities and motivation, X_{it} is a vector made up of various explanatory variables that involve various other individual and institutional characteristics, and ε_{it} is the error term.

All of the analyses are conducted for two survey time points, 1 year, and 5 years after graduation. Moreover, a fixed effects model is used to estimate the wage equation. Clusters of departments by university were used to calculate the standard errors. All the statistical analyses are weighted using the weighting variable provided by the Federal Statistical Office.

⁷Outliers were excluded from the analysis. This affected the bottom 5% and top 0.5% of the earnings in the first-wave survey (which correspond to earnings below 28,000 CHF and above 260,000 CHF) and the bottom 2.5% and top 0.05% in the second-wave survey (which correspond to earnings below 36,000 CHF and above 260,000 CHF).

Table 3 Employment situation 5 years after graduation by employment situation 1 year after graduation (pooled sample of second-wave survey, percentages in rows, $N=5877$)

1 year after graduation	5 years after graduation			Total
	Job-education match	Job-education mismatch	Not employed	
Job-education match	89.1	4.5	6.4	100
Job-education mismatch	66.8	26.3	7.0	100
No job	72.7	9.3	18.0	100
Total	83.7	7.8	8.5	100

4 Empirical findings

4.1 Incidence of job-education mismatch

One year after graduation, approximately 83% of university graduates are in employment.⁸ Of these, 15% work in a job that does not require a university education and which makes poor to moderate use of their competence (see Table 8 in the Appendix), and, on that basis, they are overeducated according to our definition. Four years later, the proportion of people with a job-education mismatch is just below 9%. This is approximately two-thirds less in the presence of an employment rate of 92%. The figures show that job-education mismatch for university graduates declines over time but persists for a non-negligible proportion of graduates in the medium term.

Comparison of the job situation at the two survey times suggests a strong path dependency (see Table 3). Of the people with a well-matched job in the first-wave survey, as many as 95% were still in a graduate job 4 years later (5% were in mismatched jobs). Out of the original population of people with a non-graduate job, almost three-quarters (72%) come to occupy a position that matches their education, but one-quarter (28%) of these remain in a mismatched job. Moreover, 89% of the formerly unemployed individuals were working 4 years later in a job that matched their education. The higher proportion of job-education mismatch among formerly non-employed graduates (compared with people who had always had a job that matched their qualifications) suggests that some of the people with no job after graduation were not in employment for the very reason that they had not (yet) found a job to match their education.

4.2 Determinants of job-education mismatch

The results concerning the determinants of job-education mismatch 1 year after graduation show that the likelihood of

⁸The 17% of inactive graduates include formally unemployed (registered) people and graduates that are not in employment for various other reasons.

Table 4 Multinomial logistic regression: determinants of job-education mismatch (1 year after graduation, pooled sample of first-wave survey). Average marginal effects

	Job-education match		Job-education mismatch		Not employed	
<i>Proxies for abilities and interests</i>						
Grade: bottom quintile	Ref.		Ref.		Ref.	
Grade: second-lowest quintile	-0.071***	(0.018)	0.039***	(0.010)	0.032**	(0.014)
Grade: middle quintile	-0.053***	(0.011)	0.033***	(0.009)	0.019**	(0.009)
Grade: second-highest quintile	0.037***	(0.012)	-0.026***	(0.009)	-0.011	(0.009)
Grade: top quintile	0.090***	(0.010)	-0.039***	(0.009)	-0.051***	(0.009)
Average study duration	Ref.		Ref.		Ref.	
Number of years of study above the median	-0.020***	(0.006)	0.006**	(0.003)	0.014***	(0.005)
Number of years of study below the median	0.010	(0.010)	-0.002	(0.009)	-0.008	(0.008)
Student job related to studies	0.111***	(0.010)	-0.040***	(0.007)	-0.071***	(0.008)
Student job unrelated to studies	-0.042***	(0.012)	0.056***	(0.010)	-0.014*	(0.008)
Mobility semester (domestic or foreign)	-0.002	(0.010)	-0.008	(0.007)	0.010	(0.007)
<i>Socio-demographic characteristics</i>						
Female	0.005	(0.010)	0.006	(0.005)	-0.011	(0.010)
Age at first-wave survey	-0.000	(0.002)	0.007***	(0.001)	-0.006***	(0.001)
Mother with tertiary degree	0.000	(0.008)	-0.009	(0.007)	0.009	(0.007)
Father with tertiary degree	-0.012	(0.009)	-0.001	(0.008)	0.013*	(0.007)
Swiss national	Ref.		Ref.		Ref.	
Foreigner educated in Switzerland	-0.043***	(0.017)	0.010	(0.011)	0.033**	(0.017)
Foreigner educated abroad	-0.031	(0.024)	0.001	(0.014)	0.03	(0.022)
<i>Structural characteristics</i>						
Unemployment rate in language region	-0.044	(0.031)	-0.009	(0.023)	0.053**	(0.021)
Change in number of graduates	-0.013	(0.022)	0.046***	(0.012)	-0.032	(0.019)
<i>Fixed effects</i>						
Departments	X		X		X	
Universities	X		X		X	
Year of graduation	X		X		X	
Pseudo R-squared			0.087			
N			12667			

Multinomial logistic regression: reference category: job-education match. Average marginal effects. Cluster for departments by university. Robust standard error in parentheses

Category percentages: job-education match: 70.6%, mismatch: 12.7%, not employed: 16.7%

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

job-education mismatch is determined to a significant extent by academic aptitudes and skills and the requisite motivation (see Table 4). The poorer (better) the final grade, the higher (lower) the probability of job-education mismatch.⁹ Individuals who require more time than usual to complete their degree in the specific subject are also more likely to have job-education mismatch. In contrast, a shorter than usual study period has no effect on the type of occupation. As expected, working as a student in a job related to the course of studies significantly reduces the probability of job-education mismatch. In contrast, a job unrelated to the course of studies is associated with a higher probability of overeducation. These findings clearly confirm that differences in the abilities of graduates have a major effect on the

degree of match between the available and required qualifications in the graduate's first job.

Moreover, it can be observed that most factors that make job-education mismatch more likely (or less likely) also increase (decrease) the likelihood of non-employment, but there are a couple of factors that produce the opposite effect. There are indications that, controlling for study performance, graduates who are older when they finish studying are more likely to have job-education mismatch but less likely to be not in employment. This shows how important it is to look at non-employment as well as job-education mismatch. These factors need to be looked at together to see that the overrepresentation of older graduates among people with mismatched jobs is only partly due to their age and has more to do with the fact that younger people are more likely to refrain from taking on a lowly qualified job and more likely to accept a period of non-employment. Socio-

⁹The probability of job-education mismatch is 91% higher for the poorest quintile of graduates compared to the best quintile.

demographic data support the theory that greater pressure to generate income from employment affects both the probability of non-employment and the probability of mismatch. The observation that non-employment is more likely among graduates whose fathers have a tertiary degree can most likely also be explained by fewer income restrictions.

The differing effects of the two structural variables are in line with expectations. Where there is a growing supply of graduates in a specific subject area, there is a significantly and distinctly higher probability of job-education mismatch but not of non-employment.

In cases where very large numbers of graduates in the same subject enter the labour market simultaneously, it is reasonable to assume that most of these will be aware that the intense competition for the few places in their subject area is likely to be long-standing and that temporary non-employment is hardly going to solve the problem. Conversely, in times of high unemployment, many graduates may rely on its being an economic and hence temporary problem, with the result that, in such situations, non-employment (which rises significantly) seems more preferable than accepting a mismatched job (that is not affected by the unemployment rate). These results also confirm the conclusions of Groot and Maassen van den Brink (2000) based on an older meta-analysis of the literature on overeducation.

The search for explanatory factors for job-education mismatch 5 years after graduation can also explore how labour market entry after university impacts the subsequent employment situation. The results show that individuals in non-matched jobs at the first-wave survey are much more likely to be in a mismatched job 4 years later (see Table 9 in the Appendix) than individuals with matched jobs, even after controlling for other factors. This indicates that job-education mismatch persists in a considerable number of cases. Non-employment at year one is also associated with a higher likelihood of job-education mismatch 4 years on. Although the effect size is much smaller here, there are definite indications that (a) some graduates chose not to enter employment because they had not found a suitable job to match their qualifications and later had to make do with just such a job or (b) the labour market penalises post-graduation joblessness. The latter is difficult to prove, but the fact that important factors that tend to indicate poor ability (low grades, for instance) are associated with both a risk of a job-education mismatch in the first job and non-employment is an indication that many less able graduates find themselves in mismatched jobs after an initial period of non-employment.

Regardless of initial employment status, there is still a statistically significantly but weaker positive link between academic abilities (expressed in final grades) and the qualifications required in the person's job, even as late as 5 years after graduation. As far as socio-demographic factors are

Table 5 Correlation between job-education mismatch and income from employment 1 year after graduation (pooled sample of first-wave survey, only employed graduates). OLS coefficients

	Model 1	Model 2	Model 3
Job-education mismatch	-0.042*** (0.016)	-0.050*** (0.012)	-0.055*** (0.010)
<i>Control variables</i>			
Department, university, year of graduation		X	X
Proxies for abilities and interest			X
Socio-demographic characteristics			X
Adj. R-squared	0.002	0.134	0.192
N	9346	9346	9346

Regression coefficients (OLS). Robust standard error in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

concerned, there is evidence that job-education mismatch among older individuals seems to be even more common 5 years after graduation, although the younger individuals are no longer refraining from joining the labour market. Significant impacts in terms of structural factors at the time of labour market entry, i.e., the unemployment rate and cohort size, no longer exert a significant influence 4 years later. These influences directly affect the quality of the first job and, via the latter, can still affect employment status 4 years later.

4.3 Correlation between job-education mismatch and earnings

Regression analysis is used in the following to investigate the correlation between job-education mismatch and earnings, with additional control variables gradually being introduced into the analyses. The results on the coefficients of the regression of job-education mismatch are summarised in Tables 5 and 6. The full models (model 3 and model 6) are given in the Appendix (Table 10).

One year after graduation, people with unmatched jobs earn approximately 4% less than people with no such mismatch (Model 1). This difference is not explained by the differences in labour market opportunities between the various departments as demonstrated by controlling for department, university and year of graduation (Model 2: -5%). If we control for variables that deliver proxy information for the various qualifications and abilities of graduates while holding socio-demographic variables constant, the wage penalties do not decrease but rather increase slightly to 5.5% (Model 3). The fact that the regression coefficient does not decrease when the variables are controlled for separately can be explained by the fact that individuals with job mismatch may, in some cases, display characteristics that are correlated with a higher wage. The crucial factor is

Table 6 Correlation between job-education mismatch and income from employment 5 years after graduation (pooled sample of second-wave survey, only employed graduates). OLS coefficients

	All individuals employed at second-wave survey			Only individuals employed at both first- and second-wave survey			
	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Mismatch (SS)	-0.087*** (0.017)	-0.082*** (0.013)		-0.072*** (0.016)			
Mismatch (fe model)							-0.037*** (0.014)
No mismatch in FS and SS			Ref.		Ref.	Ref.	
No mismatch in SS but in FS			-0.035*** (0.012)		-0.040*** (0.013)	-0.022* (0.012)	
No mismatch in SS but non-employed in FS			-0.056*** (0.014)				
No mismatch in FS but mismatch in SS			-0.056*** (0.017)		-0.061*** (0.017)	-0.052*** (0.017)	
Mismatch in SS and FS			-0.098*** (0.021)		-0.094*** (0.025)	-0.069*** (0.022)	
Mismatch in SS and non-employed in FS			-0.169*** (0.030)				
Income in FS						0.318*** (0.025)	
<i>Control variables</i>							
Department, university, year of graduation		X	X	X	X	X	
Proxies for abilities and interest		X	X	X	X	X	
Socio-demographic characteristics		X	X	X	X	X	
Time-variable characteristics							X
Adj. R2	0.007	0.211	0.217	0.231	0.232	0.327	0.556
N	4513	4513	4513	3168	3168	3168	6336
N Cluster							3168

Regression coefficients (OLS). Robust standard error in parentheses

The fixed effects model (Model 10) includes job characteristics (management position, internship, temporary job, part-time job, private sector, size of organisation, and job region) as well as a variable for the survey wave

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

the on-average higher age of individuals with job-education mismatch.

Job-education mismatch continues to be negatively correlated with wage 5 years after graduation (Table 6). The wage penalty amounts to almost 9% in the bivariate model (model 5) and is still 8% after all the observable characteristics are controlled for. Hence, the penalty is substantial 5 years after graduation.

Model 6 presents the effect of job-education mismatch with differentiation based on combinations of job status at both data collection times while holding the remaining variables constant. This shows that not only the qualification requirements for the current job have an effect on wage but that the qualification requirements for former jobs is also negatively correlated with the wage paid in the current job 4 years later. Individuals who switched from education-job

mismatch to a job that matched their qualifications between the two survey dates still earn approximately 3.5% less than individuals who were in a matched job at both dates. However, the wage penalty is substantially higher in jobs that did not require a university education at both dates (10%). A qualification-matched job is associated with a wage penalty of approximately 6% in the first-wave survey (FS) but not in the second-wave survey (SS). The same wage penalty is found for people with non-employment at career entry (date of first-wave survey) who move to an education-matched job by the time of the second-wave survey. However, unemployment at the first-wave survey coupled with a job-education mismatch 5 years after graduation is associated with a wage penalty of almost 17%. Assuming no other unobservable influences, this large wage penalty is most likely explained in part by the fact that, in addition to the handicap

of the non-education-matched job, these individuals also lack experience because of their unemployment, and experience is one factor in determining wage. Similarly, the pay penalty from a mismatched job by the time of first-wave survey may be due to the disadvantage in building up on-the-job skills.

However, the comparison of wage effects for individuals whose labour market status changed between the two survey dates might be impaired by the fact that people who switch from a mismatched job to a matched job or vice versa are not comparable to the reference group. To take these factors into account, additional models are calculated for the subsample of individuals who are employed at both survey times. More specifically, two standard methods are applied: the lagged dependent variable and fixed effect regression techniques. Neither model can entirely control for selectivity, but they provide reasonable bounds within which the causal effect of a job-education-mismatch should lie. The lagged outcome regression (Model 9) assumes that the earnings history contains information unobservable to the researcher and that, to the extent that lagged income is a good predictor of future income, the coefficients for the mismatch should be unbiased (see, e.g., Ashenfelter and Card 1985). The comparison between the coefficients in Models 8 and 9 shows quite similar coefficients, which result from the fact that individuals with a mismatch in the first-wave survey who changed to a matched position in the second-wave survey had similar entry wages as individuals who remained in a mismatched job. The same holds for individuals who switched from match to mismatch compared to those who always occupied a matched position.¹⁰ The results suggest that selectivity is not the main factor explaining the earnings differentials between matched and mismatched graduates. Finally, the findings from the fixed effects regression (model 10) validate the previous findings, which provides a lower bound for the causal effect of a mismatch on wages.

In summary, the empirical results suggest that the lower wages of individuals with a job-education mismatch are to a great extent caused by the non-graduate position rather than non-observable differences in ability between the individuals.

5 Summary and conclusions

This paper uses Swiss University Graduate Survey data to explore factors that explain job-education mismatch for university graduates and the monetary consequences of overeducation. A person is said to be overeducated if his/her job does not require a university education and his/her qualification match is low or average.

The findings suggest that overeducation is only partially a career entry problem. If, as in this paper, only those individuals whose job does not require a university degree and whose qualification match is minor or average are defined as being overqualified, the proportion declines from 15 to 9% between the two data collection points. According to these figures, 1 out of 11 people with a university education are unable to find a graduate job in the medium term.

The main factors associated with an increased risk of overeducation, apart from the choice of subject, include academic performance and behaviour while studying; hence, the risk is by no means purely coincidental. All other things being equal, graduates with the poorest grades have almost double the risk of later job-education mismatch as individuals with the highest grades. Among people in the former category, job-education mismatch also tends to be relatively persistent. More than one-quarter of these individuals do not succeed in finding a job that matches their education even in the medium term.

In monetary terms, job-education mismatch is associated with a wage penalty of approximately 4–10% in the short to medium term, depending on the estimated model. Importantly, the wage penalty increases over time for individuals who were in a mismatched job at both 1 and 4 years after graduation.

Compared with other countries, Switzerland has both a notably low proportion of university graduates overall and a relatively low proportion of graduates who do not find a suitable job after earning their degree. However, even in the presence of a low proportion of graduates, graduates with poorer grades are at significantly increased risk of job-education mismatch afterward. Given the monetary consequences of overeducation, an expansion of the higher education system, both from the point of view of the individual and from society's perspective, is advisable only if the extra students' qualifications would be superior to those of the less able graduates in today's restrictive system.

6 Kurzfassung

Ein bestimmtes Ausmass an (formaler) Überqualifizierung von Erwerbspersonen für die ausgeübte Erwerbstätigkeit, kurz Overeducation genannt, wird in allen Ländern beobachtet. In der jüngsten Meta-Studie von Leuven und Oosterbeek (2012) wird der Anteil Beschäftigter mit Überqualifikation in Europa auf rund 30 Prozent geschätzt. Überqualifizierung wirkt sich – im Vergleich zu einer stellenadäquaten Ausbildung – ungünstig sowohl auf das Erwerbseinkommen als auch auf die Arbeitszufriedenheit aus (für eine Übersicht, vgl. Quintini 2011). In Bezug auf die Einkommen zeigen die Ergebnisse früherer und jüngerer Meta-Analysen (Groot & Maassen van den Brink 2000;

¹⁰The corresponding estimates are provided on request.

Leuven und Oosterbeek 2012; Rubb 2003), dass überqualifizierte Personen generell weniger verdienen als Personen mit gleicher Ausbildung in einer ausbildungsadäquaten Anstellung, jedoch mehr als Personen, welche eine äquivalente Tätigkeit ausüben, aber nicht überqualifiziert sind. Umgekehrtes gilt für die Personen, die zu wenig Bildungsjahre aufweisen (Undereducation).

Bis jetzt fehlen für die Schweiz Befunde über die genauen Determinanten und die möglichen Auswirkungen von nicht ausbildungsadäquater Beschäftigung für Akademikerinnen und Akademiker. Solche wären aber deshalb interessant, weil Ergebnisse aus Ländern mit Hochschulsystemen, die grosse Teile einer jeweiligen Alterskohorte aufnehmen, nicht einfach auf ein Land zu übertragen sind, welches einen der (quantitativ) restriktivsten Zugänge zum Universitätsstudium kennt.

Diese Arbeit soll diese Lücke schliessen. Anhand Daten der Schweizer Hochschulabsolventenbefragung werden Erklärungsfaktoren für eine nicht ausbildungsadäquate Beschäftigung bei Universitätsabsolventen und -absolventinnen untersucht und ihre monetären Folgen geschätzt. Mit dem Datensatz verfügen wir über ein sehr reiches Set an Angaben zu den Studierenden und ihr Studienverhalten. Da die Absolventinnen und Absolventen sowohl ein Jahr wie auch fünf Jahre nach Studienabschluss befragt werden, können wir zudem Wechsler von einer inadäquaten in eine adäquate Beschäftigung als auch Wechsler in umgekehrter Richtung beobachten und dabei den Einfluss der Löhne bei der ersten Anstellung (ein Jahr nach Abschluss) berücksichtigen sowie eine fixed-effects Regression durchführen, womit eine bessere Beurteilung der Kausalität des Lohneffektes vorgenommen werden kann.

Die Befunde legen nahe, dass die nicht ausbildungsadäquate Beschäftigung der Universitätsabgängerinnen und -abgänger nur teilweise ein Einstiegsproblem darstellt. Wenn, wie in diesem Aufsatz, nur jene Personen als ausbildungsinadäquat beschäftigt bezeichnet werden, deren Arbeitsstelle keinen Hochschulabschluss verlangt und deren fachliche Passung gleichzeitig gering oder mittleren Grades ist, so reduziert sich der Anteil zwischen den beiden Zeitpunkten von 15 auf 9 Prozent. Demnach findet eine von elf Personen mit einem Hochschulabschluss mittelfristig keine Stelle, welche hochschuläquivalente Kompetenzen voraussetzt.

Unter den Faktoren, welche das Risiko erhöhen, keine ausbildungsadäquate Stelle zu finden, sind neben dem Studienfach insbesondere die Studienleistungen und das Verhalten während des Studiums ausschlaggebend. Absolventinnen und Absolventen in den tiefsten Notenrängen (erstes Quintil) weisen, verglichen mit Personen in den höchsten Notenrängen, *ceteris paribus* ein fast doppelt so hohes Risiko auf, nicht ausbildungsadäquat beschäftigt zu sein. Bei den Personen in den tiefsten Notenrängen hat die nicht ausbildungsadäquate Beschäftigung nach Studienabschluss auch eine relativ hohe Persistenz: Mehr als ein Viertel von ihnen schafft es auch mittelfristig nicht, eine ausbildungsadäquate Stelle zu finden.

Monetär gesehen geht eine nicht ausbildungsadäquate Beschäftigung kurz- bis mittelfristig mit einer Lohneinbusse von rund 4 bis 10 Prozent einher, je nach verwendetem Schätzmodell. Für Personen, die sowohl ein Jahr als auch fünf Jahre nach Studienabschluss inadäquat beschäftigt sind, nimmt der Lohnabschlag über die Zeit noch zu.

Appendix

Table 7 Descriptive description of variables (Pooled sample of first-wave survey, only observations included in regression analysis)

Variable	Obs	Mean	Std. Dev.	Min	Max
Job-education match	12667	0.706		0	1
Job-education mismatch	12667	0.127		0	1
Not employed	12667	0.167		0	1
Grade: bottom quintile	12667	0.142		0	1
Grade: second-lowest quintile	12667	0.190		0	1
Grade: Middle quintile	12667	0.334		0	1
Grade: second-highest quintile	12667	0.179		0	1
Grade: top quintile	12667	0.156		0	1
Number of years of study above the median	12667	0.492	0.903	0	15
Number of years of study below the median	12667	0.228	0.430	0	3.5
Student job related to studies	12667	0.691		0	1
Student job unrelated to studies	12667	0.724		0	1
Mobility semester (domestic or foreign)	12667	0.254		0	1
Female	12667	0.480		0	1
Age at first-wave survey	12667	28.389	4.317	22	74
Mother with tertiary degree	12667	0.397		0	1
Father with tertiary degree	12667	0.599		0	1
Swiss national	12667	0.867		0	1
Foreigner educated in Switzerland	12667	0.049		0	1
Foreigner educated abroad	12667	0.084		0	1
Standardised annual income, log.	9337	11.153	0.312	10.2	12.5
Unemployment rate in language region	12667	2.781	0.839	1.9	4.5
Change in number of graduates	12667	1.046	0.230	0.1	3.5
<i>Departments</i>					
Theology	12667	0.011		0	1
Linguistics and literature	12667	0.101		0	1
History and cultural studies	12667	0.106		0	1
Social sciences	12667	0.279		0	1
Humanities/Social sciences, interdisciplinary/other	12667	0.004		0	1
Economic sciences	12667	0.178		0	1
Exact sciences	12667	0.072		0	1
Natural sciences	12667	0.105		0	1
Exact and natural sciences, other	12667	0.014		0	1
Construction and geodesy	12667	0.055		0	1
Mechanical and electrical engineering sciences	12667	0.051		0	1
Agronomy and forestry	12667	0.014		0	1
Technical sciences, interdisciplinary/other	12667	0.001		0	1
Interdisciplinary and other	12667	0.008		0	1
<i>University</i>					
Basel	12667	0.059		0	1
Bern	12667	0.110		0	1
Freiburg	12667	0.072		0	1
Geneva	12667	0.152		0	1
Lausanne	12667	0.095		0	1
Lucerne	12667	0.001		0	1
Neuchâtel	12667	0.034		0	1
St. Gallen	12667	0.041		0	1
Zurich	12667	0.212		0	1
Lugano	12667	0.023		0	1
ETH Lausanne	12667	0.043		0	1
ETH Zurich	12667	0.158		0	1
<i>Year of graduation</i>					
2008	12667	0.200		0	1
2006	12667	0.221		0	1
2004	12667	0.289		0	1
2002	12667	0.291		0	1

Table 8 Descriptive statistics: Employment situation of graduates 1 and 5 years after graduation (pooled sample of first-wave and second-wave survey)

	1 year after graduation		5 years after graduation	
	%	N	%	N
Employed	83.3	14400	91.7	6090
Job-education match (only sample of the employed)	84.7	11831	91.5	5513
Job-education mismatch (only sample of the employed)	15.3	11831	8.5	5513

Table 9 Multinomial logistic regression: determinants of job-education mismatch (5 years after graduation, pooled sample of second-wave survey). Average marginal effects

	Job-education match		Job-education mismatch		Not employed	
Job-education match in FS	Ref.		Ref.		Ref.	
Job-education mismatch in FS	-0.166***	(0.016)	0.167***	(0.013)	-0.001	(0.012)
Unemployed in FS	-0.090***	(0.027)	0.044**	(0.019)	0.046*	(0.026)
<i>Proxies for abilities, interest</i>						
Grade: bottom quintile	-0.059***	(0.016)	0.040***	(0.012)	0.019*	(0.011)
Grade: second-lowest quintile	-0.015	(0.016)	0.013	(0.013)	0.002	(0.011)
Grade: middle quintile	Ref.		Ref.		Ref.	
Grade: second-highest quintile	-0.001	(0.015)	-0.001	(0.010)	0.003	(0.011)
Grade: top quintile	0.009	(0.019)	-0.013	(0.011)	0.004	(0.014)
Average study duration	Ref.		Ref.		Ref.	
Number of years of study above the median	-0.011	(0.007)	0.008**	(0.003)	0.003	(0.006)
Number of years of study below the median	-0.012	(0.013)	0.011	(0.011)	0.001	(0.010)
Job related to studies	0.042***	(0.013)	-0.017**	(0.008)	-0.026***	(0.009)
Job unrelated to studies	-0.011	(0.009)	0.014*	(0.008)	-0.004	(0.009)
Mobility semester (domestic or foreign)	-0.022**	(0.011)	0.003	(0.009)	0.020**	(0.009)
<i>Sociodemographic characteristics</i>						
Female gender	-0.060***	(0.012)	0.021**	(0.009)	0.039***	(0.010)
Age at first-wave survey	-0.006***	(0.002)	0.003***	(0.001)	0.002	(0.001)
Mother with tertiary degree	-0.018	(0.014)	0.005	(0.011)	0.013	(0.009)
Father with tertiary degree	0.004	(0.010)	-0.004	(0.009)	0.000	(0.009)
Swiss national	Ref.		Ref.		Ref.	
Foreigner educated in Switzerland	0.008	(0.025)	-0.002	(0.014)	-0.006	(0.020)
Foreigner educated abroad	-0.008	(0.034)	-0.044**	(0.020)	0.052***	(0.019)
<i>Structural characteristics</i>						
Difference in cantonal unemployment rate to long-term average	-0.006	(0.036)	-0.014	(0.015)	0.02	(0.032)
Unemployment rate: Missing	-0.036*	(0.019)	0.003	(0.016)	0.033*	(0.018)
Change in number of graduates	-0.023	(0.031)	0.005	(0.022)	0.019	(0.024)
<i>Fixed effects</i>						
Departments	X		X		X	
Universities	X		X		X	
Year of graduation	X		X		X	
Pseudo R-squared			0.111			
N			5288			

Multinomial logistic regression. Reference category: job-education match

Cluster for faculties by university. Robust standard error in parentheses. Category percentages: job-education match (83.6%), mismatch (7.9%), not employed (8.5%)

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

Table 10 OLS regression: Correlation between job-education mismatch and income from employment (pooled sample of first-wave and second-wave survey, only employed graduates)

	1 year after graduation		5 years after graduation	
Job-education mismatch in FS	-0.055***	(0.010)		
Job-education match in FS and SS			Ref.	
Job-education match in SS, mismatch in FS			-0.035***	(0.012)
Job-education match in SS, not employed in FS			-0.056***	(0.014)
Job-education match in FS, mismatch in SS			-0.056***	(0.017)
Job-education mismatch in SS and in FS			-0.098***	(0.021)
Job-education mismatch in SS, not employed in FS			-0.169***	(0.030)
<i>Proxies for abilities, interest</i>				
Grade: bottom quintile	-0.027**	(0.011)	-0.021*	(0.011)
Grade: second-lowest quintile	-0.003	(0.008)	-0.020*	(0.010)
Grade: middle quintile	Ref.		Ref.	
Grade: second-highest quintile	0.000	(0.007)	0.015	(0.011)
Grade: top quintile	-0.010	(0.010)	0.002	(0.015)
Average study duration	Ref.		Ref.	
Number of years of study above the median	0.003	(0.004)	-0.006	(0.006)
Number of years of study below the median	0.015	(0.013)	0.013	(0.011)
Student job related to studies	0.052***	(0.009)	0.035***	(0.010)
Student job unrelated to studies	-0.016	(0.011)	0.001	(0.008)
Mobility semester (domestic or foreign)	-0.017**	(0.007)	-0.007	(0.012)
<i>Socio-demographic characteristics</i>				
Female	-0.029***	(0.007)	-0.028***	(0.010)
Age at first-wave survey	0.037***	(0.009)	0.037***	(0.011)
Age squared/100	-0.028**	(0.012)	-0.037**	(0.016)
Mother with tertiary degree	0.006	(0.007)	-0.012	(0.008)
Father with tertiary degree	-0.009	(0.007)	0.002	(0.009)
Swiss national	Ref.		Ref.	
Foreigner educated in Switzerland	-0.004	(0.012)	0.006	(0.013)
Foreigner educated abroad	-0.079***	(0.015)	-0.019	(0.026)
<i>Fixed effects</i>				
Departments	X		X	
Universities	X		X	
Year of graduation	X		X	
Constants	10.571***	(0.151)	10.879***	(0.187)
Adjusted R ²	0.192		0.217	
N	9346		4513	

OLS regression: dependent variable is the natural logarithm of annual income. Cluster for departments by university. Robust standard error in parentheses

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

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