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Overeducation, Undereducation, and the Theory of Career Mobility

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ABSTRACT

Overeducation, Undereducation, and the Theory of Career Mobility*

The theory of career mobility (Sicherman and Galor 1990) claims that wage penalties for overeducated workers are compensated by better promotion prospects. A corresponding empirical test by Sicherman (1991), using mobility to an occupation with higher human capital requirements as an indicator for upward career mobility, was successful and confirmed by Robst (1995. However, both tests include controls for the opposite phenomenon of undereducation and report ambiguous results without offering sound theoretical explanations. Estimating random effects probits with data from the German Socio-Economic Panel we show that part of the problem is neglecting the base effect of the occupational starting position. This severely affects the stability of the results, because career mobility is mainly observed from jobs with low qualification requirements. Moreover, we show that Sicherman's indicator for upward career mobility and similar indicators as moving to a higher status position are not valid indicators. When using relative wage growth (and this is the strategic variable underlying the theory of Sicherman and Galor) overeducated workers are found to experience clearly lower relative wage growth rates than correctly allocated workers; the contrary is the case for undereducated workers. This pattern of results severely jeopardizes the career mobility model and can be better explained using signaling and segmentation theories. Based on the well-known positive correlation of access to training and upward career mobility the plausibility of our results is supported by the finding that access to informal and formal on-the-job training is relatively worse for overeducated and better for undereducated workers.

Keywords: Qualification mismatch, overeducation, career mobility, wage change

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1 Introduction

A main statement of the theory of career mobility established by Sicherman and Galor (1990) is that "part of the returns to education is in the form of higher probabilities of occupational upgrading, within or across firms". As a consequence, "individuals may choose an entry level in which the direct returns to schooling are lower than those in other feasible entry levels if the effect of schooling on the probability of promotion is higher in this firm".[1] If this was true, the theory of career mobility would provide a powerful tool for research in overeducation, that is the phenomenon when the job held requires less schooling than the worker's actual level of acquired schooling (see e.g. Duncan and Hoffmann 1981). Its influence on later overeducation research has been remarkable and it now belongs to one of the most frequently cited papers within this field. However, the theory of career mobility is no complete explanation for qualification mismatch in the labor market as it offers no possible explanation for the opposite and equally observable event of 'undereducation'. Still, Sicherman (1991) himself uses both constructs to test his theory and finds positive effects of over- and undereducation on career mobility. Robst (1995) on the other hand finds positive effects only for overeducated workers and negative effects for undereducated workers, and like Sicherman offers no sound theoretical explanation for the effects of undereducation. It is surprising that despite its influence on the literature this did has not resulted in further research until now.

The lack of theoretical explanations for the observed career mobility of undereducated workers is most likely due to the somewhat more difficult rationalization of what undereducation actually means. While the concept of overeducation, a higher formal schooling than usually required on the job, does have some intuitive appeal, the concept of undereducation is less clear. How is it possible that workers hold jobs for which they are not formally qualified? We offer an alternative explanation to Sicherman and Galor's career mobility model that is able to explain both overeducation and undereducation and is more in line with empirical results from general labor market research than the career mobility model: Undereducated workers are usually expected to have above-average abilities (Hartog 2000); they have performed - compared to the expectations linked to their (relatively low) educational attainments - an untypical successful career up to the point of time when their qualification mismatch was observed. Why shouldn't they continue to be untypically successful in their future career? And why should the overeducated, whose career path until now has explicitly confirmed that they are not able to get a job which is appropriate to their

[1] See Sicherman and Galor 1990 pages 169 and 177.

formal qualification, show up a different behavior in the future, i.e. an untypical successful career as in Sicherman (1991)?

This paper tries to give an answer to these questions by re-examining thoroughly the results obtained by Sicherman (1991) and Robst (1995) as well as by offering an alternative theoretical explanation compatible with our empirical results. The paper is set up as follows. After shortly discussing the different explanations of over- and undereducation and some empirical findings from the literature in section 2 we have a closer look at the career mobility behavior of over- and undereducated persons. Basically, we argue in sections 3 and 4 that the measures of upward career mobility chosen by Sicherman and Robst are not adequate: the probability to observe moves between certain occupations in Sicherman's categorization like e.g. from "judges and lawyers" to "physicians" are basically zero. Similarly, we are not sure what an upward move between a job that requires five years of schooling to one with six years of schooling in Robst's specification does actually tell us. We propose to use the "classic" indicator of upward wage mobility instead. Moreover, we show that the exogenous influences of upward career mobility have to be modeled carefully to prevent misinterpretations. Section 5 summarizes our findings and concludes.

2. How to Explain Over- and Undereducation?

Contrary to all competing theories which try to explain the persistence of high shares of overeducated work in all industrialized countries as e.g. human capital theory, job search theory or assignment theory[2], the theory of career mobility considers simultaneously the supply and the demand side of labor market with overeducation being rational for both partners, employees and employers. Therefore, it is obvious that overeducation researchers tend to find some charm in the career mobility explanation put forward by Sicherman (1991). Consequently, the career mobility model and its empirical test by Sicherman himself has had a strong influence on later overeducation research. As within this model, overeducation is mainly a short-term mismatch at the beginning of a working career, it seems in principal consistent with almost all empirical findings in various countries showing that work experience and tenure are negatively correlated with the probability of working overeducated (see e. g. Duncan and Hoffmann 1981, Alba-Ramirez 1993, Sloane et al. 1995, Groot 1996, Kiker et al. 1997, Daly et al. 2000). Most studies believing that their empirical results are in

[2] For an overlook on these any many more see Rumberger 1981 or Büchel (forthcoming).

line with the central findings of Sicherman's study trust in this somewhat dubious construct of the cross-sectional relationship between experience, tenure, and the match between formal qualification and skill requirements (see e. g. Alba-Ramirez 1993, Groot 1993, Groot 1996, Sloane et al. 1996). Yet, a direct re-test of Sicherman´s findings would require longitudinal data, mainly because results –especially concerning the correlation between experience and occupational mismatch- could heavily been driven by cohort effects, which would lead to artificial interpretations. Apart Robst (1995), who sticks very closely to the concept developed by Sicherman, and Hersch (1995) who looks at within firm promotions, there has been no test using longitudinal data.

Apart from the lack of direct empirical tests there is another problem encountered in the career mobility model. As already indicated in the introduction, the theory of career mobility is not applicable concerning the phenomenon of undereducation. Still, Sicherman (1991) enters an undereducation dummy in his models when testing the overeducation hypotheses of the Sicherman and Galor theory. His empirical results show the same significant positive effect on the promotion probability for overeducated and for undereducated workers (Sicherman 1991, table 3, column (c)). Sicherman by himself reacts surprised: "Since the theory of career mobility makes predictions only with respect to overeducated workers, I do not discuss the relations between undereducation and career mobility. So far I do not have a good explanation for this result." (p. 109f.).

The only author who has reacted on this somewhat puzzling situation until now is Robst (1995). He varies Sicherman´s design defining upward career mobility by a change of schooling requirements of the job; Sicherman had chosen a change to an occupation with higher human capital requirements. Following his approach –which no longer requires changes in occupation to detect career mobility- Robst (1995, Table 5, column (1)) confirms Sicherman´s findings concerning the effects of overeducation. However, he obtains the opposite result for the undereducated, i.e. promotions of undereducated persons are significantly lower than those of the reference group of correctly allocated workers. This result suits at least an intuitive expectation of microeconomic minded researchers according to which changes in the sign of a covariate should in general cause a change in the sign of estimated parameters, if there are no specific theoretical counter-arguments, which does not seem to be given in this situation.

However, this intuitive interpretation is not enough to convince us of the relevance of the career mobility model, because of several other empirical findings in the literature. First of all, previous overeducation research found that wage profiles of overeducated non-academic

new entrants to the labor market are flatter in the first career period compared to those of correctly allocated job beginners (Büchel 1994). The same could be observed for all workers in West Germany as well as in East Germany after reunification (Büchel 1998, p. 121ff.). Similar findings for other countries are rare because there is still a lack in longitudinal overeducation research (exceptions being Groot 1996, Dolton and Vignoles 1997). In addition, Dolton and Vignoles (1997), Dolton and Vignoles (2000), Mendes de Oliveira et al. (2000) show that substantial parts of the overeducated workforce fail to realize a change to jobs with a better match within a longer period of several years. Similar findings are presented by Battu et al. (forthcoming). All this shows that careers rather tend to follow the path they have started from with no extraordinary career moves for overeducated workers.

In addition, several studies show that overeducated persons are less productive than others of same formal qualification (see e.g. Tsang and Levin 1985, Tsang et al. 1991, Büchel 1998)[3]. Whereas the standard approaches in this field usually focus on job satisfaction, health status, absenteeism, firm tenure, and participation in on-the-job-training, the study by Büchel analyzes working conditions and behavior in much more detailed form (about 50 items). He finds signs for lower productivity of the overeducated in almost all items, e. g. in the responses to the question "Are you willing to work overtime without extra payment?". According to the findings by Sicherman (1991) and Robst (1995), the overeducated group answering this question highly above-average with "no" should have better prospects to realize upward career mobility. However, their "no" indicates relatively low job satisfaction, which combined with their lower on-the-job training speaks against all evidence reported by personnel researchers. Of course one could argue that an unsatisfactory situation in a specific job is an important push factor to change firm. The job matching theory in its "experience good" variant (Jovanovic 1979a, 1979b) does indeed expect an improving of the match of educational attainment and qualification requirement over the career process. However, recent analyses based on German data showed that the probability of working overeducated increases significantly with higher numbers of previous job changes Büchel (1998, p. 139), which is rather supporting a labor segmentation approach than job matching theory. In addition to that, it is well known that the occupational behavior in previous jobs determines strongly further career opportunities; else, references from former employers would not make sense. This state dependence aspect therefore would let expect that an upward mobility starting from a uninterestedly-performed job to one with higher qualification requirements should rather be an exception than a rule.

Another possible explanation for the observation of over- and undereducation is the presence of individual heterogeneity among workers. If undereducated workers tend to be "smart" and overeducated workers "dumb" then the effect of overeducation on career mobility will be underestimated and the effect of undereducation will be overestimated. We try to control for individual heterogeneity in our estimates and like Sicherman rule out this explanation as a major reason for the presence of both overeducation and undereducation in the labor market. Therefore we argue in favor of an alternative explanation that combines labor demand with signaling and segmentation theories (Spence 1973, Taubman and Wachter 1986). Imagine there is an oversupply of workers in high qualifications in some sectors of the economy, so that some workers end up in jobs that require less than their acquired training. If they do not find an appropriate job soon they might be stuck in such jobs due to the depreciation of their human capital, demotivation or simply negative signaling. If this were the case, worse career prospects linked with lower wage growth, are expected for overeducated workers compared to careers of correctly allocated persons. Undereducated workers might on the other hand be those workers who benefit from the fact that firms in other sectors are looking for qualified personnel but are not able to hire workers with the appropriate level of education. A typical example for this are software firms hiring workers without any formal degree and training them on-the-job. Such an explanation of qualification mismatch seems to be consistent with the empirical findings cited above: overeducated workers have flatter wage profiles in their early careers, they tend to be less motivated and are more likely to have changed jobs frequently. These arguments in mind, we will now turn to a systematic analysis of career mobility.

3. Data and Methods

3.1 Database and Case Selection

Our empirical analysis is based on representative longitudinal data from the German Socioeconomic Panel (GSOEP), conducted by the German Institute for Economic Research (DIW) in Berlin. This ongoing survey was started in 1984, when more than 12,000 individuals aged 16 or older were interviewed. Additional information on these individuals is collected annually with a broadly constant questionnaire. We use the West German sub-

[3] Note, however, the contrasting findings when not comparing persons with similar formal qualifications, but

sample from 1984 to 1997. The main purpose of the study is to obtain longitudinal information, especially in the fields of educational and labor market behavior (for more details see Projektgruppe Panel 1995).

We analyze year-to-year career mobility in various forms for full-time working men. This requires valid information on the variables used to construct the respective mobility measure in both years of the analyzed pair of years. In addition, valid information about the covariates is required in the base year of the pair[4]. As we run panel random effect models, those persons with only one observable year-to-year pair are excluded as well. Self-employed, trainees, and civil servants are not included in our sample. To allow for upward mobility for all persons, we exclude those who show the maximum level of the respective position measure in the base year[5].

3.2 Measuring Over- and Undereducation

The identification of over- and undereducation is carried out using a subjective approach. The GSOEP contains yearly information about the actual formal education of jobholders as well as data on the formal qualifications typically needed to perform the actual job. Usually, comparing these two variables generates the mismatch variable. However, we go one step further and check the values of this mismatch variable by additional information about the status position of the job-holders. Using this three-variables approach instead of the traditional two-variables one has advantages and disadvantages (for details see Büchel, forthcoming)). The major advantage is that the categorization becomes more precise so that the validity of the discrimination between the groups is improved. Following this procedure two new categories are introduced: implausible combinations of the three variables of origin (< 1%), and a category where a mismatch status can not clearly be stated (about 5%). Both categories are excluded in our analyses. One minor disadvantage that arises in the three-variable approach is the slightly higher risk of missing values in the mismatch variable. However, this problem is not severe, because information about status position has almost no

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persons working on jobs with similar requirements (Büchel 1999).

[4] Information on disability was not asked in the 1990 and 1993 waves of the GSOEP. Union status was only asked in years 1985, 1989, 1989, and 1993. For both variables we use the information from the last available year. This should not cause major problems as both variables show only minor variation over time.

[5] In the earnings analysis we exclude persons with gross monthly earnings in the base year above DM 10.000,-. Some very few outliers with earnings below DM 1000 and above 15000 in any year of observation were excluded.

missing values in the GSOEP. Our categorization procedure is documented in Appendix Table A1.

3.3 Sicherman´s Approach: Upward Occupational Mobility

We follow Sicherman (1991) as closely as possible by using a two-digit coding of occupational groups. This means that a change in the occupation will only be observed when there is an apparent change in the tasks performed. Like Sicherman, we only analyze upward moves. Obviously this approach requires a ranking of occupational groups. The ranking procedure is based on the mean levels of human capital needed to work in the different occupations. These levels are constructed by first estimating wage regressions including the usual controls for schooling and experience:

$$(1)\ \ln(w_i) = \alpha_0\, education_i + \alpha_1\, experience_i + \alpha_2\, experience_i^2 + \alpha_3\, required\ training_i + \beta' x_{it} + \varepsilon$$

where x_{it} are covariates other than human capital variables (for covariate list and results from this preliminary step see Appendix Table A2)[6]. We then use the parameter estimates for α_0, α_1, α_2, and α_3 (a_0, a_1, a_2, and a_3) to estimate the individual human capital needed in order to perform the occupation:

$$(2)\qquad HC_i = a_0\, education_i + a_1\, experience_i + a_2\, experience^2_i + a_3\, required\ training_i.$$

The mean level for each occupational group is then calculated which is used to rank the occupation. From this procedure we get the ranking set out in Appendix Table A3[7]. Though not completely identical, our ranking and that of Sicherman (see Sicherman 1991, Appendix A, pp. 188f.) resemble each other closely.

[6] As the variable 'required training' in the GSOEP is not asked in form of years, we have to previously estimate it using information on years of education of all workers who are correctly allocated, i.e. neither work overeducated nor undereducated. The mean level of schooling within relatively small occupational groups (n=69) is defined to be the training required to perform the occupation.

[7] Having to use the ISCO information in the GSOEP, some groups are not directly comparable to Sicherman's groups, like clerics in Germany and other clerical workers in the U.S. Moreover, the group "other craftsmen" in Germany is split up into several groups. The group "Public Advisor" is not existent in Germany and self-employed workers are not included in the analysis.

In order to test whether overeducated workers are more likely to move to higher ranked occupations we then go on to estimate random effects probit models of the following form:

$$(3) \qquad move_{it} = \alpha + \gamma_1 over + \gamma_2 under + \beta' x_{it} + u_i + \varepsilon_{it}$$

where *over* is a dummy indicating overeducation, *under* indicates undereducation, x_{it} is a set of additional exogenous variables, u_i is the random disturbance characterizing the ith observation, which is fixed over time, and ε_{it} a white noise error. Exogenous variables are those generally known to influence the career mobility process like schooling or experience in the base year. The dependent variable equals 1 if the worker moved to a higher-ranked occupation since last year. Because the highest occupational group cannot experience any more upward mobility it is excluded from the analysis. We introduce random effects to control for individual heterogeneity, i.e. the problem that individuals might not only differ in their observed but also unobserved characteristics over time. Results are discussed in section 4.1.

3.4 Upward Mobility between Status Positions

In a second step, we vary Sicherman´s definition of a career step by using another ranking of jobs, that is also based on formal hierarchies and has been frequently used in Germany to describe the relative position of workers in the labor market based on the German coding for status position of the worker. Upward career mobility is now defined as a move to a higher status position. For that purpose, we split up the status positions into four blue collar and four white collar groups. The blue collar groups are (i) un- and semi-skilled, (ii) skilled, (iii) foremen and (iv) master craftsmen. White collar groups are (i) unqualified, (ii) qualified, (iii) professional and (iv) managerial. Upward mobility may take place within those groups but also between white and blue collar workers[8]. Again, the highest group cannot experience any more upward mobility so it is excluded from the analysis. The empirical model used in this step is the same as described in the previous section; results will be presented in section 4.2.

[8] Joint groups: (i) unqualified white collar; un- and semi-skilled blue collar; (ii) qualified white collar, skilled blue collar including foremen and master craftsmen; (iii) professional white collar; (iv) managerial white collar.

3.5 Upward Wage Mobility

As a reaction to the puzzling results of the first two steps of analysis, we propose in a third step an alternative and better measure for career mobility which is already offered by Sicherman and Galor's theory itself. Their model is based on the proposition that upward career mobility is associated with wage increases, so why not look at these directly as we do in the following.

In the GSOEP workers report gross monthly wages for their current job on a yearly basis. We use this information to construct our two measures of outstanding upward wage mobility as an indicator for an upward career step. To allow for upward mobility of all individuals in our sample we excluded the highest earners with gross monthly earnings in the base year above DM 10.000,-. In our first specification (equation 5) workers (i) are defined to experience upward career mobility if their wage growth is higher than the mean wage growth plus one standard deviation in their status position group (g) in that specific pair of years (y)[9]:

(5) $$\Delta \ln (w_{i,y}) > \text{mean} (\Delta \ln (w_{g,y})) + \text{std} (\Delta \ln (w_{g,y})).$$

In our second specification we do not use a model of binary choice but chose as dependent variable a continuous one. We estimate a wage growth regressions using the same set of covariates (x_{it}) as in the previous analyses, but now using GLS with random effects:

(6) $$\Delta \ln(w_{it}) = \alpha + \gamma_1 over + \gamma_2 under + \beta' x_{it} + u_i + \varepsilon_{it}$$

Finally, we test the results obtained in this step for robustness, analyzing on-the-job training activities for under- and overeducated workers. This is done choosing two indicators, a subjective and an objective one. First, we use the answers of the respondents to the question: "Do you feel you are always learning things when doing your job that could lead to a better job or promotion?" (Answers "absolutely correct" versus "partly correct" or "not correct"). This question was posed in the GSOEP in years 1985, 1987, 1989, and 1997. Second, we use the information whether GSOEP respondents participated in a job-related training measure in

[9] The groups follow workers' status position as described in the previous section. Only managerial and professional white collar were aggregated into one group due to the relatively small number of observations per year. For each group (n=91) the means and standard deviations of wage growth are then estimated per year.

a preceding three years period which took longer than one day ("yes" or "no"). This question was asked in years 1989 and 1993. Results of this step are discussed in the section 4.3.

4 Empirical Results

4.1 Replication and Extension of Sicherman´s Approach

Following Sicherman´s approach, a descriptive analysis in the first panel of Table 1 shows that undereducated workers as well as overeducated workers show higher shares in moves to occupations with higher human capital requirements than the reference group of correctly allocated workers.

---- Table 1 about here -----

This finding is consistent with the multivariate results by Sicherman (1991), which are reported in the first column of Table 2: both coefficients on overeducation and undereducation are positive and significant. This implies higher probabilities to move to higher level occupations for these two groups in comparison with the reference group. The effect for undereducated is even somewhat higher.

---- Table 2 about here -----

Replicating Sicherman's multivariate model as closely as possible with German data, we get the same result pattern on the two interesting dummy variables as shown in Table 2 column II.[10,11] In both countries the result of the overeducation dummy seems at first glance to match Sicherman's theory: overeducated workers are assumed to be simply at the beginning

[10] See Appendix Table A4 for on overview of means and frequencies of all variables included in the analysis.
[11] Sicherman 1991 estimated binary logit models without random effects. We found that neither using standard binary probits nor logits with and without random effects changed the pattern of our results on the over- and undereducation variables in any of the mobility analysis. One exception is the estimation of fixed effects logit models where we find that the coefficient on undereducation turns in specification I. However, our other results in this and the following sections remain unchanged.

of their career where their career paths intersect with others, who have less education and therefore less opportunities for upward mobility.

The result for undereducated workers is difficult to reconcile with the findings for overeducated workers. While Sicherman (1991, p. 110) has "no good explanation for this result", it fits well with our explanation of qualification mismatch described in section 2. Some sectors have excess demand for qualified workers while others have excess supply leading to hirings of 'undereducated' workers in some jobs and 'overeducated' in others. While undereducated workers will be given the chance to be trained on-the-job, overeducated workers will have problems in finding better jobs due to negative signals of their current position or even depreciation of their human capital. However, this explanation does not fit in with the effects found for overeducated workers. In effect we believe that this mixed result is directly related to the measurement of upward career mobility, but before turning to this point in more detail we show which effects the inclusion of other variables we consider important in a model of career mobility has on the results.

Firm tenure has an influence on the probability to move between or within firms: This is a major conclusion from the career mobility theory by Sicherman and Galor (1990). Therefore, it seems somewhat strange to us that Sicherman himself did not control for this strategic variable in his own model. Similarly firm size and industry are well known to affect career opportunities. Therefore, we included the respective dummies variables in Table 2, column II for Germany with basically no effects on the over- and undereducation results.

However, there is an even more important influence that has to be considered. Looking at the occupations it is obvious that mobility between some groups is nearly impossible. In the highest groups that are primarily occupied by academics (2-8, see Appendix Table A3) we find only about 2% upward moves with most of these moves going into the very broad category which includes architects, chemists, engineers, physical and biological scientists and mathematicians. Moving down the ladder of occupations it becomes more and more plausible that upward moves can frequently happen: in the lowest groups (25-27, see Appendix Table A3) nearly 10% experience upward moves.[12] These different possibilities have to be taken into account and we propose to include controls for the starting position in the occupational hierarchy. In order to control for this "base effect" we form five groups and include four dummy variables in the third specification for Germany (Table 2, Model III). The signs on these dummies are all negative and highly significant: As expected workers in higher occupational groups are less likely to move upward than workers in the

[12] Not reported in the tables.

lowest occupations. Once including those base effects overeducation becomes insignificant, showing that indeed the base effect explains much of the variance otherwise caught in the overeducation variable, because overeducated work is mainly performed in jobs with low skill requirements[13]. Moreover, the coefficient on schooling which is negative in Sicherman's analysis and has been insignificant for Germany in the first two specifications turns to become its expected positive sign. Controlling for the base effects leads to more plausible results in terms of the theory of Sicherman and Galor: Education influences the probability to be promoted positively. In the following sections we will show whether the results carry over to other measures of upward career mobility.

4.2 Results from the Higher Status Position Approach

Using a move to a higher status position as an indicator for upward career mobility, we find that overeducated workers show by far the highest mobility to higher status positions among all workers, and undereducated ones are the least likely to make an upward career step; correctly allocated workers hold a middle position which is much closer to the career behavior of undereducated than of overeducated persons (second panel in Table 1).

---- Table 3 about here ----

This result pattern holds in the multivariate analysis (basic model I in Table 3). Compared to correctly allocated workers, overeducated workers have a higher probability of moving up. These findings are now corresponding to those presented by Robst (documented in the first column of Table 3)[14]. Undereducated workers are less likely to do so. The relation of the magnitudes of the effects shows a similar pattern in both countries. So we note at first that the findings of Sicherman (1991) and Robst (1995) can be replicated for Germany choosing different constructions of the dependent variable, that all rely on formal hierarchical rankings of jobs. Just like in the previous section, including other important covariates does not substantially affect the results (Model II), but the inclusion of the base effect does (Model

[13] In West Germany of 1995, e.g., 89% of all overeducated persons work in jobs that require no skills at all Büchel 1999a).

[14] A variant with a binary logit model, as used by Robst, leads to similar results (without documentation).

III). First of all the probability to move up depends heavily on the position already obtained. Unskilled workers -no matter whether blue or white collar- are much more likely to move up than the reference group of skilled white collar workers. On the other hand, highly skilled employees –again regardless of color of collar- show considerably fewer upward move transitions. Second, schooling once more turns positive and significant. Finally, the estimated coefficients on the over- and undereducation dummy variables turn insignificant. Again, this result is somewhat unexpected and motivates to do further research.

4.3 Results from the Upward Wage Mobility Approach

The descriptive statistics of wage change analysis are reported in Table 1, third and fourth panel. In panel 3 we find results similar to those found in the replication of Sicherman´s occupational upward mobility approach (first panel). However, the fourth panel already indicates that the results might change: mean residual wage growth is higher for undereducated workers and lower for overeducated workers in comparison with the reference group. This already points into the direction of the multivariate results, which show a fundamental change in the observed upward mobility for overeducated workers compared to Sicherman´s and Robst´s results. Based on the results from the previous exercises we include the base income in our model. This is important to control for the effect that upward opportunities are always better for people starting from a very low point.

---- Table 4 about here ----

No matter which specification we use, the coefficients on the over- and undereducation variables turn. Note, that we control for the base effect. Overeducated workers are less likely to experience above average relative wage increases and undereducated workers are more likely to experience such an increase than correctly allocated workers. Even if we believed that overeducated workers are more likely to move up between status positions or occupations the fact that matters most is whether their wages increase accordingly. There is no doubt at all that a valid indicator to measure upward career mobility should highly positively correlate with relative wage growth. If overeducated workers are expected to have

better career opportunities than correctly allocated workers, they should realize at the same time higher wage growth rates than those. This does not seem to be the case. The results presented in this section therefore suggest that the empirical test of Sicherman (1991) is not appropriate to test his theory. In addition (or: as a consequence), there is massive doubt about the power of Sicherman and Galor (1990) hypothesis concerning the benefits of an overeducation status which are expected to be given in form of better career prospects.

These results correspond to other findings from overeducation research as outlined in section 2 and can be explained by our most preferred model combining signaling and segmentation theories with simple structural discrepancies in the relative supply and demand of qualified workers: Caused by an oversupply in high qualifications, overeducated workers might be stuck in such jobs due to the depreciation of their human capital, demotivation or negative signaling. Undereducated workers might on the other hand be those workers who benefit from the fact that some firms are looking for qualified workers but are not able to hire workers with the appropriate level of education. In the following and last section we check whether this proposition can be supported using subjective and objective information on training on the job.

4.4. Testing for Robustness: Access to On-the-job Training

It could be the case that firms hire undereducated workers when they are not able to find higher qualified workers and hence overeducated workers are simply found in their jobs because there are not enough positions for their qualification level available. Given this, we should observe that overeducated workers tend to learn relatively less often specific things that could help with respect to further promotion and to receive less formal training on-the-job. The GSOEP includes information on both variables. Table 5 shows some basic descriptives.

---- Table 5 about here ----

In Table 5, we find very strong correlations between informal and formal training on one hand and the mismatch status on the other hand. Overeducated workers have much less opportunities to learn things which they consider to be useful for further career steps, and they are much more excluded from selection to on-the-job training measures than correctly

allocated workers; the contrary is the case for undereducated workers (Models I and III). These results hold when controlling for several socioeconomic characteristics as well as controlling for job characteristics (Models II and IV).

Obviously, the career mobility model of Sicherman and Galor (1990) does not fit these facts. If it were true that overeducated workers were on a career track waiting for promotion it would be more plausible to observe them learning things for promotion and receiving training, regardless of their higher formal qualification. The results presented so far hence indicate that the career mobility model though theoretically and intuitively intriguing cannot explain the widespread persistence of overeducation in all industrialized countries.

5. Conclusions

The central finding of this analysis is that overeducated workers have worse career prospects than correctly allocated workers. This result is in obvious contrast to the results by Sicherman (1991) and Robst (1995). The special situation of this result pattern is given by the fact that we could first replicate the US results of both studies with our German data. Therefore, the key to the understanding of this puzzling result picture has to be found in a discussion of the validity of the chosen indicators to identify promotion and the specification quality of the models.

Concerning the first point and starting with Sicherman´s approach, we believe that a change from an occupation which demands low human capital investment to one with higher requirements is not a satisfying indicator. First of all, these changes do not cover the majority of career mobility, because this is mostly observed within specific professions. This is especially the case when aggregating occupations within large groups as done by Sicherman. How often can we observe a move from Sicherman´s category "judges, lawyers" (ranking position 2) to that of "physicians, dentists" (ranking position 1)? We found that in West Germany most changes are realized between groups with low human capital stock.[15] Similar problems arise choosing an alternative but related approach defining upward mobility as moves to a better status position as e.g. a promotion of a blue collar worker, identified by a change from a job which requires 5 years schooling to one with a requirement of 6 years (Robst´s approach) or from the "unskilled" to the "semi-skilled" category (our second

[15] Another problem is the measurement of the human capital stock within professions which is needed to rank occupations; effects of post-schooling training remain unconsidered (see the critical remarks on this point in Hartog forthcoming).

approach) and honored with a wage increase of, let's say, 5%. Is this career step more successful than that of an employee working in the job segment which requires 17+ years of schooling, having a managerial status, realizing a job change with wage plus of 20%, but remaining in her occupational category?

In both approaches, the major problem is that mobility takes place mainly between lower categories. Not to control for this base effect must cause severe misinterpretations of the findings, as shown in our results. The problems with categorization of groups disappears when using the metric scaled variable "relative wage change"; the problem with ceiling effects at the upper end of change distribution remains. It is, e. g., trivial to state that promotion is easier to realize when starting from a low hierarchical point (where most of the overeducated are located) than from a higher one. However, this is not the question to be analyzed: The question is whether qualification mismatch per se has an impact on the career prospects. As a consequence, controlling for the starting situation is essential in these model types regardless of the construction of the dependent variable indicating a promotion.

Our overall conclusions from our findings are first that moves between occupations with different human capital requirements, between jobs with different schooling requirements, or between status positions with different levels are not very valid indicators for career mobility in a vertical sense; a better one which produces results of much higher plausibility is relative wage change. Second, when analyzing upward mobility, one has to control for the starting position. If this is not done, results tend to be influenced by the simple ceiling problem that upward opportunities are always better for people starting from a very low point that for others. This effect has nothing to do with qualification mismatches. Because overeducated (undereducated) workers tend to have jobs with lower (higher) qualification requirements than correctly allocated workers, this ceiling effect is at least partly drawn on the mismatch covariates. Therefore, the results can be severely misleading if these effects are not controlled for. Only when using wage growth as indicator for upward career mobility and controlling for starting wages, we find what we really expect: The careers of the less successful people who work overeducated continue to proceed less successful than those of correctly allocated workers, and the opposite is observable for undereducated persons.

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Appendix: Tables

Table 1 - Overeducation, Undereducation, and Upward Mobility
Descriptive Statistics

		Correctly allocated	Overeducated	Undereducated	*(All)*
A)					
Move to higher ranked occupation[a]	**No**	13065 (95.7%)	1824 (94.1%)	301 (92.9%)	*15190* *(95.5%)*
	Yes	581 (4.3%)	114 (5.9%)	23 (7.1%)	*718* *(4.5%)*
		13646 *(100%)*	*1938* *(100%)*	*324* *(100%)*	*15908* *(100%)*
B)					
Move to higher occupational position[b]	**No**	1564 (90.8%)	2166 (78.9%)	389 (94.2%)	*17119* *(89.2%)*
	Yes	1477 (9.2%)	581 (21.2%)	24 (5.8%)	*2082* *(10.8%)*
		16041 *(100%)*	*2747* *(100%)*	*413* *(100%)*	*19201* *(100%)*
C1)					
Wage growth > mean + standard deviation[c]	**No**	14154 (89.1%)	2277 (88.3%)	324 (85.4%)	*16755* *(89.0%)*
	Yes	1746 (10.9%)	300 (11.7%)	60 (14.6%)	*2106* *(11.0%)*
		15900 *(100%)*	*2577* *(100%)*	*384* *(100%)*	*18861* *(100%)*
C2)					
Residuals from wage growth regression	**Mean**	0.00003	-0.00072	0.00343	*0.00000*
	(Std-Dev)	(0.15970)	(0.16620)	(0.15898)	*(0.16058)*

Note: Frequencies are calculated for each column and are weighted by the sample weight.
[a] Only workers with valid observations on the occupation variable in two consecutive years are included. The highest occupational group in the base year was excluded because no more upward mobility can be observed for this group by definition.
[b] Only workers with valid observations on the occupational position variable in two consecutive years are included. The highest white collar (managerial) and blue collar workers (master craftsmen) in the base year are excluded.
[c] Only workers with valid wage observations in two consecutive years are included. Extreme values were excluded (below 1000 DM/month and above 15000 DM/month gross earnings). To allow for upward mobility of all workers also those with wages above 10000 DM/per month in the base period were excluded. Mean and standard deviation are calculated separately for blue and white collar workers by year.
Source: Own calculations using the waves 1984-1997 of the German Socio-Economic Panel (GSOEP)); sample consists of West German full-time working men without self-employed and civil servants.

Table 2 - Overeducation, Undereducation and Upward Occupational Mobility
Dependent variable = 1 if moved to a higher ranked occupation

	United States (Sicherman 1991)	**West Germany**		
	I[a]	**I[b]**	**II[b,c]**	**III[b,c]**
Intercept	-0.3157 (-1.2)	-1.4629** (0.1220)	-2.0167** (0.1662)	-2.2722** (0.2133)
Schooling	-0.0676** (-4.2)	0.0084 (0.0082)	0.0086 (0.0086)	0.0920** (0.0139)
Experience	-0.0536** (-3.8)	-0.0250** (0.0079)	-0.0232** (0.0088)	-0.0258* (0.0103)
Experience^2	0.0000 (1.6)	0.0004** (0.0002)	0.0004* (0.0002)	0.0005* (0.0002)
Union member	0.2050 (2.4)	-0.0155 (0.0389)	-0.0318 (0.0414)	-0.0534 (0.0488)
Black/Foreigner	0.1076 (1.2)	0.0118 (0.0399)	0.0168 (0.0420)	-0.0759 (0.0534)
Large city	-0.0949 (-1.1)	-0.0096 (0.0378)	0.0088 (0.0395)	-0.0168 (0.0478)
Married	-0.1631 (-1.5)	-0.0584 (0.0447)	-0.0596 (0.0469)	-0.0634 (0.0553)
Disabled	-0.1091 (-0.67)	-0.2194** (0.0613)	-0.3730** (0.0630)	-0.4381** (0.0710)
Overeducated	0.2181* (2.5)	0.1547** (0.0502)	0.1860** (0.0529)	-0.0267 (0.0660)
Undereducated	0.3103** (2.6)	0.2662* (0.1077)	0.2616* (0.1141)	0.6234** (0.1425)
Occupations ranked 2-8	.	.	.	-1.6443** (0.1351)
Occupations ranked 9-13	.	.	.	-0.7941** (0.0944)
Occupations ranked 14-18	.	.	.	-0.7734** (0.0961)
Occupations ranked 19-24	.	.	.	-0.8712** (0.0675)
Base group: ranks 25-27	.	.	.	
Tenure, firm size and industry dummies	NO	NO	YES	YES
Wald Chi^2	.	59.87**	375.10**	459.61**
Observations	5064		15908	
Groups	.		2701	

Note: ** indicates significance at the 1% level and * at the 5% level. All regressors are measured in the base period. [a] Logit regressions; asymptotic t-statistics in parentheses. Upward moves between 1976-1977 and 1978-1979. [b] Random effects probits; standard errors in parentheses. The highest occupational group in the base year was excluded because no more upward mobility can be observed for this group. [c] Tenure, firm size and industry dummies included and not reported.

Source: [a] PSID: Sicherman (1991), Table 3, column (c). [b] Own calculations using the waves 1984-1997 of the German Socio-Economic Panel (GSOEP); sample consists of West German full-time working men without self-employed and civil servants.

Table 3 - Overeducation, Undereducation and Upward Moves in Occupational Positions
Dependent variable = 1 if moved to a higher status position

	United States (Robst 1995)	West Germany		
	I[a]	I[b]	II[b,c]	III[b,c]
Intercept	-2.064**	-1.6371**	-1.6551**	-4.3817**
	(0.452)	(0.1518)	(0.1670)	(0.2874)
Schooling	-0.1113**	-0.0440**	-0.0418**	0.1062**
	(0.030)	(0.0101)	(0.0100)	(0.0151)
Experience	0.0386+	0.0400**	0.0442**	0.0583**
	(0.023)	(0.0074)	(0.0077)	(0.0094)
Experience^2	-0.0008	-0.0008**	-0.0009**	-0.0012**
	(0.0005)	(0.0002)	(0.0002)	(0.0002)
Union member	-0.3198*	-0.1034**	-0.0768*	-0.0491
	(0.146)	(0.0337)	(0.0343)	(0.0412)
White / Foreigner	0.3246**	-0.1147**	-0.1047**	-0.3846**
	0.151	(0.0377)	(0.0378)	(0.0539)
Large city	0.1004*	0.0793*	0.0793*	0.0969*
	0.37	(0.0353)	(0.0352)	(0.0450)
Married	0.2405	0.0299	0.0392	0.0824
	0.233	(0.0414)	(0.0414)	(0.0505)
Disabled	-0.0387	-0.0170	0.0115	-0.0060
	0.261	(0.0425)	(0.0433)	(0.0487)
Overeducated	2.027**	0.7876**	0.7779**	0.0662
	(0.152)	(0.0451)	(0.0451)	(0.0621)
Undereducated	-0.6786**	-0.4613**	-0.4542**	0.0148
	(0.274)	(0.1236)	(0.1232)	(0.1480)
Required training	0.0659+	0.0221	0.0226+	0.0925**
	(0.035)	(0.0137)	(0.0137)	(0.0183)
Unskilled blue collar	.	.	.	0.8918**
				(0.0861)
Skilled blue collar	.	.	.	-0.2690**
				(0.0699)
Highly skilled blue collar	.	.	.	-0.6456**
				(0.1077)
Unskilled white collar	.	.	.	1.7431**
				(0.0906)
Highly skilled white collar	.	.	.	-1.3493**
				(0.0906)
Base: Skilled white collar	.	.	.	.
Tenure, firm size and industry dummies	NO	NO	YES	YES
Wald Chi^2	.	362.45**	398.79.**	908.96**
Observations	16.21		19201	
Groups	.		3053	

Note: ** indicates significance at the 1% level, * at the 5% level and + at the 10% level. All regressors are measured in the base period. [a] Logit regressions; Standard errors in parentheses. Upward moves to job that requires more schooling between 1976-1978. [b] Random effects probits; standard errors in parentheses. The highest white collar (managerial) and blue collar workers (master craftsmen) in the base year are excluded. [c] Tenure, firm size and industry dummies included and not reported.
Source: [a] Robst (1995), Table 5, column (1). Dependent variable of Robst is "move to a job which requires more schooling". [b] Own calculations using the waves 1984-1997 of the German Socio-Economic Panel (GSOEP); sample consists of West German full-time working men without self-employed and civil servants.

Table 4 - Overeducation, Undereducation and Upward Wage Mobility

	West Germany			
	Dependent variable = 1 if wage growth > mean+stand. deviation[a]		Dependent variable= wage growth[b]	
	I	**II[c]**	**III**	**IV[c]**
Intercept	-0.9127**	-0.8361**	0.0655**	0.0704**
	(0.1073)	(0.1241)	(0.0090)	(0.0105)
Schooling	0.0733**	0.0756**	0.0124**	0.0125**
	(0.0087)	(0.0089)	(0.0007)	(0.0007)
Experience	-0.0094	0.0005	-0.0017**	-0.0007
	(0.0065)	(0.0070)	(0.0006)	(0.0006)
Experience^2/10	0.001	-0.001	0.0003**	0.0001
	(0.001)	(0.001)	(0.0001)	(0.0001)
Union member	0.0372	0.0417	0.0054*	0.0039
	(0.0310)	(0.0317)	(0.0026)	(0.0026)
Foreigner	-0.0083	-0.0163	-0.0142**	-0.0144**
	(0.0332)	(0.0336)	(0.0028)	(0.0028)
Large city	0.0127	0.0055	-0.0002	-0.0008
	(0.0313)	(0.0315)	(0.0026)	(0.0026)
Married	0.0203	0.0220	0.0101**	0.0101**
	(0.0366)	(0.0367)	(0.0031)	(0.0031)
Disabled	-0.1038*	-0.1095*	-0.0040	-0.0056
	(0.0413)	(0.0422)	(0.0035)	(0.0036)
Overeducated	-0.1440**	-0.1627**	-0.0253**	-0.0276**
	(0.0426)	(0.0431)	(0.0036)	(0.0036)
Undereducated	0.5099**	0.5043**	0.0458**	0.0455**
	(0.0949)	(0.0955)	(0.0085)	(0.0084)
Base Year Wage (Gross Monthly)/1000	-0.2762**	-0.2942**	-0.0352**	-0.0375**
	(0.0157)	(0.0163)	(0.0010)	(0.0011)
Tenure, firm size and industry dummies	NO	YES	NO	YES
Chi^2 / F	Chi^2=442.13**	Chi^2=480.37**	Chi^2=1375**	Chi^2=1508**
Observations	18861		18861	
Groups	2974		2974	

Note: ** indicates significance at the 1% level and * at the 5% level. All regressors are measured in the base period. Random effects probits; standard errors in parentheses. Extreme values were excluded (below 1000 DM/month and above 15000 DM/per month). To allow for upward mobility of all workers also those with wages above 10000 DM/per month in the base period were excluded. Mean and standard deviation of wage change are calculated separately for blue and white collar workers by year.

[a] Random Effects Probit; dependent variable=1 if: $\Delta \ln (w_i,g,y) > \text{mean} (\Delta \ln (wg,y)) + \text{std} (\Delta \ln (wg,y))$, where i=individuals, g = seven occupational position groups and y=pair of years.

[b] Random Effects GLS; dependent variable is wage growth: $\ln(w_t) - \ln(w_{t-1})$.

[c] Tenure, firm size and industry dummies included and not reported.

Source: Own calculations using the waves 1984-1997 of the German Socio-Economic Panel (GSOEP); sample consists of West German full-time working men without self-employed and civil servants.

Table 5 - Overeducation, Undereducation, and On-the-job Training (Subjective and Objective Measures): Descriptive Statistics

		Correctly Allocated	Overeducated	Undereducated	*(All)*
Do you feel you are always learning things when doing your job that could lead to a better job or promotion?[a]	**No/ partly**	3733 (82.06%)	752 (16.53%)	64 (1.41%)	*4549 (70.10%)*
	Yes	1732 (31.69)	137 (15.41)	71 (52.59)	*1940 (29.90%)*
		5465 (100%)	*889 (100%)*	*135 (100%)*	*6489 (100%)*
Have you participated in any vocational training during the past three years?[b]		1759 (80.10%)	334 (92.78%)	28 (51.85%)	*2121 (81.26%)*
		437 (19.90%)	26 (7.22%)	26 (48.15%)	*489 (18.74%)*
		2196 (100%)	*360 (100%)*	*54 (100%)*	*2610 (100%)*

Note: Frequencies are calculated for each column and are weighted by the sample weight.
[a] Years: 1985, 1987, 1989, 1997.
[b] Years: 1989, 1993; only training which lasted > 1 day is considered in the "yes" category.
Source: Own calculations using the waves 1984-1997 of the German Socio-Economic Panel (GSOEP); sample consists of West German full-time working men without self-employed and civil servants.

Table 6 - Learning On-the-Job and Training Participation: Tests for Robustness

	West Germany			
	Dependent variable=1 if worker feels that he can always learn things on the job that are helpful for further promotion		Dependent variable=1 if worker received at least 2 days of formal training during the last three years	
	I[a]	II[a,c]	III[b]	IV[b,c]
Intercept	-1.6566**	-2.0795**	-3.3174**	-2.6835**
	(0.2010)	(0.2517)	(0.3843)	(0.4277)
Schooling	0.1422**	0.1462**	0.1990**	0.1653**
	(0.0144)	(0.0145)	(0.0234)	(0.0232)
Experience	-0.0276*	-0.0171	0.0268	0.0321
	(0.0117)	(0.0124)	(0.0238)	(0.0248)
Experience^2	0.0002	0.0001	-0.0011*	-0.0013*
	(0.0002)	(0.0003)	(0.0005)	(0.0005)
Union member	-0.0272	0.0118	0.0850	-0.0089
	(0.0558)	(0.0569)	(0.1010)	(0.1044)
Foreigner	-0.4866**	-0.4863**	-1.3186**	-1.2366**
	(0.0658)	(0.0665)	(0.1498)	(0.1475)
Large city	0.0701	0.0609	0.2683**	0.2371*
	(0.0596)	(0.0598)	(0.1009)	(0.0998)
Married	0.1004	0.1040	0.2237$^+$	0.2379$^+$
	(0.0689)	(0.0693)	(0.1254)	(0.1241)
Disabled	-0.0204	-0.0449	-0.1085	-0.0914
	(0.0440)	(0.0485)	(0.2075)	(0.2053)
Overeducated	-0.7152**	-0.7290**	-0.7988**	-0.8095**
	(0.0839)	(0.0843)	(0.1681)	(0.1667)
Undereducated	0.4741**	0.4986**	0.8912**	0.7884**
	(0.1570)	(0.1578)	(0.2628)	(0.2564)
Tenure, firm size and industry dummies	NO	YES	NO	YES
Chi^2	345.16**	387.71**	192.17**	212.26**
Observations	6489		2610	
Groups	2238		1305	

Note: Random effects probits; standard errors in parentheses: ** indicates significance at the 1% level, * at the 5% level and $^+$ at the 10% level. All regressors are measured in the base period. The sample includes male workers who were below the age of 65 in 1997. Only west Germans and west foreigners who were educated and trained in Germany are included. Only full-time blue and white collar workers. Self-employed, trainees and civil servants are not included. All regressors are measured in the base period. Observations with missing values on the dependent variable, nationality, city size, disability, education in years, experience, tenure or marital status are not included. [c] Tenure, firm size and industry dummies included and not reported.

Source: [a] Pooled waves 1985, 1987, 1989, 1997 of GSOEP. [b] Pooled waves 1989, 1993 of GSOEP. Own calculations from the German Socio-Economic Panel (GSOEP); sample consists of West German full-time working men without self-employed and civil servants.

Appendix Tables

Table A1 - Categorization of Over- and Undereducation

Job Requirements	**Occupational Position of Job Holder**	**Formal Qualification of Job-Holder**		
		No Degree	Vocational Training Degree	Academic Degree
		Mismatch Status		
No Training or Just Short Introduction to the New Job Required	Unskilled or Semi-Skilled Blue Collar	cr	oe	oe
	Skilled Blue Collar	-	?	-
	Unskilled White Collar	cr	oe	oe
	Skilled White Collar	-	?	?
	Professional or Managerial White Collar	-	-	-
Longer Firm-Specific Settling-In Period Required	Unskilled or Semi-Skilled Blue Collar	cr	oe	oe
	Skilled Blue Collar	cr	?	-
	Unskilled White Collar	cr	oe	oe
	Skilled White Collar	ue	?	?
	Professional or Managerial White Collar	ue	?	?
Vocational Training Degree or Qualified Special Courses Required	Unskilled or Semi-Skilled Blue Collar	cr	?	oe
	Skilled Blue Collar	cr	cr	oe
	Unskilled White Collar	cr	cr	oe
	Skilled White Collar	ue	cr	oe
	Professional or Managerial White Collar	ue	cr	cr
Academic Degree Required	Unskilled or Semi-Skilled Blue Collar	-	-	-
	Skilled Blue Collar	-	-	-
	Unskilled White Collar	-	-	-
	Skilled White Collar	-	-	?
	Professional or Managerial White Collar	ue	ue	ad

Legend:
cr: Correctly Allocated
oe Overeducated
ue: Undereducated
?: Unclear Mismatch Status (< 10%)
-: Unplausible Combination of Mismatch Generating Variables (< 1%)

Note: System refers to West Germany only. No self-employed and civil servants in the sample.
Source: Own Extension of the Büchel and Weißhuhn (1997) concept.

Table A2 - Wage Regression for Ranking Occupational Groups

	Parameter Estimate	Standard error
Intercept	7.5618**	(0.0280)
Education	0.0236**	(0.0013)
Experience	0.0170**	(0.0010)
Experience2	-0.0003**	(0.0000
Required training	0.0263**	(0.0020)
Foreigner	-0.0377**	(0.0050)
City	-0.0053	(0.0043)
Spouse	0.0511**	(0.0052)
Tenure	0.0024**	(0.0003)
Unskilled blue collar	-0.1803**	(0.0086)
Skilled blue collar	-0.0844**	(0.0074)
Unqualified white collar	-0.1485**	(0.0127)
Professional/managers	0.2773**	(0.0085)
Small firm	-0.1043**	(0.0086)
Large firm	0.0614**	(0.0075)
Firm size missing	-0.2222**	(0.0104)
Industry Dummies	YES	

Note: Dependent variable is the log of gross monthly income. Workers with income below 1000 DM (15 observations) and above 15000 DM (42 observations) are not included. Number of observations: 16582. Observations with missing values on the occupation variable and the covariates were deleted. The sample is based on the mobility analyses and includes male workers who were below the age of 65 in 1997, west Germans and west foreigners who were educated and trained in Germany. Only male blue and white collar workers who work full-time in two consecutive years. Self-employed, trainees and civil servants are not included. ** indicates significance at the 1% level and * at the 5% level. Reference groups: west German citizen, qualified white collar, medium sized firm (20-200 employees).
Source: Own calculations using the waves 1984-1997 of the German Socio-Economic Panel (GSOEP); sample consists of West German full-time working men without self-employed and civil servants.

Table A3 - Ranking of Occupations (West Germany)

Ranking	Occupations (ISCO)	"Human Capital"	Ranking by Sicherman
1	Judges, lawyers, legislator (2, 20)	1.05717	2
2	Physicians, dentists (6)	1.04186	1
3	Clerics (14)	1.01834	20
4	Architects; chemists; engineers; physical and biological scientists; mathematicians (1- 2, 4-5, 8)	0.95701	5
5	Teachers (13)	0.91643	6
6	Economists, scientists (9, 19)	0.89341	4
7	Accountants (Buchprüfer), managers, (11, 21, 40-42, 50-51)	0.89102	9
8	Author, sculpturer/painter, music/performance, professional athlete (15-18)	0.88676	10
9	Administrator, bookkeeper/cashier (31, 33)	0.82841	8
10	Technicians (3)	0.80693	11
11	Office manager, transport attend, HH supervisor, inspector (30, 35, 52, 70)	0.78794	14
12	Stenographer, office worker (32, 39)	0.78724	18
13	Related medical jobs (7)	0.7863	3
14	Tech. salesperson, insurance rep., vendor (43-45)	0.785	12
15	Security service (58)	0.77263	16
16	Agricultural adm., farm manager, fisher/hunter (60-61, 64)	0.75149	15
17	Electrical engineer (85)	0.74298	19(3)
18	Armed forces (101-102)	0.73542	17
19	Machine fitter (84)	0.72403	19(2)
20	Bricklayer/carpenter (95)	0.72204	19(4)
21	Tool/die maker (83)	0.72032	19(1)
22	Conductor, transport operator (36, 98)	0.71449	21
23	Craftsmen and kindred workers, not otherwise listed (71-82, 86-94)	0.71223	19(0)
24	Mailmen, tel. operator, cook/waiter, hair stylist, service worker (37-38, 53, 57, 59)	0.71124	23
25	Stat. mach. operator, convey operator (96-97)	0.69062	22
26	Farm and forestry worker (62-63)	0.67835	25
27	Domestic help, janitor, dry-cleaner, other labor (54-56, 99)	0.6774	24

Source: Own calculations using the waves 1984-1997 of the German Socio-Economic Panel (GSOEP); sample consists of West German full-time working men without self-employed and civil servants.

Table A4 - Means and Frequencies for all Specifications

	Move to Higher Ranked Occupation	**Move to a Higher Occupational Position**	**Upward Wage Mobility**
Continuous Variables:			
Means (Standard Deviations)			
Schooling in years	11.0	10.8	10.9
	(2.3)	(2.3)	(2.2)
Experience in years	22.1	22.1	22.1
	(10.6)	(10.7)	(10.6)
Dependent Variable			0.04[a]
			(0.16)
Dummy Variables:			
Frequencies			
Dependent Variable	4.5	10.8	11.2[b]
Union	31.0	32.1	32.0
Non-German	33.2	37.0	35.5
City	32.5	32.3	32.7
Spouse	75.7	74.9	75.2
Disabled	12.3	12.2	12.3
Overeducated	12.2	14.4	13.7
Undereducated	2.0	2.2	2.0
Tenure ≤ 1 year	7.7	7.7	7.5
1 < tenure ≤ 5 years	21.1	21.1	21.0
5 < tenure ≤ 10 years	22.2	22.4	22.4
10 < tenure ≤ 20 years	30.8	30.9	30.7
Tenure > 20	18.2	17.9	18.4
Firm size < 20	14.8	13.4	13.3
20 < Firm size ≤ 200	12.5	12.3	12.2
Firm size > 200	20.6	20.6	20.5
Firm size missing	52.1	53.7	54.0
Agriculture (incl. forestry and fisheries)	0.4	0.3	0.3
Energy and mining	1.3	1.2	1.1
Manufacturing	23.2	22.6	22.5
Construction	6.9	5.5	5.4
Trade	2.7	2.8	2.8
Traffic and communication	2.2	2.1	2.1
Credit and insurance	1.5	1.3	1.3
Other services	3.2	2.9	2.9
State and social security	1.8	1.9	1.9
Non-profit	0.4	0.4	0.4
Industry missing	46.1	48.6	48.8

Note: [a] Models III and IV in Table 4. [b] Models I and II in Table 4.
Source: Own calculations using the waves 1984-1997 of the German Socio-Economic Panel (GSOEP); sample consists of West German full-time working men without self-employed and civil servants.

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