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# Further Education of Higher Education Graduates — the More, the Better?

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## Introduction

Unlike what current discussions about the 'internship generation' suggest, previous research has shown that higher education graduates in Europe continue to be relatively successful in entering the labour market, even in times of high unemployment and increasing labour market deregulation. When compared to those with lower educational credentials, graduates rapidly find a job, are employed in better positions, are less often affected by unemployment, their unemployment spells are shorter, and their average earnings tend to be higher than those of other employees (Müller & Shavit, 1998; Brennan *et al.*, 1996; Teichler, 2007b, 2007a; Schomburg, 2007; Schomburg & Teichler, 2006; Scherer, 2005; Hillmert, 2001; Butz, 2000; OECD, 2009). These advantages notwithstanding, many work in a job which does not correspond to their training (horizontal inadequacy) or have earnings below the average pay level of graduates (vertical inadequacy). In Germany, roughly one out of seven graduates is subject to a spell of inadequate employment during the first five years after graduation (Fehse & Kerst, 2007).

Previous research on inadequate employment, also called over-education or skill mismatch, has mainly focused on its determinants and consequences for career progression (Büchel *et al.*, 2003; Allen & Velden, 2002, 2001; Wolbers, 2003; Allen & Vries, 2007). In this article, we ask what higher education graduates can do after entering the labour market to increase their wages in order to avoid or overcome vertically inadequate employment. More precisely, we analyse whether participation in further education increases their wages during the first years after graduation. In times of rapid technological and organisational change, the importance of initial occupational training is in decline, whilst further education becomes more and more important for labour market success (Buchholz *et al.*, 2006). This should also hold true for higher education graduates. From studies on the selectivity into further education we know that highly educated persons have better chances of participating in further education measures (Behringer, 1999; Büchel & Pannenberg, 2004; Hubert & Wolf, 2007; Schiener, 2006; Schömann & Leschke, 2004). Schömann and Leschke (2004, p. 358) report that 38% of higher education graduates are involved in further education measures, compared to 26% among respondents with completed apprenticeship and only 7% among respondents without occupational qualifications. A descriptive analysis of a German higher education graduate cohort from 1997 shows that only 6% have not been involved in any measure of further education in the first five years of their working life (Kerst & Minks, 2004). These measures include lectures, exhibitions, congresses and workshop as well as — less frequently — long-term courses, medical specialisations and further studies.[1] Short-term courses offered by employers or external providers are especially important for graduates in computer sciences or electrical engineering, while medical doctors have the highest participation rate in all forms of further education (Kerst & Minks, 2004). The question which arises is whether

among such participants, we can still observe a positive effect on wages and, if so, which further education strategies can be said to be most successful for higher education graduates. On the one hand, previous research suggests that further education is likely to be more valued in the work environments of the highly qualified than in low-skilled work places (Bolder & Hendrich, 2000). Moreover, it seems to be most important in the early phases of working life. But the very high participation rate among higher education graduates could lead to a 'devaluation' of further education certificates in this group, reducing its relevance for wage returns.

We test these assumptions by using a German graduate panel which traces a sample of graduates up to five years after they obtained their degree in 1997 (*HIS Absolventenpanel*). We first present an overview of previous research on labour market returns of further education in Germany, followed by theoretical approaches that aim at explaining why and under which circumstances further education may entail monetary rewards for higher education graduates. The remaining sections present data, methods and empirical results. In the concluding section, we link the empirical results to the presented theoretical arguments and place them within previous empirical research.

## Previous Research on Labour Market Returns to Further Education

While Germany's education system, just like many other European systems, traditionally focused on schooling and occupational training in early adult life, further education throughout the life course has been given increasing importance for labour market outcomes (Allmendinger, 1994; Backes-Gellner, 1999; Becker & Hecken, 2005). Due to changing technological and organisational work environments, adults are now expected to continuously update their qualifications to maintain their employability. The empirical question as to whether these efforts constitute an advantage for workers and employees has, however, only recently been addressed.

Previous studies on further education addressed two main topics at the individual level: those dealing with the question of who participates in further education and those analysing its labour market consequences. Studies on individual chances of participation in further education have yielded a variety of undisputed results regarding socially unequal opportunities to participate (Behringer, 1999; Büchel & Pannenberg, 2004; Hubert & Wolf, 2007; Schiener, 2006; Schömann & Leschke, 2004). However, studies on the effects of further education on wages, career mobility or future unemployment risks are characterised by disputed and sometimes contradicting results. Some research on labour market consequences relies on participants' subjective reports of returns from further education and shows positive effects such as 'personal development' (Beicht *et al.*, 2006). Others focus on individual motives and indicate that employees often participate to obtain wage increases (Schömann & Becker, 1995; Weber, 1989). These subjective measures, however, risk overestimating the positive effects of further education by not taking into account real labour market returns (Behringer, 1996). If studies use objective measures of labour market returns, such as income or status (Büchel & Pannenberg, 2004; Fitzenberger & Prey, 1998; Jürgens & Schneider, 2006; Lechner, 1999; Pannenberg, 1998; Pischke, 2001; Schömann & Becker, 1998), results are more ambiguous, since only some find positive effects. This is partly due to a large variety of operationalisations of further education (Wohn, 2007) and

partly to the methodological problem of selectivity. The estimation of the causal effect of further education on individual wages continues to be a challenge for empirical research. The difficulty arises from the fact that participation in further education measures is not distributed equally in the population. Since it is not allocated randomly, the group of participants differs from that of non-participants in many observed and non-observed variables, such as motivation or ability, which also influence wages. In order to deal with the problem of non-random selection into further education, several methods have been applied to estimate the 'net' effect on labour market outcomes: fixed and random effect models (Büchel & Pannenberg, 2004; Fitzenberger & Prey, 1998; Pannenberg, 1998; Pischke, 2001), matching methods (Fitzenberger & Prey, 1998; Lechner, 1999) or Heckman corrections (Becker, 2000; Becker & Schömann, 1996; Schiener, 2007).

Most authors who analyse the German situation using selection corrections find small but (mostly) significant effects of further education on income. Pischke (2001) examines wage effects of further education on the basis of the GSOEP data from the years 1986–1989; in addition to the binary participation variable, he includes information on the length of the measure and on whether it was taken during work or leisure time. For both fixed and growth effect models, further education does not show a significant positive effect. Jürgens and Schneider (2006) report similar results from their analysis of the GSOEP data from the years 1984–2000, using both fixed growth models and matching models. In contrast, Fitzenberger and Prey (1998) find significant positive returns; however, they stress the sensitivity of the results to model specifications. The analyses of Büchel and Pannenberg (2004) and Pannenberg (2008), which are based on GSOEP data from the years 1984–2002 and use fixed growth models, find significant positive effects for West German respondents who are under 44 years of age; in East Germany, the effects are also significant for older age groups. Wolter and Schiener (2009) confirm the positive effect of further education on wages by applying fixed effect models to the Microcensus panel waves 1996–1998. However, when estimating separate models for age groups, the authors only find this positive effect for younger age groups (aged 20–44) in West Germany. Moreover, they show that the effect of further education decreases with increasing initial schooling level, from 5% for those with basic schooling ('*Hauptschulabschluss*') to 2.8% for higher education graduates, which is no longer significant. The effect is, however, the opposite regarding the length of further education measures: for the highly educated, they find a significant positive effect of 1% per month in further education (Wolter & Schiener, 2009, p. 110).

Finally, some interesting gender differences regarding the benefits of further education are reported. Regarding participation, based on GSOEP data from 2000, Schömann and Leschke (2004) report that women still lag behind their male counterparts (22% vs. 26%). These results confirm earlier American studies which show that women receive less training than men (Altonji & Spletzer, 1991; Barron *et al.*, 1993; Green, 1991; Lynch, 1992). It is argued that this has to do partly with self-selection due to their greater involvement in family duties and partly to a selection by employers who prefer investing in full-time personnel, mainly men (Evertsson, 2004; Schömann & Leschke, 2004). Moreover, women are less likely to participate in further education measures during their work time (Schömann & Leschke, 2004, p. 370). Similar results are reported for Sweden where women are less likely than men to participate in formal on-the-job training during ordinary

work hours, administered and paid for by the employer; they are, moreover, more likely to take part in industry-specific training, whereas men are more likely to participate in general training and training that increases promotion opportunities (Evertsson, 2004). It has also been shown for Sweden that women do not profit as much as men from their further training (Evertsson, 2004; Regnér, 1997).

As for interaction effects with institutional variables, Schömann and Leschke (2004) report that large firms (over 200 employees) facilitate participation in further education for men but not for women. Public sector employment provides good opportunities for both men and women (Schömann & Leschke, 2004, p. 382). In the general population, this is reflected in the finding that men attribute greater importance to further professional training than women; regarding higher education graduates, the evaluation is similar for both sexes (Schömann & Leschke, 2004, p. 363). Becker's and Schömann's (1996) analysis of the German Life-History Study finds, moreover, that men can profit from further education in relation to within-firm job changes, while women profit mostly from their further education when changing firms or, alternatively, when staying at their workplace.

What can we learn from previous research regarding wage effects of further education for higher education graduates? First, it seems that the exclusive focus on higher education graduates has the advantage of overcoming the problem of selectivity, since almost all respondents with a higher education degree participated in some kind of further training measure at the beginning of their careers (Kerst & Minks, 2004). Second, the sub-group of higher education graduates is a special case regarding the question of monetary returns to further education. Since they are closely involved in further education over the life course, it is questionable whether participation leads to income increases or whether — due to inflationary processes — further education does not show any positive income effects. Overall, it follows from the literature review that higher education graduates participate more often in further education; yet, whether this has positive effects on their incomes is less clear. Therefore we take into account the quantity and quality of further education activities. Regarding quantitative differences, previous studies pointed to the importance of the number and duration of the courses taken. In terms of funding, it has been shown that it made a difference whether the further education measure was employer-subsidised or not. And finally, it seems necessary to take into account qualitative differences between general and specific skills acquired in further training. For all these characteristics, we discuss differences in related wage premiums for male and female higher education graduates.

## Theoretical Explanations of the Wage Effects of Further Education for Graduates

Since almost all higher education graduates participate in some kind of further education measure during the first five years of their career, we differentiate between the frequency of participation, the duration of measures, funding, and skills acquired. In order to develop hypotheses about which strategies may have the highest monetary reward, we draw on two theoretical approaches which are considered classical in this area: signalling and human capital theory.

One of the most prominent theories for explaining wage returns to further education is the human capital theory whereby education is seen as an investment in people's human capital which is deemed to increase their productivity and thus lead to higher financial remuneration (Becker, 1964; Sesselmeier & Blauermel,

1997). Although classical versions focused on years of schooling in early life (Buchmann *et al.*, 1999), later developments described the accumulation of human capital as a lifelong process which is also related to further education (Becker & Hecken, 2005; Blossfeld & Huinink, 1991). People are believed to behave rationally when investing in their human capital over the life course, for example by participating in further education, so that accumulated earnings, net of direct costs for education and indirect opportunity costs due to employment breaks are maximised (Buchmann *et al.*, 1999).

Regarding the quantity of further education courses taken, this indicates that a higher number of courses leads to an increase in human capital and greater individual productivity and, consequently, higher wages. However, the marginal utility principle of human capital theory also predicts that a person's investment in further education ends when direct and indirect costs exceed utility. Thus, one must examine whether participation in a higher number of further education courses is associated with linearly increasing monetary returns or whether there is a 'cut-off point' where marginal utilities start to diminish again. From the classical human capital theory, we can expect diminishing marginal utilities in investments in further education. Yet, the amount of human capital acquired through further education cannot only be measured by the number of courses taken. The length of further education should also matter, since longer training measures are equalled to a higher investment in a participant's human capital. Hence, participation in longer further education courses should, *ceteris paribus*, yield higher monetary returns.

Unlike the human capital theory, Spence's signalling approach (1973) tries to incorporate employer decisions in the problem of matching individuals to jobs. Job matching occurs in the context of a feedback loop in which employers' expectations lead to wage offers for those with various levels of education, which, in turn, leads to investment in education by individuals. Following recruitment, the discovery of the relationships between education and productivity results in revised expectations and beliefs and the cycle starts again. In the logic of the signalling theory, the relation between participation in further education measures is not explained by an increase in remunerated productivity (as the human capital theory would have it). Instead, participation serves as signals or 'screening devices' (Stiglitz, 1975) which help employers when hiring people to have an 'educated guess' about their productivity. Thus, they can draw conclusions regarding their work orientation, lifestyle and other behavioural components (e.g. tendency to absenteeism, continuity of employment, reliability, learning aptitude, motivation, etc.) (Weiss, 1995, p. 133). While the marginal utility principle of the human capital theory expects a person's investment in further education to end when direct and indirect costs exceed utility, the signalling theory expects a never ending competition for more further education courses (Berg, 1970). This is especially true when candidates cannot be differentiated by observable differences in productivity, such as educational qualifications.[2] From signalling theory, we would thus expect that the frequency of further education measures had a linear positive effect on wages since employers perceive them as signals of high productivity. Likewise, long-term measures should be perceived as signals that the participant has spent a considerable amount of time and effort to build up further qualifications.

Regarding qualitative differences, two types of further training are differentiated in the literature: occupation-specific and general. Becker's version of the human capital theory draws attention to the problem of general vs. specific skill

acquisition (Becker, 1962). Specific further training is supposed to increase a person's firm- or occupation-specific expertise and consists of (formal) on-the-job training and preparatory courses to take on new job tasks or for advancement in the firm. General further training is understood to increase a person's general competences or self-development, e.g. courses in computing skills, languages, or management competences. While the acquisition of general human capital through further training is useful in many firms, specific human capital is only beneficial to the firm that has provided it through further training.

The main problem of general skills is the poaching of skilled workers by other firms. Hence, firms are reluctant to invest in their employees' general skills, since they are not willing to pay for skills that can be used elsewhere. Instead, individuals must pay for the acquisition of general further education by receiving no wages or by earning wages that are below what could be received elsewhere. Firms are willing to pay for specific training since they benefit from higher productivity. At the same time, no rational employee would invest in training that cannot be used elsewhere, especially when the rate of labour turnover is high. Hence, we expect employees who participate in general further education to receive higher monetary returns, since they often bear the costs themselves, while the financial contribution of employers to specific further education reduces the monetary returns for employees. Moreover, it has been argued that the financial remuneration of further education should depend on the investor, irrespective of whether the course provides general or specific human capital (Büchel & Pannenberg, 2004, p. 79). Hence, one can expect that wage returns to further education are always lower if the employer subsidises the further education course and claims part of the financial reward.

These arguments lead to the following hypotheses which are to be tested empirically:

H1.1 Following from human capital and signalling theories, we expect wage returns to increase with a growing number of further education courses.

H1.2 Following from human capital theory, we expect a decreasing rate of return to the number of further education courses taken after graduation.

H1.3 Following from human capital and signalling theories, we expect participation in longer courses to lead to higher rates of wage returns for higher education graduates.

H2.1 Following from human capital theory, we expect that further education courses which are co-financed by the employer will lead to lower monetary returns for the individual employee than courses paid for exclusively by the employee.

H2.2 Regarding the skills acquired through further education, we expect general further education to have a positive effect on earnings.

## Data and Methods

In order to test our hypotheses, we conducted an analysis on the basis of a representative German panel study of the 1997 graduate cohort (*HIS-Absolventenpanel*) which surveys higher education graduates about one (T1) and five (T2) years after graduation. The survey provides detailed information on the respondent's higher education, as well as on the process of entering the labour market during the first five years after graduation (for a detailed description of the data set, see Fabian & Minks, 2006).

In order to assess wage returns to further education, we used random effects panel regressions to estimate logarithmised gross hourly wages.[3] These regression

models take into account the clustered nature of the data where two observations are available per person. Pooled OLS standard errors and test statistics are generally invalid because they ignore the often substantial serial correlation in the error terms. Thus, RE models are considered more efficient than pooled OLS models (Wooldridge, 2009, p. 439). The RE model calculates the influence of the explanatory variables on the dependent variable by including two error terms in the equation: the person-specific (time-constant) $a_i$ and the error-term $u_{it}$ varying between individuals and time:

$$y_{it} = \beta_0 + \beta_1 x_{it1} + \ldots + \beta_k x_{itk} + a_i + u_{it},$$

where Cov ($x_{itj}$, $a_i$) = 0, t = 1, 2, . . . T; j = 1, 2, . . ., k. $a_i$, i.e. the time-invariate person-specific error, is a random variable. The assumption is — as in the OLS regression — that the error term is not correlated with the explanatory variables (here: at all time points).[4]

As explanatory factors of the logarithmised gross hourly wages, we included the measures for the quantity of further education in the *first model*: Due to the mentioned high participation rate of graduates, we did not include a binary variable measuring participation (due to low discriminatory power)[5]. Instead we measured the quantity of further education by including the number of further education measures that a respondent reported to have taken since graduation[6], as well as the exponent of the number to control for declining marginal returns. The measures of further education included lectures, exhibitions, congresses or workshops as well as — less often — long-term courses, medical specialisations or further studies. As mentioned before, our concept of further education does not include mandatory phases of practical training immediately after higher education, as those for teachers, lawyers or medical doctors which are considered part of the regular professional training. To take into account the duration of further education, a dummy variable indicating long-term measures was included, capturing further studies, medical specialisation or long-term courses.

In the *second model*, the funding of further education was operationalised by several dummy variables indicating how the further education measure was financed: exclusively by the employer, exclusively by the employee, co-financed by employer and employee, or by the labour office or other funding sources. We also included variables measuring the human capital which respondents reported to have acquired by their further education, based on the question 'Have you experienced any changes due to your participation in further education?' Since four skills could be named, we constructed a variable using only the first skill mentioned, assuming that it indicated the most important skill acquired through further education. The corresponding variable was collapsed into three categories. General human capital measures if the respondent had developed his or her personality or social competencies or if he or she had acquired general education through further education. Firm- and occupation-specific human capital measures whether the respondent had achieved an increase in occupational skills, more income, a better position, a more challenging/interesting job, or whether he or she had changed occupation, changed employer or started self-employment. The third category captured neither specific nor general human capital, but indicated whether further education was used to avoid or end unemployment, avoid downward mobility, or compensate deficiencies from higher education.

The *third* model included all explanatory variables capturing participation in further education together. In the *fourth model* we included additional control

variables (time-varying, if available) which previous research had identified as having an influence on wage (as well as on participation in further education). These control variables may be divided into three groups. First, we controlled for indicators of the respondent's education biography: a completed apprenticeship, age at graduation (under 26, 26 to 29 years, 30 years and older) and the type of higher education degree obtained. Here, we differentiate between '*Fachhochschule*' degrees, i.e. degrees from a university of applied science, university degrees (*Diplom* and *Magister*), state examinations (*Staatsexamen*), teaching qualifications and completed PhD degrees; we also controlled whether a respondent was involved in an ongoing PhD project. Academic subjects were subdivided into eight categories based on the ISCED classification (UNESCO, 1997): humanities, arts, social sciences, law, economics, natural sciences, health, engineering. Second, we included various family characteristics, namely parental education (at least one parent with '*Abitur*'), marital status, having at least one child in the household, as well as the duration of family-related employment breaks (in months). Third, we included various variables capturing the respondent's labour market experience and current employment situation: career orientation (whether a respondent agreed or strongly agreed to have the following goals: extraordinary achievements in occupational life, leading position), length of unemployment and work experience (in months) since graduation, employment in East Germany, vertical labour market position (employment in a profession or in management), firm size (large firm with over 500 employees), as well as employment in the public sector. (For a descriptive overview on all variables, see Table I).

We calculated models separately for men and women in order to trace the gender-specific influence of our explanatory variables.

## Empirical Results

Here, we present some initial results describing the labour market status and wages of male and female higher education graduates in the first five years after graduation. Second, the type of further education they have acquired is illustrated in some detail. Finally, we present evidence from multivariate models on wage returns of further education.

### *Descriptive Analysis: graduates in further education*

Concerning labour market involvement, the overview in Table II confirms that our sample of graduates is a highly involved group. In the first year after graduation, 89% of men and 84% of women are in paid labour. Four years later, the 'employment gap' between male and female graduates has widened somewhat: male graduates have increased their participation to 94%, while female graduates' participation has dropped to 79%.[7] Compared to the general population, female higher education graduates are very attached to the labour market. As for wage development in the first five years after graduation, we find a steep increase in wages: men's hourly gross wages increase from 14.56 to 24.31 euros; women's from 11.49 to 20.49 euros. At the same time, we observe a remarkable growth in variation: the standard deviation for male graduates increases from 4.76 to 21.28 and for female graduates from 5.06 to 11.37 euros.

Regarding overall participation in further education, our analysis confirms previous research with the HIS graduate panel data that only 6% of higher education graduates have not participated in any measure five years after

TABLE I. Percentages or means and standard deviations

| Variable | Mean | SD |
|---|---|---|
| Woman | 0.436 | |
| Hourly gross wage T1 | 13.262 | 5.122 |
| Hourly gross wage T2 | 22.829 | 18.202 |
| Log hourly gross wage T1 | 2.498 | 0.443 |
| Log hourly gross wage T2 | 3.047 | 0.365 |
| No. of further education measures | 10.268 | 8.883 |
| Long-term further education | 0.300 | |
| Funding: Employer-financed | 0.496 | |
| Employee-financed | 0.130 | |
| Co-financed | 0.320 | |
| Other financing | 0.054 | |
| Acqurired skills: general skills | 0.069 | |
| specific skills | 0.508 | |
| other skills | 0.041 | |
| no skills | 0.382 | |
| Type of degree: 'Fachhochschule' | 0.276 | |
| University Diplom | 0.407 | |
| Magister | 0.065 | |
| state examination | 0.124 | |
| Teaching degree | 0.128 | |
| PhD | 0.113 | |
| PhD student T1 | 0.154 | |
| PhD student T2 | 0.065 | |
| Apprenticeship | 0.384 | |
| *Age of graduation: under 26 years* | 0.202 | |
| 26–29 years | 0.600 | |
| 30 years or older | 0.199 | |
| *Subject: Humanities* | 0.112 | |
| Engineering | 0.312 | |
| Natural sciences | 0.193 | |
| Social sciences | 0.053 | |
| Law | 0.049 | |
| Economics | 0.141 | |
| Health | 0.085 | |
| Educational sciences | 0.034 | |
| Arts | 0.021 | |
| Duration unemployment (months) T1 | 0.557 | 1.753 |
| Duration unemployment (months) T2 | 1.648 | 4.232 |
| Duration employment (months) T1 | 5.960 | 5.967 |
| Duration employment (months) T2 | 52.020 | 17.821 |
| Profession, management T1 | 0.339 | |
| Profession, management T2 | 0.347 | |
| Large firm T1 | 0.303 | |
| Large firm T2 | 0.421 | |
| Public sector T1 | 0.396 | |
| Public sector T2 | 0.387 | |
| Job in East Germany T1 | 0.151 | |
| Job in East Germany T2 | 0.153 | |
| Family status: married T1 | 0.174 | |
| Family status: married T2 | 0.449 | |
| Child in household T1 | 0.121 | |
| Child in household T2 | 0.358 | |
| Duration family obligations (months) T1 | 2.373 | 7.473 |
| Duration family obligations (months) T2 | 3.114 | 10.089 |
| Parent with 'Abitur' | 0.470 | 0.499 |
| Career-orientation | 0.380 | 0.485 |

TABLE II. Labour market returns and participation in further education

| Variable | Men | | Women | |
|---|---|---|---|---|
| | Mean | SD | Mean | SD |
| In employment T1 | 89.27 | | 84.62 | |
| In employment T2 | 93.96 | | 78.97 | |
| Hourly gross wage T1 | 14.564 | 4.761 | 11.487 | 5.064 |
| Hourly gross wage T2 | 24.307 | 21.287 | 20.485 | 11.366 |
| Participation in further education | 94.42 | | 93.16 | |
| No. of further education measures | 10.252 | 8.276 | 10.290 | 9.613 |
| Type of training: Lectures | 0.739 | | 0.714 | |
| Exhibition, congress | 0.604 | | 0.519 | |
| Workshops | 0.876 | | 0.884 | |
| Long-term courses | 0.169 | | 0.240 | |
| Medical specialization | 0.036 | | 0.055 | |
| Further studies | 0.042 | | 0.050 | |
| Other | 0.026 | | 0.021 | |
| Funding: Employer-financed | 0.597 | | 0.365 | |
| Employee-financed | 0.078 | | 0.196 | |
| Co-financed | 0.287 | | 0.363 | |
| Other financing | 0.038 | | 0.076 | |
| Acqurired skills: general skills | 0.076 | | 0.060 | |
| specific skills | 0.515 | | 0.500 | |
| other skills | 0.031 | | 0.054 | |
| no skills | 0.379 | | 0.386 | |

*Source:* HIS-Absolventenpanel (Graduate cohort 1997).

graduation (Kerst & Minks, 2004). The figure does not vary much between sexes (men: 6%, women: 7%).

Regarding the frequency of involvement, graduates reported being involved rather regularly in further education measures. The average number of further training measures in the first five years after graduation was 10 for both sexes, with a somewhat larger standard deviation of 9.6 for women than for men (8.3). As to the type of training which graduates attend, short-term measures were by far the most frequent: over 70% reported having listened to lectures, around 60% of male graduates attended exhibitions or congresses (52% females). A much smaller group was involved in long-term courses (men: 17%, women: 24%), medical specialisation (men: 4%, women: 6%) and further studies (men: 4%, women: 5%).[8]

Another interesting finding is the gender difference in financial support from employers for their graduate employees' further education: while 60% of male graduates reported that their employers funded their further education, only 37% of female graduates had that experience. At the same time, women were more likely to pay either exclusively themselves for their further training (20%, vs. 8% men) or co-finance the measure (women: 36%, vs. 29% men). A small percentage of 4% male and 8% female graduates reported having had other sources of funding, such as the labour office.

As for the type of skills which graduates reported to have acquired through further education, specific skills were by far the most dominant (around 50%). This category included respondents who reported having achieved an increase in occupational skills, more income, a better position, a more challenging/interesting job, or changed occupation or employer, or started self-employment through their

further education. Another large group of almost 40% of the respondents reported not having observed any relevant change through their further education measures. Finally, there was a smaller group of around 7% of respondents who said that further education had allowed them primarily to acquire general skills. This included respondents who reported having developed their personality or social competencies or acquired general education through further education. No large gender differences were observed regarding this classification of acquired skills.

Thus, the descriptive results confirm previous findings that higher education graduates are highly involved in further training. Short-term measures, such as workshops, lectures or exhibitions and congresses prevail. Moreover, graduates are most likely to acquire specific skills. Male graduates are more likely than their female counterparts to have employers who pay for their further training. In the following, we turn to the question of whether and to what extent this involvement leads to monetary advantages in the labour market.

*Multivariate Hypotheses Testing: wage returns to further education*

In order to estimate monetary returns of different types of further education strategies, we calculated random effects models with logarithmised log hourly wages as dependent variable. Model 1, which only includes variables that capture further education activities, shows a small but significant positive effect of further education on respondents' wages for both men and women (Table III, model 1). When including a variety of control variables in the model, the effect is only significant for men and amounts to an approximate 1% wage increase (Table III, model 2). Although this effect seems very small, it should be kept in mind that this is the effect per measure; since the frequency of individual participation is rather high among higher education graduates (mean: 10), the total effect adds up to a 10% increase for an average graduate in the first five years of his career. The finding that the positive effect of the frequency of participation in further education is only significant for male graduates confirms previous research in Sweden which suggested that men benefited more from their training (Evertsson, 2004; Regnér, 1997).

Moreover, the squared variable of frequency of further education measures is significantly negative in all models, although with a very small effect size (<0.0005). This supports the idea of human capital theory which assumes a decreasing marginal effect of more further education measures. Theoretical expectations of an ever increasing financial return of additional further educational measures uttered by signalling theory to the contrary do not seem to hold. However, the very small effect size indicates that the positive effect of further education only starts decreasing from a very large number of measures onwards.

The expectation that long-term further education has a positive effect on income is not confirmed. Although the effect is positive in all models, it is not statistically significant in any. This contradicts a finding from a previous study which found that the duration of a measure had a significant positive effect on wages of the highly educated (Wolter & Schiener, 2009).

In this study, however, we are not able to include length of the measure as a metric variable; it could thus be that our binary variable does not ideally capture the effect of duration. In our model, it is more important to know whether the employer is willing to exclusively finance their employees' further education. Unlike arguments from classical human capital theory, both exclusively employee-funded measures and co-financed measures have a negative impact on wages

TABLE III. Random Effects panel model estimating gross hourly wages

| | Model 1 | | Model 2 | |
|---|---|---|---|---|
| | Men | Women | Men | Women |
| **Quantity of further education** | | | | |
| No. of further education | 0.014** | 0.008** | 0.009** | 0.003 |
| No. of further education$^2$ | –0.000** | –0.000** | –0.000** | –0.000* |
| Long–term further education | 0.000 | 0.031 | 0.002 | 0.009 |
| **Funding of further education (RC: Employer-financed)** | | | | |
| Employee-financed | –0.262** | –0.218** | –0.056* | –0.061** |
| Co–financed | –0.090** | –0.120** | –0.022+ | –0.047* |
| Other financing | –0.167** | –0.202** | –0.078* | –0.042 |
| **Skills acquired though further education (RC: No skills acquired)** | | | | |
| General human capital | 0.143** | 0.087* | 0.056** | 0.052 |
| Specific human capital | 0.013 | 0.006 | 0.001 | 0.004 |
| Other human capital | –0.147** | –0.025 | –0.144** | –0.020 |
| **Control variables** | | | 0.086** | 0.029 |
| *Higher education degree (RC: Fachhochschul-Diplom)* | | | | |
| Magister | | | 0.050 | –0.036 |
| State examination | | | –0.140** | –0.091* |
| Teaching qual. | | | –0.017 | –0.014 |
| *Field of study (RC: Humanities)* | | | | |
| Engineering | | | 0.096** | 0.014 |
| Science | | | 0.086** | 0.058* |
| Social Sciences | | | 0.035 | –0.055 |
| Law | | | 0.188** | 0.030 |
| Business | | | 0.075* | 0.049 |
| Health | | | 0.067 | 0.014 |
| Education | | | 0.060 | 0.055 |
| Arts | | | 0.195** | 0.000 |
| Phd degree | | | 0.028 | 0.045 |
| PhD student | | | –0.067** | –0.072* |
| Apprenticeship | | | –0.001 | 0.007 |
| *Age at graduation (RC: 26–29 years old)* | | | | |
| < 26 years | | | 0.023 | –0.030 |
| > 29 years | | | 0.005 | 0.036 |
| Career orientation | | | 0.046** | 0.026 |
| Unempl. duration | | | 0.003+ | 0.000 |
| Work experience | | | 0.008** | 0.011** |
| Profession / Management | | | 0.077** | 0.084** |
| Big firm | | | 0.077** | 0.114** |
| Public sector | | | –0.153** | –0.090** |
| Job East Germany | | | –0.171** | –0.117** |
| Married | | | 0.031* | 0.031 |
| Child(ren) | | | 0.027+ | 0.106** |
| Family breaks | | | 0.004+ | 0.001 |
| Parent with Abitur | | | 0.003 | 0.012 |
| Constant | 2.813** | 2.656** | 2.387** | 2.302** |
| No. of observations | 4114 | 2835 | 4114 | 2835 |
| No. of group | 2377 | 1787 | 2377 | 1787 |
| R square between | 0.099 | 0.058 | 0.446 | 0.381 |

*Source*: HIS-Absolventenpanel (Graduate cohort 1997), own calculations, significant + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

compared to exclusively employer-funded measures. This holds true for both men and women. This result should, however, be interpreted with caution, especially regarding causality: It could well be that further training is not the cause of wage increase, but rather a 'token' offered by the firm to employees who make a successful upward move in the firm.

For the skills which respondents have acquired in further education measures, human capital expectations are confirmed: compared to respondents who report not having experienced any change through their further education, those who acquired general further education are rewarded with a comparatively strong and significant positive effect on their wages. The effect amounts to 14% for men and 9% for women in model 1 (Table III). In model 2, the inclusion of a variety of controls decreases the effect to 6% for men, while the effect for women is no longer significant. Further analysis shows that the positive effect is mostly due to personality development measures. Since we are dealing with the upper strata of the labour market, we can assume that these measures mainly mean management-related skills, such as personnel management, team building, etc. It is plausible that further education measures in this area prepare for leading positions in a firm and thus contribute to the employee's financial remuneration. While we cannot confirm the Swedish finding that men are more likely to participate in general training and training that increases promotion opportunities (Table II), we are in line with the study in the sense that men in our German graduate sample are also found to benefit more from their further training measures (Evertsson, 2004).

## Discussion and Conclusion

While initial training was traditionally the most important condition for labour market success in Germany, in times of rapid technological and organisational change, lifelong learning has become increasingly important to secure adequate employment throughout one's working life. This article set out to assess the importance of further education for wages as an indicator for vertical adequacy of employment, focusing on higher education graduates. Although previous research suggests that lifelong learning is more valued in the work environments of the highly qualified than at low-skilled work places, it could also be that the high involvement leads to a 'devaluation' of further education certificates in such a highly active group. In terms of frequency of participation, we confirm previous findings of a small positive effect of further education measures which is, however, only significant for men. Although it only amounts to a 1% wage increase per measure, the on average high frequency of participation leads to substantial wage increase due to participation in further education in the first five years of male graduates' careers.

As for the quality of further education measures, we find two additional differentiations: unlike what human capital theory would expect, we show a significantly positive effect of further education measures financed exclusively by the employer on wages. This holds true for both male and female graduates. Thus, women who benefit from further training exclusively financed by the employer also experience significant wage increases. As for the type of further education measures, we find, as predicted by human capital arguments, that those which provide graduates with general rather than specific human capital are financially remunerated. Since we focus on the highly educated who are well-placed in the

labour market, we assume that these further education courses mainly comprise management-related skills, such as leadership or teambuilding skills. Again, this effect is only significant for men. Male graduates' further education strategies are thus more successful in terms of wage increase as an indicator of vertical labour market segregation than those of their female counterparts.

Generally, one can say that the influence of initial graduate training continues — at least in Germany — to be central for the development of wages at the beginning of careers. Despite the ongoing importance of initial training, further education can contribute to wage setting processes in early graduates' careers. More specifically, frequency of participation does have a small but significant effect on male wages. However, qualitative aspects of further education are more important. More specifically, those measures which are exclusively funded by the employer exert a positive influence on both male and female graduates' wages. Additionally, male graduates profit most from general further education, mainly in the form of courses aiming at personality development. We thus conclude that graduates' vertical labour market position in terms of their wages can indeed be influenced by further education strategies. It is, however, not the quantity which matters, but rather the quality, indicated by employer subsidies, as well as qualifications preparing for leading positions.

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## NOTES

1. The concept of further education in this study does not include mandatory phases of practical training immediately after higher education, as is the case for teachers, lawyers or medical doctors.
2. This leads to the paradoxical situation where employees continue to accumulate further education certificates even when they cannot expect any returns from their investment (Wolter & Schiener, 2009, p. 95). Hence, we could face the danger of a system of further education which mainly certifies supposedly higher productivity (Becker & Schömann, 1996, p. 431).
3. In the HIS survey, respondents were asked about their gross monthly labour earnings at T1 and T2, but not about all employment spells since graduation. The choice to calculate hourly wages instead of monthly earnings aims at examining wage effects net of working hours (Petersen, 1989). The possibilities to calculate hourly wages with HIS-data are, however, somewhat limited, since contractual working hours are only reported for part-time workers. Therefore, full-time workers are assigned 40 weekly working hours. The alternative option of estimating gross monthly earnings would have forced us to exclude part-time workers in order to control for the working hours effect. Yet, this would have increased the problem of selectivity — especially regarding female working biographies at reproductive ages. In addition, we did not include the self-employed and those working abroad, since their wages were likely to be determined by mechanisms that differed from those for graduates in dependent employment in Germany.

4. The alternative panel model approach, namely the fixed effects (FE) panel model, allows for correlation between person-specific error term and explaining variables. Since, however, FE models consider only variances in individuals over time, they exclude (mostly) time constant explanatory variables from the analysis. In our case, all our explanatory variables are measured only at T2 by asking about participation in further education since graduation, yet, without including questions on the exact time point. Since these variables cannot be included in FE models, we decided to calculate RE panel models.
5. Respondents who reported that they had not participated in any further education measures in the last five years (139 respondents) are not included in the multivariate models.
6. Over 50 courses are coded as 50 to avoid biased estimates due to outliers.
7. Since women's withdrawal from the labour market is mostly associated with founding a family, the female graduates included in our sample are characterised by a higher labour market attachment than the average female graduate population. This should be kept in mind when interpreting the gender-specific results.
8. The latter three are collapsed to a binary variable indicating long-term further education, which is included in the multivariate models.

## REFERENCES

ALLEN, J. & VELDEN, R. V. D. (2001) Educational mismatches versus skills mismatches: effects on wages, job satisfaction, and on-the-job-search, *Oxfort Economic Papers*, 53, pp. 434–452.

ALLEN, J. & VELDEN, R. V. D. (2002) When do skills become bsolete, and when does it matter? , in: A. D. GRIP, J. V. LOO & K. MAYHEW (Eds) *The Economics of Skills Obsolescence: theoretical innovations and emprical applications* (Amsterdam and others, JAI Press Ltd.).

ALLEN, J. & VRIES, R. D. (2007) Determinants of skill mismatches: the role of learning environments, the match between education and job and work experience, in: L. LASSNIGG, H. BURZLAFF, M. A. DAVIA RODRIGUEZ & M. LARSSEN (Eds) *Lifelong Learning. Buildung Bridges through Transitional Labour Markets* (Apeldoorn, Antwerpen, Het Spinhuis Publishers).

ALLMENDINGER, J. (1994) *Sozialpolitik und Lebensverlauf* (Frankfurt a.M., Campus).

ALTONJI, J. G. & SPLETZER, J. R. (1991) Work characteristics, job characteristics, and the receipt of on-the-job training, *Industrial and Labor Relations Review*, 45, pp. 58–79.

BACKES-GELLNER, U. (1999) Betriebliche Aus- und Weiterbildung im internationalen Vergleich, in: D. TIMMERMANN (Ed) *Berufliche Weiterbildung in europäischer Perspektive* (Berlin).

BARRON, J. M., BLACK, D. A. & LOEWENSTEIN, M. A. (1993) Gender differences in training, capital and wages, *Journal of Human Resources*, 28, pp. 343–364.

BECKER, G. S. (1962) Investment in human capital: a theoretical analysis, *The Journal of Political Economy*, 70, pp. 9–49.

BECKER, G. S. (1964) *Human Capital. A Theoretical and Empirical Analysis, with Special Reference to Education* (New York, Columbia University Press for NBER).

BECKER, R. (2000) Selektive Weiterbildungschancen und Exklusion von Arbeitslosen in Ostdeutschland, in: F. BÜCHEL, M. DIEWALD, P. KRAUSE, A. MERTENS & H. SOLGA (Eds) *Zwischen Drinnen und Draußen. Arbeitsmarktchancen und sozialen Ausgrenzungen in Deutschland* (Opladen, Leske+Budrich).

BECKER, R. & HECKEN, A. (2005) Berufliche Weiterbildung — arbeitsmarktsoziologische Perspektiven und empirische Befunde, in: M. ABRAHAM & T. HINZ (Eds) *Arbeitsmarktsoziologie. Probleme, Theorien, empirische Befunde* (Wiesbaden, VS Verlag für Sozialwissenschaften).

BECKER, R. & SCHÖMANN, K. (1996) Berufliche Weiterbildung und Einkommensdynamik. Eine Längsschnittstudie mit besonderer Berücksichtigung von Selektionsprozessen, *Kölner Zeitschrift für Soziologie und Sozialpsychologie*, 48, pp. 426–461.

BEHRINGER, F. (1996) Zum individuellen Nutzen beruflicher Weiterbildung: Subjektive Einschätzungen und objektive Veränderungen, *Zeitschrift für Berufs- und Wirtschaftspädagogik*, Kosten und Nutzen beruflicher Bildung Beiheft 12, pp. 84–104.

BEHRINGER, F. (1999) *Beteiligung an beruflicher Weiterbildung. Humankapitaltheoretische Erklärung und empirische Evidenz* (Opladen, Leske+Budrich).

BEICHT, U., WALDEN, E. M. & WALDEN, G. (2006) *Berufliche Weiterbildung: welche Kosten und Nutzen haben die Teilnehmenden?* (Bonn, Bundesinstitut für Berufsbildung).

BERG, I. (1970) *Education and Jobs. The Great Training Robbery* (New York, Praeger).

BLOSSFELD, H.-P. & HUININK, J. (1991) Human capital investments or norms of role transitions? How women's schooling and career affect the process of family formation, *American Journal of Sociology*, 97, pp. 143–168.

BOLDER, A. & HENDRICH, W. (2000) *Fremde Bildungswelten: alternative Strategien lebenslangen Lernens* (Opladen, Leske+Budrich).

BRENNAN, J., LYON, S., SCHOMBURG, H. & TEICHLER, U. (1996) Employment and work of British and German graduates, in: J. BRENNAN, M. KOGAN & U. TEICHLER (Eds) *Higher Education and Work* (London and Bristol, Pennsylvania, Jessica Kingsley Publishers).

BÜCHEL, F., DE GRIP, A. & MERTENS, A. (2003) *Overeducation in Europe: current issues in theory and policy* (Cheltenham, UK, Edward Elgar).

BÜCHEL, F. & PANNENBERG, M. (2004) Berufliche Weiterbildung in West- und Ostdeutschland. Teilnehmer, Struktur und individueller Ertrag, *Zeitschrift für Arbeitsmarktforschung*, 37, pp. 73–126.

BUCHHOLZ, S., HOFÄCKER, D. & BLOSSFELD, H.-P. (2006) Globalization, accelerating economic change and late careers. A theoretical framework, in: H.-P. BLOSSFELD, S. BUCHHOLZ & D. HOFÄCKER (Eds) *Globalization, Uncertainty and Late Careers in Society* (London *et al.*, Routledge).

BUCHMANN, M., KÖNIG, M., LI, J. H. & SACCHI, S. (1999) *Weiterbildung und Beschäftigungschancen* (Chur, Rüegger).

BUTZ, M. (2000) Lohnt Bildung noch? Die Einkommensungleichheiten der unterschiedlichen Bildungsklassen in der Bundesrepublik Deutschland im Zeitvergleich 1982–1995, in: P. A. BERGER & D. KONIETZKA (Eds) *Neue Ungleichheiten der Erwerbsgesellschaft* (Opladen, Leske & Budrich).

EVERTSSON, M. (2004) Formal on-the-job training: a gender-typed experience and wage-related advantage?, *European Sociological Review*, 20, pp. 79–94.

FABIAN, G. & MINKS, K.-H. (2006) *Dokumentation des Scientific Use Files 'HIS Absolventenpanel 1997'* (Hannover).

FEHSE, S. & KERST, C. (2007) Arbeiten unter Wert? Vertikal und horizontal inadäquate Beschäftigung von Hochschulabsolventen der Abschlussjahrgänge 1997 und 2001, *Beiträge zur Hochschulforschung*, 29, pp. 72–98.

FITZENBERGER, B. & PREY, H. (1998) Beschäftigungs- und Verdienstwirkungen von Weiterbildungsmaßnahmen im ostdeutschen Transformationsprozess: Eine Methodenkritik, in: F. PFEIFFER & W. POHLMEIER (Eds) *Qualifikation, Weiterbildung und Arbeitsmarkterfolg. ZEW Wirtschaftsanalysen Bd. 31* (Baden Baden, Nomos).

GREEN, F. (1991) Sex discrimination in job-related training, *British Journal of Industrial Relations*, 29, pp. 295–304.

HILLMERT, S. (2001) *Ausbildungssysteme und Arbeitsmarkt: Lebensverläufe in Großbritannien und Deutschland im Kohortenvergleich* (Wiesbaden, Westdeutscher Verlag).

HUBERT, T. & WOLF, C. (2007) Determinanten der beruflichen Weiterbildung Erwerbstätiger. Empirische Analysen auf der Basis des Mikrozensus 2003, *Zeitschrift für Soziologie*, 36, pp. 473–493.

JÜRGENS, H. & SCHNEIDER, K. (2006) Dynamische Lohneffekte beruflicher Weiterbildung. Eine Längsschnittanalyse mit den Daten des SOEP, in: M. WEIß (Ed) *Evidenzbasierte Bildungspolitik: Beiträge der Bildungsökonomie* (Berlin, Duncker & Humblot).

KERST, C. & MINKS, K.-H. (2004) *Fünf Jahr nach dem Studienabschluss — Berufsverlauf und aktuelle Situation von Hochschulabsolventinnen und Hochschulabsolventen des Prüfungsjahrgangs 1997* (Hannover, HIS-Hochschulinformations system GmbH).

LECHNER, M. (1999) The effects of enterprise-related training in East Germany on individual employment and earnings, *Annales d'Économie et de Statistique*, 55/56, pp. 97–128.

LYNCH, L. M. (1992) Private-sector training and the earnings of young workers, *American Economic Review*, 82, pp. 299–312.

MÜLLER, W. & SHAVIT, Y. (1998) The institutional embeddedness of the stratification process. A comparative study of qualifications and occupations in thirteen countries, in: Y. SHAVIT & W. MÜLLER (Eds) *From School to Work* (Oxford, Clarenden Press).

OECD (2009) *Education at a Glance 2009. OECD Indicators* (Paris, OECD Publishing).

PANNENBERG, M. (1998) Weiterbildung, Betriebszugehörigkeit und Löhne: Ökonomische Effekte des 'timings' von Investitionen in die berufliche Weiterbildung, in: F. PFEIFFER & W. POHLMEIER (Eds) *Qualifikation, Weiterbildung und Arbeitmarkterfolg. ZEW Wirtschaftsanalysen Bd. 31* (Baden-Baden, Nomos).

PANNENBERG, M. (2008) Individuelle Erträge von Weiterbildung in KMU's und Großbetrieben: Evidenz für Westdeutschland, *Sozialer Forschritt*, 2, pp. 39–43.

PETERSEN, T. (1989) The earnings function in sociological studies of earnings inequality: functional form and hours worked, *Research in Stratification and Mobility*, 8, pp. 221–230.

PISCHKE, J.-S. (2001) Continuous training in Germany, *Journal of Population Economics*, 14, pp. 523–548.

REGNÉR, H. (1997) *Training at the Job and Training for a New Job: two Swedish studies* (Stockholm, Swedish Institute for Social Research, Akademitryck).

SCHERER, S. (2005) Patterns of labour market entry — long wait or career instability? An empirical comparison of Italy, Great Britain and West Germany, *European Sociological Review*, 21, pp. 427–440.

SCHIENER, J. (2006) *Bildungserträge in der Erwerbsgesellschaft. Analysen zur Karrieremobilität* (Wiesbaden, VS Verlag für Sozialwissenschaften).

SCHIENER, J. (2007) Statuseffekte beruflicher Weiterbildung im Spiegel des Mikrozensus, *Working Paper Rat für Sozial- und Wirtschaftsdaten*, 16.

SCHÖMANN, K. & BECKER, R. (1995) Participation in further education over the life course, *European Sociological Review*, 11, pp. 187–208.

SCHÖMANN, K. & BECKER, R. (1998) Selektivität in der beruflichen Weiterbildung und Einkommensverläufe, in: F. PFEIFFER & W. POHLMEIER (Eds) *Qualifikation, Weiterbildung und Arbeitsmarkterfolg. ZEW Wirtschaftsanalysen Bd. 31* (Baden-Baden, Nomos).

SCHÖMANN, K. & LESCHKE, J. (2004) Lebenslanges Lernen und soziale Inklusion — der Markt alleine wird's nicht richten, in: R. BECKER & W. LAUTERBACH (Eds) *Bildung als Privileg? Erklärungen und Befunde zu den Ursachen der Bildungsungleichheit* (Wiesbaden, VS Verlag für Sozialwissenschaften).

SCHOMBURG, H. (2007) The professional success of higher education graduates, *European Journal of Education*, 42, pp. 35–57.

SCHOMBURG, H. & TEICHLER, U. (2006) *Higher Education and Graduate Employment in Europe. Results of Graduate Surveys from 12 Countries* (Dordrecht, Springer).

SESSELMEIER, W. & BLAUERMEL, G. (1997) *Arbeitsmarkttheorien* (Heidelberg, Physica).

SPENCE, M. (1973) Job market signalling, *The Quarterly Journal of Economics*, 87, pp. 355–374.

STIGLITZ, J. E. (1975) The theory of 'screening', education, and the distribution of income, *American Economic Review*, 65, pp. 283–300.

TEICHLER, U. (Ed) (2007a) *Careers of University Graduates. Views and Experiences in Comparative Perspective* (Dordrecht, Springer).

TEICHLER, U. (2007b) Does higher education matter? Lessons from a comparative graduate survey, *European Journal of Education*, 42, pp. 11–34.

UNESCO (1997) *International Standard Classification of Education ISCED 1997* (Paris, UNESCO).

WEBER, W. (1989) Lohn und Weiterbildungsmotivation, in: K. EMMERICH (Ed) *Einzel- und gesamtwirtschaftliche Aspekte des Lohns* (Nürnberg).

WEISS, A. (1995) Human capital vs. signalling explanations of wages, *Journal of Economic Perspectives*, 9, pp. 133–154.

WOHN, K. (2007) Effizienz von Weiterbildungsmessung, *Research Note Rat für Sozial- und Wirtschaftsdaten*, 15.

WOLBERS, M. H. (2003) Job mismatches and their labour-market effects among school-leavers in Europe, *European Sociological Review*, 19, pp. 249–266.

WOLTER, F. & SCHIENER, J. (2009) Einkommenseffekte beruflicher Weiterbildung. Empirische Anaysen auf Basis des Mikrozensus-Panels, *Kölner Zeitschrift für Soziologie und Sozialpsychologie*, 61, pp. 90–117.

WOOLDRIDGE, J. M. (2009) *Introductory Econometrics: a modern approach* (Mason, South Western).