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# High and steady or low and rising? Vocational versus general education in life-cycle earnings

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In this paper, we compare experience-earnings profiles of employees with vocational and general education background in Germany, the Netherlands and the United Kingdom, three countries with fundamentally different education systems. Using Mixed-Effects Linear Regression Models we show that earnings of employees with vocational education are higher in the initial phase of their career. However, generally educated catch up over the time on the labor market. Life-cycle differences in earnings are more pronounced in Germany than in the United Kingdom and the Netherlands.

## 1 Introduction

Countries differ with respect to their educational systems to supply skills and qualifications to young people, who in turn determine the supply of human capital to firms in an economy. While initial vocational education is an important component of education systems in several industrialized countries, other countries focus mainly on the provision of general education. The appropriateness of vocational systems of education in generating the skills needed in a modern economy has repeatedly been called into question. The structural change away from traditional crafts and industries toward services and, more broadly, the move to a knowledge-based economy is thought to require more systemic and theoretical knowledge and skills, which allow for more flexibility in rapidly changing labor markets (Bowman 1993, Baethge 2006). It is argued that education systems providing general qualifications better meet the demand of firms operating in restructuring economies (Heidenreich 1998). Adding to that argument, figures published by the OECD (EAG 2008) show that in countries with elaborate vocational systems, expenditures for

students in vocational education are much higher than for students in general education programs. While this is the case for Austria, Germany and Switzerland, costs for general programs exceed those of vocational programs in the Netherlands. The question has to be posed whether vocational education generates high costs without offering corresponding benefits, especially for economies underlying rapid technological change. Costs of educational programs, as published by the OECD, are relatively straightforward to measure. However, costs are only one part of the story. Before judging about the efficiency and effectiveness of different educational pathways, also the benefit side needs to be considered thoroughly.

The present paper therefore focuses on earnings of employees having either undergone upper-secondary vocational or general education programs. We compare experience-earnings profiles of the differently educated employees under the hypothesis that initial earnings and the subsequent experience-earnings curves differ between the two groups. The reason for this is that young adults opting for vocational programs, which often comprises work-experience, become "specialists" over the time in the program. The match between acquired and required skills improves already during the educational phase, which is not the case for young adults following a more general education path. We expect for the latter group that the lack of specialization and work experience will translate into lower initial productivity and thus lower initial earnings compared to vocationally educated employees. Following this logic, the greater the share of vocation-specific training in the program the better the initial match and the higher initial earnings. On the other hand, general education delivers a broad body of general knowledge that is the foundation for changing occupations over their careers and for responding rapidly to technological change (Goldin 2001). Thus, over time, also generally educated employees reach their "optimal" productivity level by learning "on-the-job", participating in continuing vocational training activities or by changing jobs and occupations. Since this broader foundation is likely to offer more opportunities to increase productivity later on in working life, one result of our analysis may be that the wage curves of vocationally and generally educated intersect at some point over working life and that generally educated reach a higher earnings-level than their vocationally educated fellow employees.

In this paper, we concentrate on employees with upper-secondary educational level. Employees with either higher (i.e. tertiary) or lower education are not included in the analysis. The reason for this concentration on upper-secondary education lies in the fact that employees at this level form the largest part of the workforce in the three reference countries. This "middle qualification level" encompasses employees that are an important factor in driving production and growth in an economy. Estimates based on the European Labour Force Survey (EU-LFS) show that in Germany over 60 percent of the workforce has earned a qualification at upper-secondary level.

In the Netherlands and the United Kingdom this share is somewhat lower (45 percent), but still much higher than the one of respective groups at lower secondary or tertiary level [1].

The contribution of the paper to the literature is threefold: First, the paper offers interesting results on the impact of different types of upper-secondary education programs (i.e. vocational and general) on life-cycle-earnings. Although a number of studies exist that estimate wage effects of vocational qualifications for Israel and the United States (Neuman 1991, 1999; Hotchkiss 1993; Meer 2007), evidence for European countries is rare. Second, by conducting the analysis for three different countries, we contribute to the ongoing debate on the benefits of vocational education and training systems in an international context. Third, by employing an econometric model that so far has not been used for estimating the impact of education on earnings, we also add to the methodological discussion in this area of research.

The remainder of the paper is structured as follows. After giving a short overview on theoretical aspects and on the literature, in section 3 we discuss education systems in the three countries of reference. In Section 4, we describe the data sources chosen for the analysis. The estimation of age-earnings profiles is done in section 5 and 6 via simple OLS earnings-equations and Mixed-Effects Linear Regression Models. The last section offers an overview on the main results and draws conclusions from the analysis.

## 2 Literature and Theory

### *2.1 Literature*

The hypothesis formulated above touches upon several strands of literature. First, the relation between education and earnings is one of the most popular topics in economic literature since the seminal works of Becker (1964) and Mincer (1958; 1974). An overview on methods and applications estimating returns to education based on the ideas of Mincer can be found in Grossbard (2006). Second, literature about job-matching is relevant for the analysis presented in this paper, since we argue that the shape of experience-earnings profiles reveals information about the matching of individual skills and the job-requirements of firms. Concerning the latter, the importance of job characteristics for productivity and earnings has been stressed by Thurow (1975) in his job competition model. Bringing both, supply and demand of skills together has been the achievement of job-matching theory, which has been advanced by authors like Jovanovic (1979) and Hartog (1992).

Taking this literature as a starting point, van Eijs & Heijke (2000) develop a theoretical model in which earnings-tenure profiles are derived. Initial earnings give an indication of the quality of the match at the beginning of a job. In this framework, training "on-the-job" is used to decrease the mismatch between acquired and required skills, whereas the costs for training are

[1] The shares refer to the year 2007. Source is the Eurostat data-base New Cronos

mainly shifted to the employee who receives lower wages at the beginning his career. Estimating earnings functions by occupational level and occupational field they conclude for the Netherlands that academic graduates have a comparative advantage in complex jobs and those with a low educational level have a comparative advantage at low level jobs. The same is concluded for employees with a medium level of education, i.e. also for this group of employees there is evidence for a comparative advantage over differently qualified in the same type of (intermediate level) jobs.

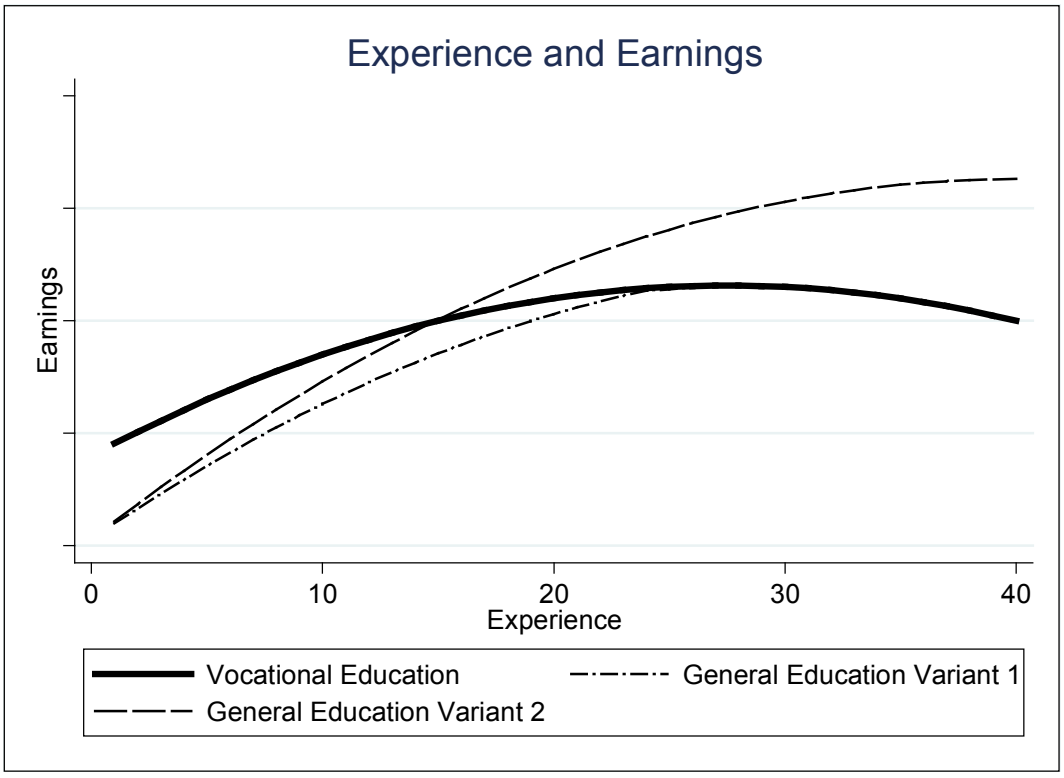
Building upon a contribution by Willis (1979) and extending the methodological and thematic scope, Meer (2007) analyses the effect of track choice (general vs. academic vs. technical vs. business) on earnings. Meer concludes that "the evidence points to comparative advantage in track selection: those on the technical track are best off there, and those on the academic track are best off following that path" (p.572). Pischke (2007) analyze the returns to apprenticeship training in Austria. The authors find wage returns of about the same size as returns to other forms of education, such as school based education in colleges. Also Neuman (1991, 1999) and Hotchkiss (1993) estimate the effects of secondary vocational training on the wage received and find mixed results. While Neuman and Ziderman find a positive and significant impact on wages for Israel, Hotchkiss finds no significant effects for the US. An important point made by several authors is that individuals differ with respect to ability, social background and interest, and that these differences need to be taken into account when analyzing earnings of differently qualified employees.

Yet another strand of literature deals with institutional frameworks and their role in the matching processes on the labor market. Marsden (1986) and Marsden and Ryan (1991) point out the importance of education systems for labor market integration of young adults. They broadly differentiate between two institutional arrangements, one with and one without strong apprenticeship systems. The resulting labor markets are either internal labor markets (ILM) or occupational labor markets (OLM). The key difference between the two is the presence of an education and training system providing occupationally-specific skills, thus transforming the stratification system from an internal labor market type into an occupational labor market system. Gangl (2001) points out that vocational education and training systems "perform an effective presorting of individuals and allow for a stratification system based on certified skills. In the absence of such training systems, matching processes have to rely relatively more on experience and mobility, thus yielding a different type of stratification system" (p.3).

The cited literature points towards an important aspect that needs to be taken into account when analyzing age-earnings profiles: Education systems and labor markets are institutions that interact with each other. The way education is organized in a country influences the quantity and quality of skills offered on the labor market. Firms, in turn, adjust their organizational structure and business strategies to the amount and type of human capital "available" on the labor market. In our

case, Germany and the Netherlands are examples for an occupational labor market (OLM) arrangement, while the United Kingdom can be classified as an internal labor market (ILM) arrangement. Thereby, the general question emerges whether different systems result in different outcomes in terms of labor and product market outcomes. While works of the authors cited above and others focus mainly on the role of vocational education and training in the employment (unemployment) outcome and further labor market career of young adults, the task of this paper is to analyze earnings differences between differently qualified employees over the life cycle in different educational systems.

**Figure 1: Hypothetical experience-earnings profiles**




A central assumption is that earnings reflect upon the productivity of employees and that therefore experience-earnings profiles may be used to obtain an indication of the quality of the initial match between acquired and required skills and the development of productive capacities over the working life[2]. The quality of the initial match is related to the earnings received at the beginning of a labor market career. Along the dimension of labor market experience earnings

[2] The assumption that earnings reflect the productivity of employees is not unchallenged. Several authors (Acemoglu 1998, 1999a, Booth 2004, Brunello 2002a) claim, for example, that wage compression (i.e. the gap between productivity and wages that increases with the amount of human capital) is an important feature of many industrialized economies and explains the investment of firms is general human capital. Dearden (2006) show that productivity increases induced by training exceed the wage gains for the training participants. However, for the analysis in this paper it is sufficient that productivity and earnings are monotonically positive related i.e. highly productive workers earn more than less productive workers.

increase due to learning on-the-job and continuing vocational training (Gustman 1982; Meyer 1982). Over time, however, the slope of the experience-earnings curve declines indicating that on-the-job training and especially formal training becomes less attractive the more experienced and thus the closer to retirement employees are. Overall, we expect for both, vocationally and generally educated employees, a concave experience-earnings profile.

Differences in the initial earnings and the shape of the experience-earnings curves can be interpreted in the following way: Higher initial earnings for one group of employees imply a comparative advantage over the other group of employees, since both groups of employees have obtained an education at the same (upper-secondary) educational level and thus have "invested" the same amount of time in their education. Whether this advantage holds over time depends on the shape of the experience-earnings curves. The curve is assumed to rise more steeply the more productive an employee becomes. The increase in productivity (and thus in earnings) stems from the acquisition of additional human capital through on-the-job learning and continuing vocational training. According to our argument, we would expect higher initial earnings for vocationally trained employees and a catching-up process for generally educated thereafter, as shown in Figure 1. In the first scenario shown in the graph (Variant 1), the curve of the generally educated converges to the one of the vocationally educated. This means that generally educated reach the productivity level of vocationally educated after some time in the labor market through e.g. on-the-job training. The "final" level of productivity and wages are similar for the two groups. In the second scenario, the curve of the generally educated rises more steeply than in Variant 1 and intersects with the one of vocationally educated at some point over working life. A catching-up process takes place and at some point generally educated become more productive than vocationally educated (Variant 2). Whether either group has an advantage over the other depends on the point in time when the two curves intersect. Assuming that the *initial* ability of both groups is controlled for, Variant 2 would contain an important message, namely that general education, ceteris paribus, leads to a higher productivity level than in the case of vocationally educated. The reason for this could be that the ability for learning throughout the working life differs between the two groups and that on-the-job training is more effective in the case of generally educated employees. This, on the other hand, would not mean that vocational education is inferior to general education from an individual perspective, since the initial earnings-advantage may still offset the gains obtained through a higher "final" productivity level. To understand, how general and vocational education is organized in the three reference countries, the following section offers a short overview over the respective education systems.

## 3 Education Systems

To compare labor market outcomes in different countries, in this case earnings of employees, it is useful to pin down the common features and main differences between education systems in

the three reference countries. Education systems of all three countries feature compulsory education at least until the age of sixteen. At this stage, students in the three countries have different options continuing their educational career. Alternatively, as it is not unusual in the United Kingdom, but less frequent in Germany or the Netherlands, they can leave the formal education system and enter the labor market. Those remaining in the formal education system choose between more general education and vocational education with varying shares of company-based training. In Germany, this share is largest with students spending about two days of their week in vocational schools and three days at the workplace. The same holds for the BBL-programs in the Netherlands. The BOL-participants, however, have considerably lower shares of company-based training. In the United Kingdom, vocational programs generally contain lower shares of company-based training (except for apprenticeships).

For students remaining in the general system, the aim is to gain an upper-secondary qualification that opens the way to tertiary education. Once achieved, however, students of the three countries (again) have the choice between continuing formal tertiary education or to enter employment. In contrast, for the vast majority of those opting for a vocational path at the age of sixteen, the usual way is to enter the labor market after obtaining upper-secondary vocational qualification. In contrast to Germany and the Netherlands the vast majority of young adults in the United Kingdom receives a general type of education with little or no work practice before beginning their labor market career.

In this paper, the focus is especially on employees that have obtained upper-secondary qualification either by following a vocational or a general educational program. Employees that have obtained either no upper-secondary at all or have, after finishing upper-secondary education, obtained tertiary qualifications are excluded from our analysis.

## 4 Data and Variable Construction

Data source for Germany is the socio-economic panel (GSOEP). The GSOEP started in 1984 as a longitudinal survey of private households and persons in the Federal Republic of Germany. For the analysis in the Netherlands, the data used has been produced by the *Institute of Labour Studies* (OSA). OSA conducts a survey every two years to collect data about the (potential) labor force in the Netherlands. The first wave of the OSA Labour Supply Panel was carried out in 1985. Subsequent surveys have taken place every two years (from 1986 to 2006). The survey asks about respondents' employment situation and their behavior on the labor market. Further, information about education and earnings is gathered. For the United Kingdom, the British Household Panel Survey (BHPS) is used. Equivalent to the German panel, data from 1991 to 2006 is used for the estimation of earnings-profiles.

Tables A.1 to A.3 in the appendix display the descriptive statistics for the variables used for estimation separately for generally and vocationally educated employees[3]. A detailed description of the descriptives is provided in the extended version of the paper available upon request.

We restrict our sample to employees having obtained an upper-secondary qualification either through a vocational or a general type of educational program. Our argument here is that those two groups of employees are most likely to be comparable concerning unobservable characteristics responsible for selection into different tracks. One component of our strategy to control for selection is thus to narrow down the samples to persons having similar levels of ability or a similar social background. Those employees that either have not attained upper-secondary education or have obtained tertiary education are removed from the data-sets. Further, we restricted the data to persons between 18 and 64 years of age. In the pooled data-sets we are left with around 70.000 observations for Germany, around 2.500 observations for the Netherlands and nearly 40.000 observations for the United Kingdom.

## 5 Estimating Earnings-Experience Profiles

### *5.1 Pooled OLS-Regression*

We first estimate a simple OLS model for each pooled data-set of the three countries. Thereby, we regress log hourly wages on a set of explanatory variables. The equation then has the form

**¡Error! Marcador no definido.**
$$y_i = \beta_1 + \beta_2 voc_i + \beta_3 exp_i + \beta_4 exp_i^2 + \beta_5 voc \cdot exp_i + \beta_6 voc \cdot exp_i^2 + \beta_7 X_i + \varepsilon_i \quad (1)$$

whereas X is a vector of variables such as individual-, job- and firm-characteristics (see Tables A.1 to A.3 in the appendix). We estimate two equations, one with X containing merely individual characteristics (nationality, gender) and a dummy indicating whether the employee works part-time. The second equation additionally controls for firm-size, job-type and industry of the firm the employee works in. In both models, we add a set of year-dummies to control for business variations. The explanatory variables of our interest are *voc* (Vocational education), which is a dummy-variable indicating, whether the employee has gone through vocational education, and the interaction terms of *voc* with experience and experience squared.

For all three countries the coefficient of *voc* is positive and significant, indicating higher initial earnings for vocationally educated. At the same time, the interaction of *voc* with experience is significantly negative in Germany and the United Kingdom. Also for the Netherlands this coefficient estimated by including the whole set of control variables (Model 2) is significantly

[3] Although tenure is described in the table, it is not used in the regressions due to potential endogeneity problems. However, simulations including tenure and tenure interactions showed that the inclusion of these variables in the regression would not significantly alter the results.

negative. This indicates a flatter earnings curve for this group of employees. The corresponding graphs and tables are available upon request.

### *5.2 Mixed-Effects Linear Regression Model*

The estimates presented above do not account for the fact that most individuals are observed for more than one time-period. Consequently, the observations in the pooled data-set are not necessarily independent from each other. Observations of the same individual are likely to be correlated, which could be partly due to between-person heterogeneity in the intercept (i.e. initial earnings) and partly due to the slopes of covariates (Rabe-Hesketh and Skrondal 2008). Further, the two groups might still differ not only in their observable characteristics, but also with respect to unobservable factors, like social background, motivation, interest or ability. As pointed out in the previous section, one component of our strategy to handle selection problems is the narrowing down of the sample groups to upper-secondary graduates, which are likely to be very similar in their unobservable characteristics. In addition, we develop a Mixed-Effects Linear Regression Model that takes into account the differences in the intercept and slope of the experience-earnings curve for vocationally and generally trained.

Building on equation 1 we start by describing a random-intercept model with the random intercept $\theta_{1j}$ and the residual $\zeta_{ij}$ being the permanent and the transitory error component of the model (Rabe-Hesketh and Skrondal 2008)[4].

$$y_{ij} = \beta_1 + \beta_2 exp_{ij} + \beta_3 exp \cdot x_{ij}^2 + \beta_4 X + \theta_{1j} + \zeta_{ij} \qquad (2)$$

The random intercept $\theta_i$ and $\zeta_{ij}$ are both assumed to be normally distributed with a mean of zero, independent of each other, with $\theta_i$ independent across persons and $\zeta_{ij}$ independent across persons and observations. While the model above allows for employee-specific intercepts, we can also model our assumption that earnings of different employees have different slopes over time by adding a random coefficient of labor market experience $\theta_{2j} \exp_{ij}$. To assess, whether there are systematic differences between vocationally and generally educated employees we add a dummy variable *voc* to the fixed part of the model. Further, to trace the differences between vocationally and generally educated over the dimension of experience, we add the cross-level interaction term *Voc*Experience*. The finally estimated model yields

$$y_{ij} = \beta_1 + \beta_2 exp_{ij} + \beta_3 exp_{ij}^2 + \beta_4 X + \beta_5 voc_j + \beta_6 voc \cdot exp_{ij} + \beta_7 voc \cdot exp^2{}_{ij} + \theta_{1j} + \theta_{2j} exp_{ij} + \zeta_{ij} \qquad (3)$$

[4] In a "fixed-effects" approach $\theta_{1j}$ is eliminated entirely from the model, which removes all time-invariant unobservable heterogeneity from the model. However, at the same time also the impact of observable time-invariant variables on the dependent variable cannot be estimated directly. (Greene 2008) discusses advantages and problems involved when choosing mixed linear models in the context of wage regressions.

Estimation results shown in Table 1 generally support those obtained on the basis of pooled OLS-regressions. With respect to the coefficient of interest indicating the difference in initial earnings (*Vocational Education*), it remains positive and significant in the case of Germany and the United Kingdom. For the Netherlands, however, the respective coefficient turns insignificant.

**Table 1: Mixed-Effects Linear Regression Model**

| Variable | Germany | Netherlands | United Kingdom |
|---|---|---|---|
| | | Log(hourly wage) | |
| Time | 0.0033(***) | 0.0184(***) | 0.0368(***) |
| | (0.000) | (0.003) | (0.001) |
| Experience | 0.0400(***) | 0.0386(***) | 0.0514(***) |
| | (0.004) | (0.006) | (0.001) |
| Experience2 | -0.0007(***) | -0.0006(***) | -0.0010(***) |
| | (0.000) | (0.000) | (0.000) |
| Vocational Education | 0.0991(***) | 0.0462 | 0.0470(*) |
| | (0.020) | (0.064) | (0.020) |
| Voc*Experience | -0.0181(***) | -0.0066 | -0.0103(***) |
| | (0.004) | (0.007) | (0.002) |
| Voc*Experience2 | 0.0004(**) | 0.0001 | 0.0003(***) |
| | (0.000) | (0.000) | (0.000) |
| Constant | 2.1623(***) | 1.8281(***) | 1.3990(***) |
| | (0.019) | (0.054) | (0.013) |
| Observations | 71020 | 2494 | 39508 |

Standard errors in parentheses

(*)$p<0.05$, (**)$p<0.01$, (***)$p<0.001$

Further, the negative and significant coefficient on the interaction between *Vocational Education* and *Experience* are significantly negative in Germany and the United Kingdom, supporting the notion that the slope of the experience-earnings profile is less steep for the vocationally educated . Again, for the Netherlands the respective coefficient is not significantly different from zero.

Figure 2 for Germany, however, contains another message: Because the two curves intersect at an experience of about 10 years and the earnings curve of generally educated remains steeper than the one of vocationally educated, generally educated employees reach a notably higher level of productivity than vocationally educated. However, very late in the labor market career the two curves intersect again, when the earnings curve of generally educated comes down faster than for vocationally educated.

**Figure 2: Mixed-Effects Linear Regression Model**

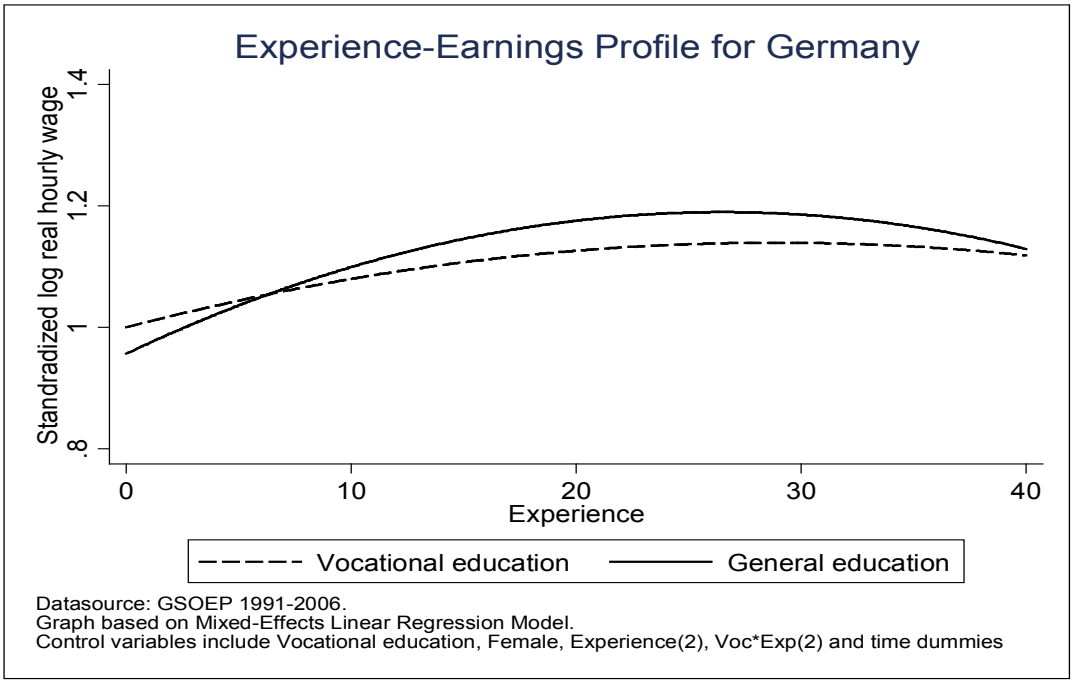
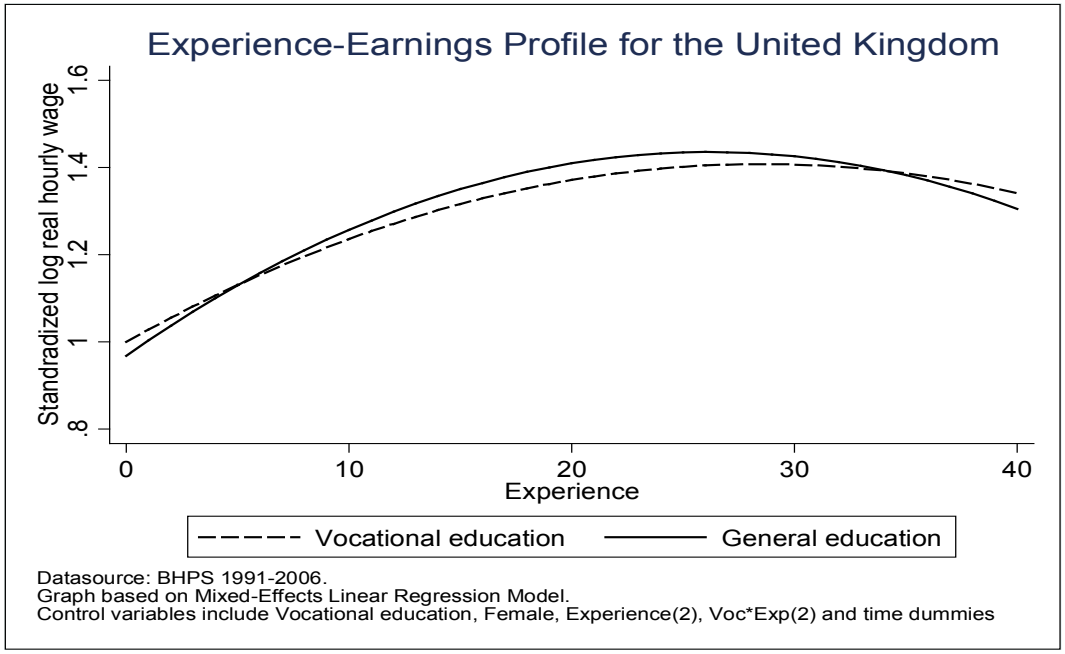
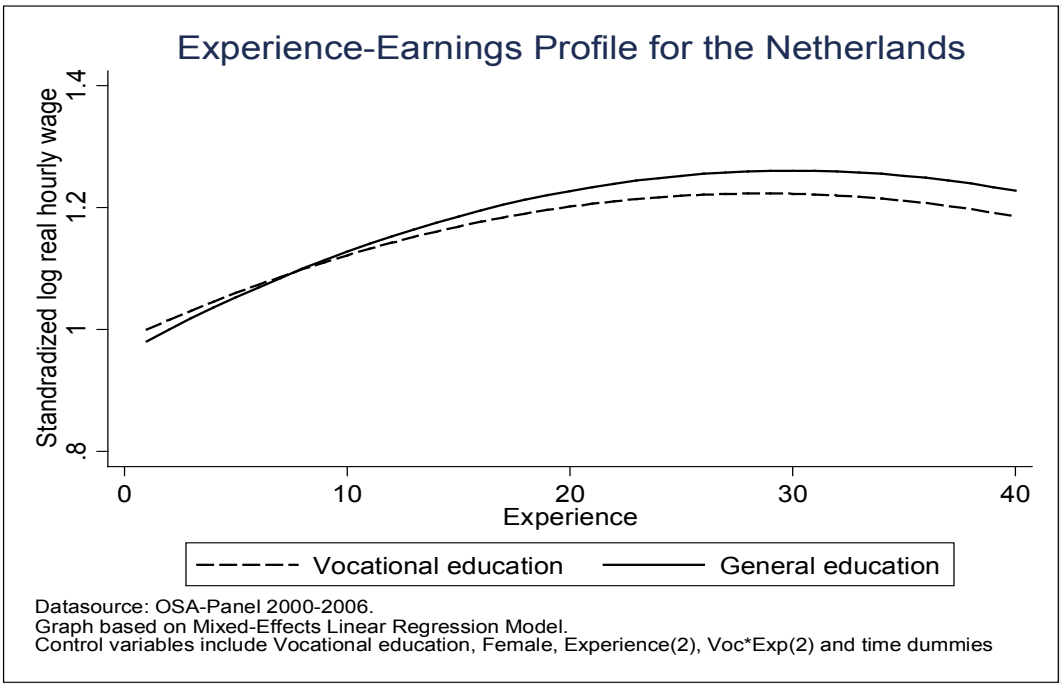



**Figure 3: Mixed-Effects Linear Regression**




**Model**

**Figure 4: Mixed-Effects Linear Regression Model**




A similar result is obtained from the analysis for the United Kingdom, since the coefficients go into the same direction. However, Figure 4 indicates that the initial earnings and slopes of the two curves are much closer together than in the German case. Again, the two curves intersect at an experience of over ten years and intersect again late in the labor market career of the respective employees. Results for the Netherlands differ to the extend that the graphical display in Figure 3 is very close to the one obtained by estimating pooled OLS-regressions, however the differences between the two groups of employees are statistically not robust.[5]

## 6 Summary and Conclusions

In this paper, we have analyzed experience-earnings profiles of differently educated employees. We showed that those employees having undergone vocational education have higher earnings at the beginning of their labor market career than those having received general education. The underlying hypothesis is that vocational specialization paired with working practice improves the fit between job requirements and individual skills and therefore leads to a better initial match on the labor market compared to those without vocational training. With increasing work experience, however, generally educated catch-up in terms of productivity and earnings due to informal and

[5] A number of robustness checks were performed. First, we estimated spline-regressions on the pooled OLS. The effect of vocational training remained significant for Germany but turned insignificant for the United Kingdom. Further, we estimated the Mixed Effects Linear Regression model the group of employees with < 20 years of experience. Again, For Germany the respective coefficients remained significant, whereas the coefficients for the United Kingdom turned insignificant. The same result was obtained when including cohort dummies. Thus, results for Germany seem extremely robust while those for the United Kingdom seem sensitive to variations in the estimation method and model.

formal on-the-job training. The optimal productivity (and earnings) level might then differ between the two groups of employees or not.

Using panel data for all three countries, a first set of simple pooled OLS-regressions supported the expectation of higher initial earnings for vocationally educated employees in the three countries. In all countries, at around five to eight years of experience, earnings curves intersect with the curve of generally educated. From there on, earnings of generally educated exceeds those of vocationally educated. Results on the basis of Mixed-Effects Linear Regression Models showed that this observation is still valid for Germany and the United Kingdom. For the Netherlands, however, the results reveal that initial earnings of the two groups of employees do not differ significantly. This is also the case concerning differences in the slopes of the respective experience-earnings curves.

We interpret these results in the following way. Considering that in Germany the group of vocationally educated to a large extend consists of former apprentices with high shares of working-practice, it is no surprise to find that the match between skills and job requirements is better than for generally educated employees, resolving in a significant earnings advantage for the former group of employees. This result also seems plausible considering that an intense cooperation exists between unions, employer organizations and state authorities in defining the contents of vocational education and training. Employers have good knowledge of the skills and competencies acquired by vocationally educated employees and tailor the responsibilities and requirements of jobs to be filled accordingly. In addition, around two thirds of former apprentices are retained in the training firm, indicating a smooth transition from the status as trainee to a status of employee. In the Netherlands the share of upper-secondary graduates with apprenticeship training is somewhat lower and consequently the (initial) advantage of vocationally educated is less pronounced. Further, Dutch law requires all students enrolled in vocational programs to be educated in a way that allows for a smooth transition to tertiary academic education. Although in practice the number of those entering tertiary level after having obtained a vocational qualification is rather small (although larger than in Germany), institutions and firms are likely to focus much more on general knowledge and skills than in Germany. Somewhat more difficult to explain is the positive effect of vocational qualifications in the United Kingdom, where vocational tracks are usually taught in full-time schools and colleges and containing relatively small shares of practical training. Another result from the above analysis is that generally educated reach higher earnings-levels than vocationally trained after a certain period in the labor market. One reason for this could be that general education focuses relatively more on general knowledge and problem solving skills, which could lead to higher learning abilities throughout working life. However, further research is necessary to confirm this hypothesis since continuing vocational training and its effects on productivity and wages was not in the focus of the paper. The present work also calls for a further differentiation of

different types of vocational education and training on the upper secondary level to obtain clarity on the impact of the share of practical training on earnings. Our results suggest, however, that the way of organizing vocational education and training may have an impact on the differences between earnings-profiles of vocationally generally educated employees.

## 7 Figures and Tables

**Table 1: Descriptive Statistics - Germany**

| | General Education | Vocational Education |
|---|---|---|
| | **Mean** | **Mean** |
| **Individual characteristics** | | |
| Age | 30.896 | 40.255 |
| Female | 0.455 | 0.429 |
| Male | 0.545 | 0.571 |
| National | 0.888 | 0.918 |
| Foreign | 0.112 | 0.082 |
| **Employment characteristics** | | |
| Hourly wage | 12.980 | 13.068 |
| Experience | 7.224 | 18.177 |
| Fulltime | 0.537 | 0.806 |
| Parttime | 0.463 | 0.194 |
| **Firm characteristics** | | |
| Firmsize < 20 | 0.345 | 0.302 |
| Firmsize 20-200 | 0.252 | 0.281 |
| Firmsize 200-2000 | 0.190 | 0.213 |
| Firmsize4 > 2000 | 0.213 | 0.203 |
| **Industry (NACE)** | | |
| Agriculture | 0.007 | 0.020 |
| Mining and quarrying | 0.001 | 0.006 |
| Manufacturing | 0.163 | 0.295 |
| Electricity, gas and water supply | 0.006 | 0.013 |
| Construction | 0.041 | 0.097 |
| Wholesale and retail trade | 0.148 | 0.157 |
| Hotels and restaurants | 0.049 | 0.021 |
| Transport and communication | 0.062 | 0.063 |
| Financial intermediation | 0.048 | 0.039 |
| Real estate | 0.135 | 0.046 |
| Public administration | 0.063 | 0.078 |
| Education | 0.090 | 0.022 |
| Health | 0.102 | 0.097 |
| Other services | 0.083 | 0.041 |
| Activities of households | 0.002 | 0.005 |
| Extra-territorial organizations | 0.002 | 0.001 |

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| | General Education | Vocational Education |
|---|---|---|
| | **Mean** | **Mean** |
| **Job skill level (ISCO)** | | |
| Senior officials and managers | 0.056 | 0.045 |
| Professionals | 0.207 | 0.028 |
| Technicians | 0.234 | 0.221 |
| Clerks | 0.155 | 0.143 |
| Service workers | 0.143 | 0.128 |
| Skilled agricultural workers | 0.001 | 0.015 |
| Craft and related trades workers | 0.059 | 0.246 |
| Plant and machine operators | 0.043 | 0.103 |
| Elementary occupations | 0.101 | 0.071 |
| Observations | 2385 | 70066 |

Source: GSOEP 1991-2006

## Table 2: Descriptive Statistics - Netherlands

| | General Education | Vocational Education |
|---|---|---|
| | **Mean** | **Mean** |
| **Individual characteristics** | | |
| Age | 38.751 | 39.392 |
| Female | 0.560 | 0.460 |
| Male | 0.440 | 0.540 |
| Dutch | 0.958 | 0.971 |
| Foreign | 0.042 | 0.029 |
| **Employment characteristics** | | |
| Hourly wage | 10.581 | 10.272 |
| Experience | 17.403 | 18.786 |
| Fulltime | 0.610 | 0.690 |
| Parttime | 0.390 | 0.310 |
| **Firm characteristics** | | |
| Firmsize < 25 | 0.290 | 0.287 |
| Firmsize 25-100 | 0.253 | 0.246 |
| Firmsize 100-1000 | 0.345 | 0.370 |
| Firmsize4 > 1000 | 0.109 | 0.094 |
| **Industry (SBI)** | | |
| Agriculture | 0.016 | 0.014 |
| Industry | 0.082 | 0.145 |
| Building and Construction | 0.016 | 0.064 |
| Wholesale and retail trade | 0.174 | 0.186 |
| Transport and communication | 0.114 | 0.076 |
| Material services | 0.208 | 0.121 |
| Other services | 0.042 | 0.027 |
| Public administration | 0.147 | 0.096 |
| Education | 0.040 | 0.025 |
| Health | | 0.247 |
| **Job skill level (SBC92)** | 0.160 | 0.040 |
| Elementary | 0.036 | |
| Low | 0.285 | 0.218 |
| Middle | 0.436 | 0.562 |
| High | 0.216 | 0.159 |
| Scientific | 0.027 | 0.022 |
| Observations | 754 | 1746 |

Source: OSA-Panel 2000-2006

**Table 3: Descriptive Statistics - United Kingdom**

| | General Education | Vocational Education |
|---|---|---|
| | **Mean** | **Mean** |
| **Individual characteristics** | | |
| Age | 34.177 | 37.550 |
| Female | 0.509 | 0.500 |
| Male | 0.491 | 0.500 |
| National | 0.996 | 0.995 |
| Foreign | 0.004 | 0.005 |
| **Employment characteristics** | | |
| Hourly wage | 10.948 | 11.099 |
| Experience | 16.177 | 19.550 |
| Tenure | 3.896 | 4.578 |
| Fulltime | 0.848 | 0.840 |
| Parttime | 0.152 | 0.160 |
| **Firm characteristics** | | |
| Firmsize < 20 | 0.345 | 0.333 |
| Firmsize 20-200 | 0.248 | 0.242 |
| Firmsize 200-2000 | 0.289 | 0.304 |
| Firmsize4 > 2000 | 0.108 | 0.108 |
| **Industry (NACE)** | | |
| Agriculture | 0.008 | 0.008 |
| Mining and quarrying | 0.000 | 0.007 |
| Manufacturing | 0.005 | 0.184 |
| Electricity, gas and water supply | 0.020 | 0.023 |
| Construction | 0.058 | 0.060 |
| Wholesale and retail trade | 0.083 | 0.082 |
| Hotels and restaurants | 0.018 | 0.014 |
| Transport and communication | 0.090 | 0.075 |
| Financial intermediation | 0.083 | 0.070 |
| Real estate | 0.053 | 0.043 |
| Public administration | 0.070 | 0.062 |
| Education | 0.131 | 0.091 |
| Health | 0.047 | 0.060 |
| Other services | 0.117 | 0.099 |
| Activities of households | 0.086 | 0.114 |
| Extra-territorial organizations | 0.006 | 0.007 |
| **Job skill level (ISCO)** | | |
| Senior officials and managers | 0.154 | 0.132 |
| Professionals | 0.070 | 0.051 |
| Technicians | 0.146 | 0.170 |
| Clerks | 0.238 | 0.221 |
| Service workers | 0.174 | 0.140 |
| Skilled agricultural workers | 0.007 | 0.007 |
| Craft and related trades workers | 0.075 | 0.160 |
| Plant and machine operators | 0.080 | 0.076 |
| Elementary occupations | 0.056 | 0.043 |
| Observations | 19059 | 20711 |

Source: BHPS 1991-2006