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The Influence of Further Education on Occupational Mobility in Switzerland

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Further education attainment is an important part of the work life, but its impact on occupational achievement is far less well understood than basic education. In this study, we examine the influence of further education on occupational upward and downward mobility and gender differences in the influence. Further, we address selection bias involved in this process. The sample for the study includes both men and women from the 1945–51 and 1959–61 birth cohorts in the German-speaking part of Switzerland. We employ Cox's proportional hazards model to estimate the effects of three different types of further education on the rate of upward and downward mobility, independent of basic education, work-related individual attributes, and labour-market factors. The findings show that further education aimed at a formal credential, such as advanced training and retraining, increases chances for upward mobility. We found that the association between credential-oriented further education and upward mobility is stronger for women than for men. It reflects greater selectivity among female participants. We also found that further education participation has only a moderate negative effect on downward mobility. Basic education remains an effective measure against downward mobility.

Introduction

The influence of basic education (education obtained before labour-force entry) on status attainment has been well documented in the literature (Blau and Duncan, 1967; Duncan, Featherman and Duncan, 1972; Featherman and Carter, 1976; Featherman and Hauser, 1978; Faegerlind, 1975, 1987). More recent research has advanced our understanding of this process by adopting a temporal approach in examining the influence of formal education on occupational achievement (Carroll and Mayer, 1986; Blossfeld, 1986; Hannan, Schömann and Blossfeld, 1990; Mayer, 1991). For example, using an event-history model, Blossfeld (1986) has demonstrated that there are strong life-course, cohort, and period effects on occupational attainment among three German male cohorts of 1929–31, 1939–41, and 1949–51. He has further shown that the effect of education on upward mobility seems to increase when these effects are taken into consideration (p. 221, Table 4). Mayer (1991) has shown an increasing influence of education on occupational status over the same three German male cohorts. Using the same data source, Hannan *et al*. (1990) have found that the effect of basic education on the level of initial wages decreases substantially over time.

What is less well understood is the impact of further education (obtained during the work life) on occupational achievement. In the past, research on status attainment and occupational mobility in sociology has largely ignored further education. As some have pointed out (Kerckhoff, 1990; Hanushek and Quigley, 1985), the omission of further education may have caused two problems. One is that the effects of further education on occupational attainment may have been wrongly attributed to social background, basic education, or previous occupational status. The other is that occupational upward

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mobility as a result of further education attainment may be erroneously attributed to labour-force processes (Kerckhoff, 1990). These problems are especially serious when a significant amount of further educational attainment occurs after labour-force entry, as it does in a number of European countries (Müller, 1977; Becker, 1991; Schömann and Becker, 1995; Bundesamt für Statistik, 1989; Bundesamt für Bildung und Wissenschaft and Bundesamt für Industrie Gewerbe und Arbeit, 1988; Tuijnman *et al*., 1988; Tuijnman, 1989; Kerckhoff, 1990). To a lesser degree, it has also been increasing in the United States (Davis and Bumpass, 1976; Felmlee, 1988).

Only recently have researchers begun to pay attention to further education and its impact on occupational achievement. A growing body of sociological research has been emerging since the 1980s (Bowlby and Shriver, 1970; Coleman *et al*., 1972; Davis and Bumpass, 1976; Müller, 1977; Jones and Davis, 1986; Mangum and Adams, 1987; Shütze and Istance, 1987; Felmlee, 1988; Kalleberg and Lincoln, 1988; Tuijnman *et al*., 1988; Tuijnman, 1989; Kerckhoff, 1990; Becker, 1991, 1993; Lynch, 1991). These findings have shown fairly consistent evidence that further education increases occupational prestige and improves employment conditions. While earlier findings pertaining to associations between further education and income have been inconclusive (for a review of this issue see Tuijnman, 1989: 71–73), more recent studies and especially research documented in the economic literature have shown a consistent positive effect of further training on income. Buchmann et al. (1999: 114–132) have shown that further education attainment for occupational updating and advanced training has a positive effect on income among the two Swiss–German birth cohorts of 1949–51 and 1956–61. Participation in employment training programmes significantly increased the earnings level of participants and the effect is stronger for American women than for men (Ashenfelter, 1978; Bloom, 1984; Couch, 1992). Studies in Germany have shown that completion of further training significantly increases male participants' income when changing jobs within the firm. For women, further education leads to increases in earnings when changing job between firms (Becker and Schömann, 1996). Schömann, Becker and Zühlke (1997) have reported that further education participation reduces the risk of unemployment, especially for women, in the eastern part of Germany.

While previous research on further education has enhanced our understanding of the association between further education and status attainment, it is limited in several respects. First, there is no systematic theoretical reasoning that links further education to occupational outcomes. Consequently, previous research rarely distinguishes among different types of further education.[1] More recent studies have shown that determinants of further education differ by the type of further education pursued (Li *et al*., 1995) and the effects of further education on mobility across occupational sex boundaries also differ by further education type (Li *et al*., 1998). This suggests that further education is unlikely to have a homogeneous effect on occupational mobility. Thus, an adequate differentiation of further education types is crucial to our understanding of its influence on occupational attainment. Second, many previous studies are based on cross-sectional data (Bowlby and Shriver, 1970; Coleman *et al*, 1972; Jones and Davis, 1986; Mangum and Adams, 1987; Felmlee, 1988) and based on samples which exclude women (Jones and Davis, 1986; Tuijnman *et al*., 1988, Tuijnman, 1989), thus limiting our understanding of the dynamic process of occupational attainment and gender differences in this process. Third, there is a self-selection process involved in both further education and occupational attainment. This process is hitherto not well understood and it remains a challenge to researchers who attempt to determine an adequate estimate of the effect of further education on occupational achievement.

In this study, we attempt to bridge these gaps. Based on human-capital, signal/filter, and segmentation theories, we develop hypotheses that link type-specific further education attainment to occupational mobility. Our empirical analysis focuses on the effect of further education on upward and downward mobility, gender and cohort differences in this process, and the extent to which the effect of further education may be attributed to selection bias. The sample for the analysis includes

both men and women from the 1949–51 and the 1959–61 birth cohorts in the German-speaking part of Switzerland. We employ an event-history analysis to estimate the effect of three different types of further education on the rate of upward and downward mobility, controlling for basic education, work-related individual attributes, and labour-market factors. From the outset, we define further education as educational qualifications which are relevant to labour-market activities and which are obtained after labour-force entry. Further, we distinguish between credential- and non-credential-oriented types of further education, and we further distinguish between two different types of credential-oriented further education.

This analysis focuses on between-firm mobility for a number of reasons. First, the three types of further education under consideration include occupational updating, advanced training, and retraining. The last two types of further education are credential-oriented and are often financed by individuals. These types of further training are most relevant for between-employer job shifts, and thus they are unlikely to be linked to within-firm upward mobility. Secondly, job shifts occur much more frequently across firms than within firms (e.g. Becker, 1993; Becker and Schömann, 1996), and occupational upward mobility is more likely to occur as a result of between-firm than within-firm job changes (Becker, 1993). Previous research has shown that between-firm moves are more important for women in terms of income attainment than are within-firm changes (Becker and Schömann, 1996).

Workers change firms because they see opportunities to move up or to find a better job match in a new firm. Although the Swiss retirement system is firm-based, so that between-firm job shifts may be costly, our data show a substantial amount of between-firm mobility, which warrants investigation. For example, between 39 and 46 per cent of the respondents covered in our base sample moved either upward or downward at least once, and about 69 per cent made at least one horizontal move across firms during a 15-year period. Occupational updating, a non-credential-oriented type of further education, is more likely to be related to within-firm mobility, especially when such further training is financed by the employer. Unfortunately, we have no data on within-firm mobility. We will bear this linkage in mind as we evaluate the results pertaining to the effect of this type of further education on occupational mobility.

Theoretical Considerations

Further Education and Occupational Mobility

Human-capital theory. Human-capital theorists posit that formal education is the most important human resource because it creates skills which have a high value in the labour market (Schultz, 1961; Becker, 1964; Mincer, 1974; Mincer and Polachek, 1974). Typically, an investment in schooling steepens age-earnings profiles, lowering earnings during the investment period but raising them in the future (Becker, 1964: 36). Becker (1964: 7–29) considers further training, such as on- and off-the-job training, an important form of human-capital investment, and he contends that it has the same kind of effects on earnings as basic education does (1964: 153–154). In general, those who invest in schooling will be better off economically over the lifetime than those who do not, because income returns on education will not only compensate for the costs of education – including fees, loss of earnings, and lack of work experience – but will also have a lasting effect on individual life chances.

Nevertheless, the actual return on human capital cannot be perfectly predicted because of uncertainties about several important factors which affect the returns. There is an uncertainty about the length of life, one's own ability (especially for younger people who do most of the investing), and about numerous unpredictable events. In general, the longer the time required to collect the return on an investment in human capital, the less knowledge one has about the future economic environment and hence the less able one is to predict the actual return on schooling adequately (Becker, 1964: 55). One implication is that such uncertainties would lead individuals to revise their investment decisions later on. For example, technological progress and other changes often induce increases in human-capital investment (Becker, 1964: 54). Various forms of further education participation reflect changes in

individuals' investment decisions as a response to structural changes.

Given the close association between income and occupational prestige, one expects that further education as an investment in human capital will have a significant impact on occupational status as has often been found in the literature (Bowlby and Shriver, 1970; Coleman *et al.*, 1972; Jones and Davis, 1986; Mangum and Adams, 1987; Felmlee, 1988; Tuijnman *et al.*, 1988; Kalleberg and Lincoln, 1988; Kerckhoff, 1990; Becker, 1991; Becker, 1993). Since further education participation reflects individual adaptation to structural changes or a correction for a wrong decision about human-capital investment, it is expected to reduce the risk of downward mobility (Becker, 1991; Alex, 1987: 223; Fink and Sauter, 1980: 1; Schömann *et al.*, 1997)

Signal/filter theory. Signal/filter theorists argue that education is a signal of job applicants' productivity rather than a measure of skill and competences (Arrow, 1973; Spence, 1974; Weise, 1995). Better educated workers are not a random sample of individuals. Rather, they possess attributes which are considered as 'desirable' and 'productive' but are not directly observable. For example, better educated workers are more motivated and they are less likely to quit and to be absent. They also have better life-styles which contribute to productivity: they are less likely to drink, to smoke, and to use illegal drugs. All these attributes are unobservable because employers cannot legally use them as selection criteria. Therefore, employers demand a certain level of education to sort and screen job applicant's unobserved abilities, and workers choose a certain amount of schooling to signal their abilities to employers (Weise, 1995). Like basic education, further education serves as a signalling and filtering function. From employers' point of view, further training helps reduce uncertainties about applicants' true productivity potentials and avoid costly wrong hiring. From workers' point of view, further education signals their abilities and desirable attributes which are conducive to productivity. Thus, from the perspectives of signalling theories, we expect that further education will increase the chances of occupational mobility.

Segmentation theories. The basic argument of segmentation theory is that inequalities in occupational achievement cannot be entirely attributed to differentials in workers' abilities and skills. Instead, labour-market structure and allocation mechanisms help shape educational and occupational opportunities. Sengenberger's (1987) theory of labour-market segmentation in Germany is most pertinent to the Swiss context, given the similarities in educational systems and the labour-market structure between the two countries. According to this theory (Sengenberger, 1987: 119–208), there are three major types of labour-market segments; the firm-specific (firm-internal) market, the craft-specific market, and everyone's market. Everyone's labour market is characterized by a flexible wage structure, weak interdependency between employers and employees, a requirement of low qualifications and little work experience, the lack of a career ladder and job security, and thus a strong tendency for employees to move between employers or jobs. The craft-specific labour market consists of numerous small firms and requires occupation-specific qualifications to enter. It is characterized by a well-defined wage structure, job security, and interdependency between employers and employees. The firm-internal labour market mostly consists of large firms and requires high but not necessarily occupation-specific qualifications to enter. Although similar and linked to the craft-specific labour market (Blossfeld and Mayer, 1988), the firm-internal labour market is marked by its provision of greater job security, a career ladder for employees, and even stronger interdependency between employers and workers.

Firm-financed further training, such as occupational updating, is most common in the firm-internal labour market (e.g. the public sector, banks, insurance companies, and core industries). Such further training is intended to update the skill level of workers so that the firm can maintain its market competitiveness and strengthen the interdependency between employers and employees. Furthermore, firm-financed further training is often designed for updating firm-specific skills, hence reducing the likelihood of inter-firm mobility. Firm-financed further training is much less common in the craft-specific labour market, and workers in this market often seek credential-oriented further training outside the firm and finance the training themselves. Through between-firm job changes, further education can help improve the career chances of workers in this

labour-market segment (Becker, 1993). Further education among workers in 'everyone's market' may improve their labour-market chances in terms of more stability and more integration into the labour market, and under certain circumstances it can also increase the chances of upward mobility.

Expectations

Based on the theoretical arguments discussed above and in light of Switzerland's educational system and labour-market characteristics we contrast and compare three types of further education.[2] The first type is called *occupational updating*, which involves taking courses in the areas of language, computer skills, bookkeeping, and management/administration. Occupational updating is often intended to improve qualifications and skills for the current occupation. From the perspectives of human-capital (Becker, 1964: 18–28) and segmentation theories, this type of further training is most likely to increase the chances of upward mobility within the firm, but is very unlikely to lead to between-firm upward mobility. Furthermore, from the signal theoretical point of view, this type of further training may not serve as a strong signal of workers' attributes because it entails no formal credentials. Therefore, it may have little effect on labour market mobility.

The second type of further education is called *advanced training*. It is aimed at a higher or a second credential. The prerequisite for this type of education is that participants have completed an occupational credential before participation. The completion of advanced training often facilitates entry into high-status occupations. From the point of view of human-capital theory, we expect that advanced training will have a strong positive effect on occupational mobility because it is a large investment in terms of time and money. Further, from the signal/filter theoretical perspective, advanced training serves as a strong signal of desirable but unobserved attributes of job searchers because it entails a higher formal credential. According to the segmentation theory, participants in this type of further training come mostly from the craft-specific labour market. In comparison to the firm-internal labour market, the interdependency between employers and employees is weaker in this market, and advanced training is expected to increase the chances of inter-firm mobility.

The third type of further education is *retraining* for a new occupation. From the human-capital theoretical point of view, retraining may not necessarily increase the chances of upward mobility because the practice of a new occupation means depreciation of initially invested human capital. In contrast, advanced training is cumulative so that the initial investment in human capital is not lost. From human-capital theory, we expect that retraining will reduce risks of downward mobility because it may be a correction for a wrong investment decision which can lead to downward movement. From the signal/filter theoretical point of view, retaining may also be a signal of desirable and productive attributes and thus would have a positive effect on upward mobility.

Gender Differences

On the one hand, women may not receive the same benefits from further education as men do for several reasons (Felmlee, 1988). First, female participants in further education tend to have greater family obligations, which may erode the effect of further education on upward occupational mobility. This may be especially true for women whose participation is intended for labour-force re-entry after a long period of interruption. Secondly, female participants are likely to be older and hence may face age discrimination. Thirdly, sex segregation at work may make it difficult for women to translate their added educational qualifications into occupational rewards. Moreover, further education itself may be sex typed so that it would not help women move out of a typical female occupation, which is associated with low occupational status. On the other hand, studies which control for age and family obligations have shown a larger effect of further training on occupational prestige for women than for men (Becker, 1991; Lynch, 1991; Ashenfeler, 1978; Couch, 1992).

In general, women's career paths are very different from those of men. One notable consequence is a large gender gap in earnings (Treiman and Terrell, 1975; Featherman and Hauser, 1976). More family obligations, a greater tendency to have interrupted careers and to work part time among women,

combined with sex discrimination at work and occupational sex segregation, tend to constrain women's occupational development. As a result, women's career profiles are often flat with little change in wages and occupational status over time (Felmlee, 1982; Rosenfeld, 1978, 1980; Loprest, 1992). Labour-market attachment is especially weak among Swiss women.[3] The vast majority of women either detach themselves completely from the labour force or greatly reduce their labour-market activity after marriage and the birth of their first child. Among working mothers, the majority work only part-time, 15 hours or less per week (Charles and Buchmann, 1994). Those few women who are fully committed to the labour force throughout their life course often have to forgo marriage and the family. For these substantive reasons, it is important to examine the mobility process separately for men and women and to address the question of whether women benefit in the same way as men do from further education in terms of occupational mobility.

Data and Method

Data

The data for this analysis come from a survey conducted in 1989 of the two birth cohorts of 1949–51 and 1959–61 in the German-speaking part of Switzerland (Buchmann and Sacchi, 1997).[4] The survey includes detailed biographical data on education, occupation, and family formation. The sample was drawn by a two-stage method whereby 100 communities (stratified by region types and community size) were selected.[5] Cohort members from the selected communities were then randomly sampled based on the official register of community residents.

There is some evidence that individuals with the lowest level of schooling are underrepresented in the data, but the distribution of other educational categories is very comparable to available nationally aggregated statistics. The present analyses will be based on a weighted sample which is representative of the two birth cohorts of Swiss Germans and representative of all educational categories.[6] The survey generated a weighted base sample of 1886 respondents: 910 (48 per cent) are women and 976 (52 per cent) are men.[7] Schnell (1993) points out that sampling weights are based on the assumption that the underrepresented subgroup of the population is homogeneous. Since this assumption is seldom satisfied, the use of sampling weights for regression analysis is problematic (Schnell, 1993). On the other hand, it is commonly known that analysis based on biased samples yields incorrect estimates for the relationship between variables of interest. By not using sampling weights, researchers leave the problem unsolved.

We find the strategies proposed by Winship and Radbill (1994) sensible and useful for handling this issue. If the parameter estimates are substantially similar, the unweighted results are preferred because they are more efficient and the estimated standard errors will be correct. But, when the weighted and unweighted parameter estimates are different, one needs to examine the possibility that the model may be misspecified. The model may be respecified by adding linear, non-linear, or interaction terms which have substantive meanings. Adding the weight variable or interactions of it with other independent variables is a way of diagnosing misspecification. If the respecification of the model does not make the differences between weighted and unweighted estimates disappear, it is likely that the weights are correcting for sampling selection bias. Winship and Radbill have demonstrated that in this situation, use of weights will yield consistent parameter estimates, although the standard errors need to be adjusted by using White's estimator (White, 1980). We adopt this strategy and will compare weighted and unweighted results.

Method

In this analysis, we employ Cox's proportional hazards regression model to estimate the effects of three types of further education on the rate of upward and downward mobility, controlling for basic education, work-related individual attributes, and labour-market factors. We use a more general hazards model, such as Cox's proportional hazards model, because we are mainly concerned with the effects of the explanatory variables but not with the distribution of the time of the event. In parametric transition-rate models (e.g. Gompertz or Weibull models), one needs to specify the distribution for

the time of the event. For our purpose, a general model is appropriate (Allison, 1989: 33).

To determine whether or not the data are consistent with the proportionality assumption of the Cox regression model, we conducted graphical and statistical tests to see if the hazard rates for upward and downward mobility differ by gender and cohort over time. The graphical examination is obtained by simply plotting the survival and hazard rate functions by these subgroups. A visible divergence between groups in the hazard rate shown in the graph may or may not indicate a violation of the proportionality assumption. The statistical test is more powerful. The test allows for an interaction between sex, cohort, and duration (Blossfeld, Hamerle and Mayer, 1989: 142–149).[8]

As we expected, both graphical and statistical tests suggest that the hazard rate of upward mobility significantly differs by sex over time. The statistical test showed a significance level of $p = 0.008$. This difference violates the proportionality assumption of the Cox regression model. Thus, it mandates separate Cox models for men and women when analysing upward mobility. On the other hand, we found no gender differences in the hazard rate of downward mobility; the p-value $= 0.0834$. With respect to cohort, the statistical test showed that the proportionality assumption is satisfied: the interaction between cohort and duration is not significant at the level of $p < 0.05$ for both upward and downward mobility rates.

To prepare an event-history data file, we first split the data-set according to the number of job spells which a respondent experienced during the observation period (between the first labour-force entry and the time of survey in 1989) (Brüderl and Ludwig-Mayerhofer, 1994; Blossfeld *et al.*, 1989). This procedure produces a person-job episode record. In addition, we constructed interruption episodes.[9] This is especially important for our purposes, since much of the credential-oriented further training takes place during the intervals between jobs. We further split the datafile according to the timing of further education participation. The procedures produce a final sample of about 4318 episodes for the hazards model for upward mobility and a sample of about 4812 episodes for the downward mobility model.

Selection Bias

Selection biases arises from various sources: sampling bias due to non-random sampling or due to lack of complete information on the dependent variable is one, and social selectivity of the event of interest is another. For instance, missing data on personal income for a significant portion of the population often poses a serious problem for investigations of income differentials. Our analysis focuses on the event of occupational status change, and only a small proportion of the sample (4–5 per cent) have missing data for the timing of the event. The missing cases tend to be older, more concentrated in the lower educational strata, less likely to have participated in further education, and have a much shorter work history. To investigate potential sampling bias due to the missing data for the timing of upward and downward mobility events, we apply Heckman's method (Heckman, 1979) to our data, using the LIMDEP7 program. Greene (1995) offers a brief but intuitive summary of various sample selection models based on Heckman's model. They all share the following structure:

$$y = X\beta + u_1 \quad (1)$$

$$z^* = V\gamma + u_2 \quad (2)$$

where y denotes the dependent variable of interest (e.g. income or propensity for mobility) and X denotes variables that predict y. The term, z^*, is a selection rule or a variable that indicates whether or not an observation crosses some threshold. V denotes variables that predict z^*. β and γ are the coefficients for the X and V variables. The terms, u_1 and u_2, denote the error terms. An observation is selected into the analysis only when z^* crosses the threshold. Potential bias results when data for analysis are not sampled randomly from the population or when observations with missing information on the dependent variable are omitted from the analysis. The solution to the problem is to first analyse the process that generates z^*, and then incorporate the information about this process into the estimation of y.

The procedure for using Heckman's method involves two steps:

1. use a probit model for z^*, and for each observation, compute the inverse of Mill's ratio, using the probit coefficients;

2. regress y on the X variables and the inverse of Mill's ratio to estimate the coefficients for the X variables and the covariance between the two error terms in equations (1) and (2).

In our case, the probability that a case is not missing on the timing of the event was predicted by variables such as cohort, basic education, further education, and work history. In the second step, this estimated probability (the inverse of Mill's ratio) was included as a covariate (bias correction) along with other independent variables in the Cox model to predict the hazard rate of upward and downward mobility.

Another source of selection bias comes from social selectivity of participation in further education. Participants are a selective group of individuals who may have a higher than average propensity for occupational upward mobility to begin with. Therefore, the characteristics associated with participants are important determinants of occupational mobility. Lack of control of these attributes would lead to an upward bias in estimates of further education effects on occupational mobility. One important dimension of such selectivity includes demographic and social characteristics, such as age, gender, basic education, labour-market sector, work history, and occupational status (Müller, 1977; Felmlee, 1988; Tuijnman, 1989; Li *et al*., 1995; Schömann and Becker, 1995; Becker, 1993; Becker and Schömann, 1996; Schömann *et al*., 1997).

We control for such social selectivity by including these factors in the analysis. This allows us to estimate the effect of further education on occupational mobility independent of social selectivity. As we will demonstrate, correlated residuals between occupational mobility and further education (hence selection bias) can be substantially reduced by controlling for such selection factors. We employ the bivariate probit model to estimate the correlated residuals. The advantage of the bivariate probit model is that one can estimate two different equations at the same time, allowing the residuals for the two dependent variables to correlate (Greene, 1995: 457; 1993: 660). For example, in our case, one equation predicts the probability of upward mobility and the other predicts the likelihood of further education participation. Procedurally, we estimated four pairs of equations: upward mobility with each of the four binary indicators of participation in further education as will be shown in Tables 1, 2 and 3.[10]

There is another dimension of selectivity which is based on 'unobserved' individual heterogeneity (Heckman and Hotz, 1989; Heckman and Smith, 1996: 59–71). Such unobserved heterogeneity may be commonly related to the dependent and independent variables of interest, and lack of control for it may also lead to upward biases in the estimates. Selection on unobservables occurs when unknown factors enter the decision rule for further education participation. Researchers have no information about such factors and hence they are 'unobserved', but they may be observed by the person deciding to go into further training programmes (Heckman and Smith, 1996: 63).

One example is that individuals may possess private information about gains from the participation that cannot be proxied by the available data. Heckman and Smith (1996: 61, equation 2.19) illustrate two components of the gains from participation in a training programme:

1. the expected or observed gains for the average person with relevant characteristics controlled for in the model; and
2. unobserved or idiosyncratic gains for a particular person.

Under self-selection, individuals who have a comparative advantage in the programme and who are more motivated may be more likely to participate in the programme and thus will have a larger gain from the participation than would the average population with the same characteristics (Maddala, 1983: 261–267; Heckman and Smith, 1996: 60). Participants in further education may be better informed than the general population about conditions in the labour market. Therefore, the gains from further education attainment in terms of increased chances for occupational mobility may be larger for the participants than for the average person.

We use the treatment effects model described in LIMDEP7 (Greene, 1995) to adjust for such bias. The treatment effects model is similar to Heckman's approach to selection bias:

$$y = X\beta + z\delta + u_1 \tag{3}$$

$$z^* = V\gamma + u_2 \tag{4}$$

$$z_i = 1 \text{ if } z_i^* > 0 \text{ and } z_i = 0 \text{ if } z_i^* \leqslant 0$$

where z indicates the presence or absence of participation in a programme, and δ denotes the effect of z on y. The rest of the terms have the same denotations as in equations 1 and 2. Here, instead of predicting the probability for inclusions (not being a missing case for the timing of the event), the treatment effects model in our case predicts the probability of participation in further education. Participation was coded as '1' and non-participation and missing categories were coded as '0'. A second bias correction variable (the inverse of Mill's ratio) is first estimated in the probit model and then included as a covariate in the hazards model which includes all observations (participants, non-participants, and missing cases).

Variables

The dependent variables are the instantaneous rates of the first upward or downward movement during the period (measured in months) between labour-force entry and the fifth job, controlling for the timing of the event.[11] We use the same criteria as Blossfeld (1989: 69) to define upward mobility: a job change with more than a 10-per-cent increase in occupational prestige scores is counted as an upward move. Consistently, we also define a downward move as a job change with more than a 10-per-cent decrease in occupational prestige scores. An examination of the first four job changes in our data shows that these definitions capture 78 per cent of all upward moves and about 82 per cent of downward moves in the sample. About 46.4 per cent of the sample have made one or more upward moves as we have defined above. Among them, about 80 per cent have made only one move, and 20 per cent have made two or more moves. About 31.4 per cent of the sample have made downward moves. Among them, 78 per cent made only one move, and 22 per cent made two to four moves. The analysis focuses on the first upward and downward moves.[12]

The independent variables include three types of further education (occupational updating, advanced training, and retraining), basic education, previous occupational status, authority at the workplace, work experiences, work interruption, labour-market sectors, the size of the firm, cohort membership, and the episode type (for more detail see the Appendix)[13]. The time-constant covariates include basic education, measured as education obtained before the first entry into the labour force, and cohort membership. Several dummy variables were used to distinguish among various levels of basic education: primary school, secondary school, apprenticeship, middle school with diplomas, and technical college and university. Apprenticeship was the reference group. A dummy was used to differentiate the two cohorts, the younger cohort of 1959–61 being the reference group.

The time-varying variables include the three types of further education and the remaining covariates. The first type, *occupational updating*, is further education which is related to labour-market activities but does not entail a credential.[14] Regular and occasional participants are contrasted with non-participants (the reference group). The second type, *advanced training*, is further education aimed at a higher degree. The third type, *retraining* is learning a new or second occupation. One important difference between advanced training and retraining is that the former requires a vocational degree to have already been attained before participation, whereas the latter does not have such a prerequisite. For both types, participants are contrasted with non-participants. The distributions of the independent variables are displayed separately for men and women in the Appendix.

Results

Upward Mobility

The survival function in Figure 1 reveals different mobility processes for men and women. From 0 to 18 months there is no difference, but from 20 months onwards, a gender divergence emerges and continues throughout the observation period. At the point of 220 months, about 72 per cent of women have not made a first upward move versus about 58 per cent males who have not experienced the event. It suggests that men on average have a much higher probability for upward movement, and they tend to move at an earlier stage of their work life than women do.

The multivariate results are presented in Table 1, separately for men and women. In the third column of Table 1 we present the summary results from an interactive model, which pooled the female and

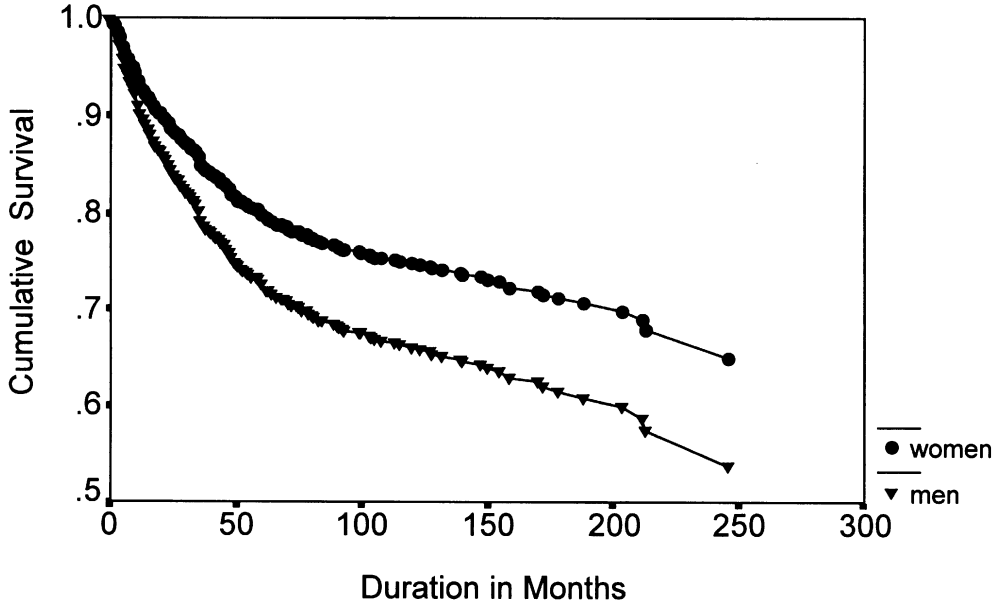

Figure 1. *Upward mobility patterns by sex*

male samples together and specified gender interactions with all covariates. Stars in that column indicate that a covariate effect differs significantly by sex. We focus our discussions of the results on the main issues we want to address, but control variables of statistical significance will also be discussed.

The results show that regular participation in non-credential-oriented further education has no significant effect on the upward mobility rate for either men or women. Regular participation in this type is most likely to be financed by the firm. Therefore, it does not increase the chances for between-firm upward mobility, but it may increase chances for promotion within the firm. Occasional participation in this type of further education tends to lower the probability of upward mobility for men, but the effect is not statistically significant for women. Occasional participation in further education aimed at updating job skills may be supported by the firm or financed by the individual. In either case, male participants tend to stay on in the same job. When a job change does occur, it may not involve a substantial increase in occupational status. Considering that much of further training for occupational updating is financed by employers, it is not surprising that it reduces between-firm upward mobility.

Because we have a good number of missing cases for the timing of participation in occupational updating, its effect on upward mobility may be underestimated. A dummy variable for the missing cases was included in the model. For men, the missing cases are not significantly different from others, but for women, the missing category has a higher rate of upward mobility than others. However, since we have no information on when the participation took place, we cannot determine the direction of causality. If the participation occurred before the event of upward mobility, it is likely that further training for skill updating increased the chances of upward mobility. But if the participation took place after the event of mobility, the opposite might be true. This issue will be further addressed later in this section.

Consistent with our hypothesis, further education aimed at a higher credential significantly increases the upward mobility rate for both men and women. Moreover, the effect appears to be much larger for women than for men. The sex difference may be attributed to the fact that women who manage to complete an advanced degree through further education form a highly selective group. For instance, the participation rate is twice as low for women as for men, 3 versus 6 per cent. Participants

Table 1. *Effects of further education on upward occupational mobility: estimates from the Cox proportional hazards model*

Variables	Men B (S.E.)	Women B. (S.E.)	Sex difference
Further education			
Occupational updating			
regular participation	0.207 (0.203)	−0.146 (0.312)	
occasional participation	−0.414 (0.162)*	−0.008 (0.184)	
timing missing	−0.176 (0.111)	0.359 (0.123)**	
Advanced training	1.111 (0.169)***	1.856 (0.253)***	*
Retraining	0.321 (0.249)	1.541 (0.336)***	**
Cohort 1950	0.096 (0.102)	−0.342 (0.123)**	**
Basic education			
Primary	−0.902 (0.255)***	0.148 (0.181)	**
Secondary	0.095 (0.186)	0.121 (0.174)	
Apprenticeship	—	—	
Middle school with degree	0.060 (0.238)	0.800 (0.208)***	**
College/university	0.395 (0.291)	0.722 (0.423)$^{+}$	*
Previous occupational status	−0.072 (0.006)***	−0.088 (0.007)***	
Authority at workplace	−0.012 (0.086)	−0.059 (0.123)	
Labour-force experience	−0.006 (0.002)***	−0.006 (0.002)*	
Labour-force interruption	−0.320 (0.216)	−0.005 (0.175)	
Job episode	−1.853 (0.110)***	−0.778 (0.125)***	***
Public sector	−0.164 (0.137)	−0.079 (0.154)	
Service sector	0.203 (0.113)	0.189 (0.137)	
Firm size	0.069 (0.035)*	0.016 (0.049)	
Episodes	2120	2198	
Events	433	316	
−2 log likelihood	5636.2	4174.9	
Chi-square	474.3***	340.5***	
d.f.	18	18	

$^{+}p \leqslant 0.10$, $*p \leqslant 0.05$, $**p \leqslant 0.01$, $***p \leqslant 0.001$.

in this type of further education in general are a selective group of individuals, but the female participants are even more 'exceptional'. Hence, we are comparing a group of 'exceptional' women with selective male participants.

Also consistent with our expectations, the results show that further education for learning a new occupation has a positive effect on the upward mobility rate for women, but not for men. Overall, the results confirm our hypothesis that advanced training will have a larger positive effect on occupational upward mobility than retraining. Among men, advanced training significantly increases the chances of occupational mobility, whereas retraining does not. Among women, both advanced training and retraining have a positive effect on the mobility rate, but advanced training seems to have a larger effect than retraining does. Again, the main reason is that retraining means some depreciation of the initially invested human capital, whereas advanced training is built upon the initial investment.

Several control variables have significant effects on the dependent variable. Older women are less likely than younger women to move upwardly, but among men, cohort does not have a significant effect. For men, having only primary education significantly reduces the chances of upward mobility, but among women it is not significant. Women who have completed middle school with degrees are much more likely to move upward than the reference group. Women with middle-school degrees are not trained for a specific occupation and they tend to be located in a less differentiated labour-market sector. These conditions make them more mobile

than those who obtained an apprenticeship. To a lesser degree, women with college or university degrees are also more likely to move up than the reference group, maybe because of their higher educational qualifications and their favourable labour-market location.

For both men and women, previous occupational status and work experiences are negatively associated with the rate of upward mobility. The effect of previous occupational status may be understood as a 'ceiling' effect. That is, the higher one is on the occupational ladder, the less room there is for upward mobility. As for work experience, the longer one has worked for a firm, the more one is settled in the job. The variable, 'job episode', has a strong negative effect on the mobility rate. In other words, those who have interruptions between jobs (therefore having interruption episodes) are much more likely than those without interruption (having job episodes) to move up through a firm change. This effect is much stronger for men than for women. It is consistent with the observation that men tend to have job interruptions for reasons related to occupational mobility, whereas women often experience job interruptions for family-related reasons.

In further analysis we have examined the cohort interactions with further education and other covariates, separately for men and women (analysis available upon request). Most of the independent variables have a uniform effect on the mobility rate across cohorts, suggesting that the pattern of occupational upward mobility remains stable across the cohorts and over the two decades covered in the data. One notable exception, however, is that participation in advanced training has a substantially stronger positive effect for younger than for older women. This suggests that younger women are much better able to translate their additional education in the form of advanced training into higher occupational status. This difference is independent of cohort differences in labour-market commitment, since work experiences and work interruptions have been controlled in the model. It may reflect more structural opportunity for younger women who have obtained the highest level of further training to achieve upward mobility.

In addition, younger women with primary education have a relatively higher mobility rate than the reference group does, but this does not hold true for older women. It is important to bear in mind that although more mobile, the primary group on average still has a lower status than those who have completed an apprenticeship, which is the standard credential for the Swiss labour market. At best, the primary educational group could catch up with the apprenticeship group via further education, but it is unlikely that they would surpass the latter in the current occupational status as they would need to make twice as much effort to do so.

Downward Mobility

Given the very different occupational paths men and women take, we present the results for downward mobility separately for men and women, even though we have found no significant gender difference in downward mobility rates. Figure 2 illustrates the mobility process by gender. In general, the mobility rate is lower on average than that for upward mobility. At the point of about 207 months, about 75 per cent of the cases have not experienced a first downward move, and this holds true for both men and women.

The multivariate results in Table 2 show that regular participation in further education and advanced training has only a small negative effect on the risk of downward mobility among men. For women, none of the three types of further education has a significant effect on downward mobility. Older women have a significantly lower risk of downward movement than younger women, but the risk does not differ by cohort for men. Women with basic education at the primary and secondary levels have a higher risk of downward mobility than those at the apprenticeship level. Recall that we observed earlier that younger women at the primary educational level are also more likely to move upward than the reference group. Taken together, these findings suggest that the bottom educational group is more vulnerable to labour-market instability.

For men, in comparison to the reference group, those with secondary education are more likely to move downward, but those with middle school and college/university education have a lower risk of downward mobility. Women with college/university education also have a lower risk of downward mobility than the reference group. Overall, the effect of basic education is very similar across gender: below

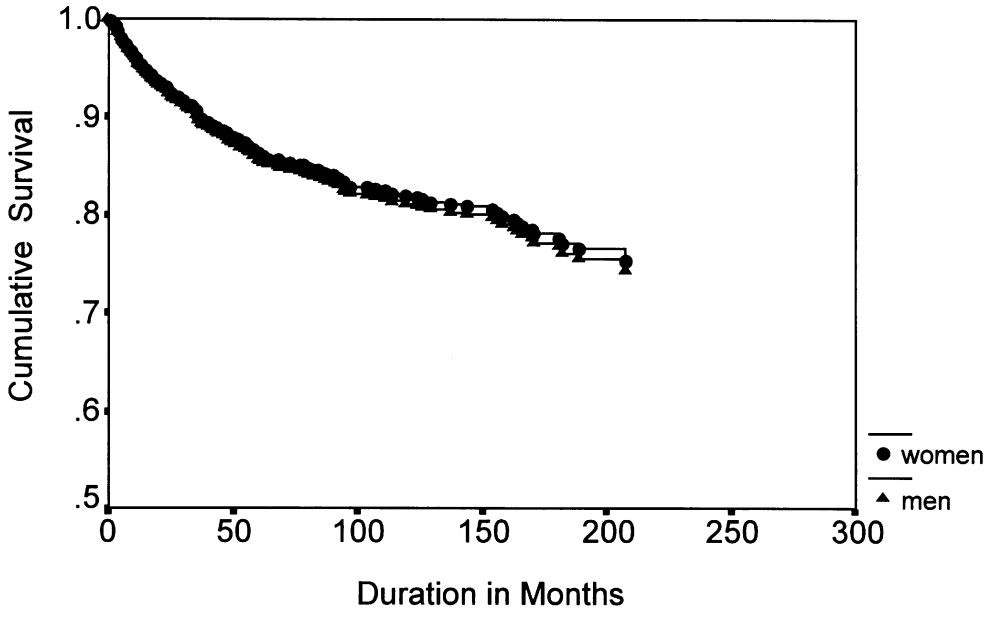

Figure 2. *Downward mobility patterns by sex*

the apprenticeship level, the risk of downward mobility is higher, and above this level the risk is lower. Several other control factors are also significant. While previous occupational status and employment in the service sector (for women only) are positively associated with the risk of downward mobility, job episodes, work experience, employment in the public sector (for men only), and firm size (for women only) have negative effects on the risk.

In a further step, we have examined cohort differences in the effects of further education on downward mobility (analysis available upon request). We found that the effects of further education did not differ by cohort, but there are significant cohort interactions with several control variables. One cohort difference concerns the effects of basic education among men. Having technical college or university degrees significantly reduces the risk of downward mobility for younger men but not for older men. This difference contradicts the 'credential inflation' argument and suggests that attainment of the highest level of education may have become more important in preventing downward mobility.

For women, the effects of the independent variables did not differ by cohort, with one exception. Employment in the public sector reduces the risks of downward mobility for older women but not for younger women. It is likely that labour-market dynamics and other structural changes have made employment in the public sector a less effective measure against the risk of downward mobility than it used to be. Alternatively, one can think of this cohort difference as an age effect. Working in the pubic sector may be effective for preventing downward movement only at a later stage of the life course or at a higher level of seniority, which to some extent reflects age.

To assess the contribution of further education to the overall explanatory power of the models, we conducted likelihood ratio tests. The improvement in model prediction for upward mobility is highly significant at the $p < 0.001$ level for both men and women. Once again, this confirms our hypothesis that further education plays an important role in occupational development. The improvement in the explanatory power of the downward mobility model is not as large as that for upward mobility, but it is still significant at the $p < 0.05$ level.[15]

Selection Bias

Thus far we have found that independent of social selection factors, credential-oriented further education

Table 2. *Effects of further education on downward occupational mobility: estimates from the Cox proportional hazards model*

Variable	Men B (S.E.)	Women B (S.E.)	Sex difference
Further education			
Occupational updating			
regular participation	−0.461 (0.276)$^{+}$	−0.455 (0.289)	
occasional participation	−0.287 (0.206)	−0.120 (0.193)	
timing missing	−0.012 (0.144)	−0.090 (0.139)	
Advanced training	−0.607 (0.328)$^{+}$	0.540 (0.327)	*
Retraining	−0.071 (0.361)	0.179 (0.357)	**
Cohort 1950	−0.188 (0.138)	−0.575 (0.137)***	**
Basic education			
Primary	0.008 (0.313)	1.504 (0.183)***	**
Secondary	1.187 (0.216)	0.823 (0.188)***	
Apprenticeship	—	—	
Middle school with degree	−1.452 (0.466)**	−0.260 (0.234)	**
College/university	−0.785 (0.296)**	−1.126 (0.389)**	*
Previous occupational status	0.049 (0.007)	0.065 (0.007)***	
Authority at workplace	0.036 (0.099)	0.136 (0.094)	
Labour-force experience	−0.008 (0.002)	−0.012 (0.003)***	
Labour-force interruption	−0.275 (0.294)	−0.182 (0.211)	
Job episode	−1.391 (0.162)	−0.962 (0.144)***	***
Public sector	−0.840 (0.300)	−0.174 (0.152)	
Service sector	0.091 (0.148)	0.362 (0.172)*	
Firm size	−0.064 (0.045)	−0.099 (0.050)*	
Episodes	2397	2415	
Events	242	260	
−2 log likelihood	3267.1	3579.9	
Chi-square	168.1***	179.9***	
d.f.	18	18	

$^{+}p \leqslant 0.10$, *$p \leqslant 0.05$, **$p \leqslant 0.01$, ***$p \leqslant 0.001$.

has a significant effect on the hazard rate of upward mobility, but it has only a small effect on downward mobility. The effect may well reflect participants' desire and motivation to improve their occupational status as suggested in previous studies (Rubenson, 1987: 43; Boshier and Collins, 1983; Bowlby and Shriver, 1970; Felmlee, 1988; Becker, 1991). Like other unobservable attributes, motivation for occupational achievement may be a common causal factor for both further education and upward mobility. To address this issue, we used the bivariate probit model to estimate the correlation between the residuals for upward mobility and further education participation. Table 3 shows the bivariate probit estimates of the correlated residuals for the two events. Panel I excludes social selection factors and Panel II includes them (basic education, occupational status, work history, labour-market sector, firm size, and level of authority at the work place). In Panel I, both events are predicted with cohort only. Further education variables were not included in the bivariate equation to predict occupational mobility because it would introduce residual correlations that confound with the effect of social selection factors. For both men and women, the ρ coefficients are very large and highly significant in Panel I, suggesting a strong correlation between the two residuals and hence the two processes. Nonetheless, this correlation is drastically reduced when social selection variables are controlled for in Panel II. A clear implication is that by controlling for these selection variables, as we did in the Cox regression model, we have substantially reduced the spurious association between further education and upward

Table 3. *Bivariate probit estimates of residual correlations between further education participation and upward occupational mobility*

	I[a]		II[b]	
	Residual correlations (ρ)	**S.E.**	**Residual correlations (ρ)**	**S.E.**
Men				
Regular participation	−0.563****	0.031	0.088	0.057
Occasional participation	−0.419****	0.033	0.158***	0.047
Advanced training	−0.676****	0.032	−0.065	0.039
Retraining	−0.755****	0.027	−0.145*	0.062
Women				
Regular participation	−0.702****	0.026	0.090	0.084
Occasional participation	−0.519****	0.030	0.069	0.054
Advanced training	−0.810****	0.020	−0.215**	0.071
Retraining	−0.846****	0.016	−0.184**	0.076

[a]Without control for social selection factors (basic education, occupational status, and work-related characteristics).
[b]With control for social selection factors.
*p ⩽ 0.05, **p ⩽ 0.01, ***p ⩽ 0.0025, ****p ⩽ 0.0005.

Table 4. *Re-estimates of the effects of further education adjusting for selection bias*

	Men B (S.E.)	**Women B (S.E.)**
Upward mobility		
Occupational updating		
regular participation	0.352 (0.342)	−0.528 (0.539)
occasional participation	−0.884 (0.317)**	−0.396 (0.498)
Advanced training	0.631 (0.296)*	1.524 (0.468)**
Retraining	0.178 (0.358)	1.115 (0.581)*
Selection bias adjustment I[a]	−0.607 (0.321)	−0.443 (0.415)
Selection bias adjustment II[b]	0.325 (0.194)	0.165 (0.294)
Downward mobility		
Occupational updating		
regular participation	−0.677 (0.489)	−0.461 (0.485)
occasional participation	−0.532 (0.461)	−0.411 (0.507)
Advanced training	−0.516 (0.461)	0.303 (0.441)
Retraining	0.154 (0.481)	0.051 (0.506)
Selection bias adjustment I[a]	0.029 (0.408)	−0.458 (0.467)
Selection bias adjustment II[b]	−0.009 (0.286)	0.192 (0.289)

[a]Adjustment for bias due to missing data on the dependent variables.
[b]Adjustment for bias due to unobserved heterogeneity.
Note: Other control variables were included in the model but for brevity they are omitted from the table.
*p ⩽ 0.05, **p ⩽ 0.01, ***p ⩽ 0.001.

mobility and thus have improved our estimates of further education effects. The residual correlation, nonetheless, remains significant in Panel II for occasional participation and upward mobility among men. For women, the residuals are still significantly correlated for advanced training/retraining and upward mobility.

An important question remains: to what extent may these findings be affected by two other sources of selection bias? One is the missing data on the timing of mobility events, and the other is unobserved heterogeneity of participation in further education. To address this issue, we used the probit model to estimate two bias correction variables (the inverse

of Mill's ratio) and then included them in the hazards model as covariates. One is the adjustment for selection bias due to missing data on the dependent variable (selection bias adjustment I). The other adjusts for the bias due to self-selection based on unobserved individual characteristics (selection bias adjustment II).

Table 4 shows the new estimates of further education effects, controlling for these selection biases. Social selection variables were controlled for as they were in Tables 1 and 2, but for brevity we do not present them here. For upward mobility, the effects of occasional participation in occupational updating and advanced training remain significant for men, but the significance level has changed. The effect of advanced training has become substantially smaller, but the effect of occasional participation in occupational updating has increased. This is not surprising because, as discussed earlier, the missing data on participation can lead to an underestimation of its impact on mobility, and the selection adjustment II may have reduced some of the bias due to the missing data.

Consistently, among women, the effects of occupational updating have increased, although they remain non-significant. The effects of both advanced training and retraining have decreased, although they remain significant when the selection bias adjustments are included in the model. For downward mobility, the effect of occupational updating has increased, and the effect of advanced training has decreased, although they all remain non-significant. One implication is that without taking the selection biases into account, we might have to some extent either over- or underestimated the influence of further education on occupational upward mobility among men.

The inclusion of the inverse of Mill's ratio in a linear regression model often introduces heteroscedasticity in the error term. The presence of heteroscedasticity violates the important assumption of constant variance in the disturbance term, an assumption which is required for the ordinary least squares estimation in linear regression models. Heteroscedasticity leads to biased estimates of the variance of regression coefficients and hence inefficient (or not minimum-variance) estimates of the coefficients (Heckman, 1979; Johnson, Johnson and Buse, 1987: 292–299). Heteroscedasticity is typically associated with cross-sectional data (Johnson, Johnson and Buse, 1987: 296–297) and its consequence for event-history data is unknown. We know of no statistical methods that address this problem in event-history models, although there are ways of modelling heteroscedasticity in probit, bivariate probit, and tobit models (Greene, 1995).

To get a sense of the extent to which the presence of heteroscedasticity may affect the results, we ran two probit models which predicted the probability that the event of mobility occurred, using the same covariates as employed in the Cox regression model. We estimated one probit model with heteroscedasticity taken into account and the other without it, using the LIMDEP program. In general, the magnitude of the estimates either decreased or increased from the models with heteroscedasticity taken into account to models without it, but the significance level remains unchanged. We believe that the results would not change significantly if we had a way to control for heteroscedasticity in the hazards model.

Another potential problem with the inclusion of the inverse of Mill's ratio is that it may cause multicollinearity with other covariates, a problem which can lead to imprecision of parameter estimates, depending on the degree of collinearity. Large standard errors are a good indicator of the problem. Typically, a dramatic change in the magnitude of the standard error on a particular coefficient with the inclusion or deletion of other covariates indicates multicollinearity (Johnson, Johnson and Buse, 1987: 263–275). A reversal of the coefficient sign suggests severe collinearity. When comparing the standard errors for further education coefficients presented in Table 4 and those in Tables 1 and 2, we notice a visible increase in the standard errors with the inclusion of the two bias adjustment variables. On the other hand, there is no reversal of coefficient signs, except for the coefficient for the retraining variable in the downward mobility model for men, which, nonetheless, remains non-significant. Also, the significance or non-significance of the other coefficients remains unchanged, although the magnitude has either decreased or increased. In sum, the inclusion of the inverse of Mill's ratios may have indeed introduced a certain amount of multicollinearity with the further education variables, but it is not severe enough to alter the

hypothesis testing of the effect of further education on occupational mobility.[16]

Weighting

We have thus far presented the weighted results. A question remains as to whether the weighted results are different from unweighted ones. We have compared the two results and noticed an important difference in gender interactions with participation in advanced training and retraining. The weighted analysis shows that the effect of these types of further education is substantially stronger for women than for men, whereas the unweighted analysis does not reveal such a difference. We have pursued various ways of respecifying the model as suggested by Winship and Radbill (1994: 248–249), for example, by adding the weight variable and sensible interaction terms in the model.

Even after following these procedures, however, the difference remains. What does it mean? Because women exhibit very different labour-market behaviour than men do in Switzerland, gender differences in occupational mobility patterns are to be expected. The larger effect of advanced training and retraining for women reflects greater selection of female participants. The weight variable in our case is a function of basic education. Given the strong association between basic and further education and gender differences in both types of education attainment, the weight variable must also be related to sex and further education. In this light, the weight variable is correcting for the biased effects of these variables on occupational mobility.[17]

Discussion and Conclusion

Overall, the results are consistent with our hypotheses derived from human-capital, signal/filter, and segmentation theories. Further educational attainment aimed at a formal credential, such as advanced training and retraining, significantly increases the rate of upward occupational mobility. Occasional participation in occupational updating has a negative effect on upward movement for men. The findings have also shown that not all types of further education under consideration have a significant effect on occupational mobility. Thus, a distinction among various types of further education is important for understanding the link between further education and occupational achievement.

Further, our results have revealed that Swiss men and women have different patterns of upward mobility. Given the low labour-market participation rate among Swiss women, it is important to control for factors reflecting gender differences in labour supply when we compare mobility processes between men and women. We have partially controlled for these by including basic education in the analysis, but we were unable to control for other factors, such as marital status, and the number and age of children.[18] For this reason, we must be careful in interpreting the finding that the effect of further education is stronger for women than for men. Rather than saying that further education yields greater gains for women, we believe that the stronger association between further education and upward mobility among women reflects grater selectivity of female participants.

The findings further demonstrate that there is a selection process involved in occupational mobility. Credential-oriented further education increases the chances of upward mobility, but participants are a selective group of individuals who may have a higher propensity for occupational achievement to begin with. Therefore, to estimate the true effect of further education on occupational mobility, demographic and social characteristics associated with participants must be taken into account. Our findings have clearly demonstrated that by controlling for these variables, one can substantially reduce selection bias. There may still be other unknown selection factors which influence individuals' decisions about participation in further training and job mobility. We have attempted to address this issue by using Heckman's method, but future analysis using alternative methods (e.g. Lillard, 1993; Larsen and Rohwer, 1993) would further improve our understanding of the association between further education and occupational mobility and the selection processes involved.

We found that downward movement is a less frequent event, and we found no gender difference in such movement. The relatively low rate of downward mobility may be attributed to Switzerland's stable economy and a large foreign worker base.

Foreign workers with low skills take up lower-level jobs so that native workers may be able to move up or maintain their position on the occupational ladder. We found that further education has only a moderate negative effect on downward mobility for men. In contrast, basic education is a much more effective measure against downward mobility. Those with a standard credential (apprenticeship) constitute a middle category; below this level, the risk for downward mobility is higher, but above it the risk is lower.

Due to lack of data, our analysis has been limited to the first five job changes of the respondents. Because of this restriction we may have underestimated the effect of further education on occupational mobility. Nevertheless, the underestimation is likely to affect only a small proportion of individuals, since the vast majority of them do not move frequently in the Swiss labour market. It is also possible that further education may not have an effect on occupational mobility until later career stages. Therefore, data on a longer span of individuals' work lives would provide more insight. On the other hand, we should not forget that the probability of occupational mobility is likely to decrease as one ages. There may still be an underestimation of the effect of occupational updating due to the factors discussed earlier. Future studies which differentiate between firm-provided and privately financed non-credential further education and which are based on more complete information on the timing of the participation would shed more light on the impact of this type of further education on career outcomes.

Notes

1. Müller (1977) and Becker (1991) distinguished between degree- and non-degree-oriented further training, but they did not do so when examining the effect of further education on occupational status. Tuijnman *et al*. (1988) distinguish four types of further education and rank-order them; (1) non-credential general adult education, (2) credential-related general adult education, (3) non-credential career-related adult education, and (4) credential career-related adult education. However, this construction does not differentiate two types of credential-related further education. One type entails an advanced degree and constitutes a career path, and the other involves occupational reorientation or retraining which has no connection with a previous credential.
2. In contrast to countries whose educational system emphasizes general knowledge, the Swiss educational system is highly vocation-oriented and differentiated. After four to six years of primary schooling, pupils choose one of the three types of secondary schools – *Realschule*, *Sekundarschule*, and *Gymnasium*. Most of the graduates of *Realschule* and *Sekundarschule* serve a traditional apprenticeship and obtain an official certificate upon completion, and the majority of graduates from *Gymnasium* go on to universities. After age 15, the majority of young people invest in formal schooling which is aimed at a specific occupational credential. The data for this analysis show that at the point of first labour-force entry, 11% of respondents had primary schooling, 11% had secondary schooling, about 63% had vocational training or had served apprenticeships, about 8% had middle-school degrees, and 8% had technical college or university degrees. The credential-orientation of the Swiss educational system is reinforced by the hiring practice of employers, who rely mainly on occupation-specific credentials to allocate people to jobs. Only in times of labour shortage will employers consider hiring those without occupational credentials (Buchmann and Sacchi, 1998). These characteristics suggest a strong link between education and occupational allocation in Switzerland, and this tight link in turn implies that further education obtained during the work life will have a significant impact on occupational attainment.
3. The culture discourages Swiss women from combining motherhood with a career. The lack of institutional support for working mothers – such as a lack of adequate childcare centres and incompatibility between children's school, shopping, and working hours – restricts their ability to do so (Charles and Buchmann, 1994; Buchmann and Charles, 1995). For instance, only about 30% of women with children under age 6 are gainfully employed (Charles and Buchmann, 1994) as compared with 50–60% of married American women with children under age 6, working either full or part time (Deseran, Li and Wojtkiewicz, 1993: 178–179).
4. There are four official languages in Switzerland: German, French, Italian, and Romantsch. About 65% of the total Swiss population speak German. Compared with other multilingual nations, economic, political, and cultural divergences are quite modest in Switzerland. Foreigners were excluded from the survey for a number of reasons. First, the

response rate among foreign workers was anticipated to be quite low due to the fact that many of them do not speak German. Second, resources did not allow for a sufficient over-sampling of various groups of foreign workers to make a meaningful comparison across groups. Third, many foreign workers obtained their schooling outside Switzerland and it would be difficult to compare educational careers between native Swiss and foreigners.

5. Region types were defined based on the labour-market structure (Schuler and Nef, 1983).
6. A non-integer weight factor is available in the dataset for this purpose. In addition, an integer weight variable with similar properties was created to correct the over-sampling biases for the Cox models which require integer weights.
7. About 80.2% of respondents worked full time (38 or more hours) and 5.4% worked less than 38 hours per week in the first job. About 14.3% of the sample did not report their working hours.
8. Interactions of sex and cohort with duration were created using the SPSS commands ('Time Program') for the Cox regression model and were tested in the model. Significant coefficients for the interaction terms suggest that the hazard rate of upward mobility differs by sex or cohort over time. For upward mobility, the interaction between gender and duration has a Beta coefficient of -0.008, a standard error of 0.003, and a significance level of $p = 0.008$; for downward mobility, the corresponding figures are -0.005, 0.003, and 0.083.
9. A job interruption episode is defined as any interval between two jobs which is longer than two months. The values of time-varying covariates preceding the interval, such as working hours and occupational prestige, etc., were assigned to the interval episodes. To control for differences between job and interval episodes, a dummy was included in the analysis.
10. The estimation of the bivariate probit model was based on the same datafile as for the Cox model. One equation in the bivariate model predicts the likelihood that the event of occupational mobility occurred during the observation period and other equations predict the likelihood of participation in various types of further education before the event of mobility.
11. The data record up to 12 job changes, but the information on the relevant time-varying covariates is available only for the first five job shifts. For this reason, we include only the first five job episodes in the analysis. This restriction is unlikely to create a problem because the majority of the respondents had only four or fewer job changes.
12. Note that by our definition, upward and downward mobility events are contingent upon a job change between firms. Any possible change in occupational status within one firm is not included in the definition.
13. Both upward and downward mobility episodes were created from the same base sample of 1886 respondents. However, because the total number of upward mobility events differs from that of downward mobility events, we have two different samples of episodes for the Cox regression hazards model. For this reason, the variable distributions across episodes are presented separately in the Appendix.
14. There are many cases with missing data on the timing of occupational updating. We used the information about when the participation ended and how often a person participated in it to estimate the timing of participation, but a good portion remains missing after this adjustment. A dummy indicating the missing cases was included in the model to examine whether and how the missing cases are different from others.
15. For men, $G = (-2 \log \text{likelihood without further education}) - (-2 \log \text{likelihood with further education})$, $G = 6183.4 - 5636.2 = 547.2$, and degrees of freedom $= 18 - 13 = 5$. For women, $G = 4286.1 - 4174.9 = 111.2$ and degrees of freedom $= 18 - 13 = 5$. The likelihood-ratio test for downward mobility among men is $G = 3490 - 3267 = 223$ and for women $G = 3585 - 3579.9 = 5$, with 5 degrees of freedom.
16. We have also compared the standard errors of the coefficients for other covariates (social selection factors) in Tables 1 and 2 and those in Table 4. There is no substantial difference between the two sets of standard errors.
17. As we are uncertain about whether White's estimator provides robust standard errors for the maximum likelihood estimation with which the Cox model is estimated (Greene, 1995), we present the standard errors generated from the weighted analysis as they are. Winship and Radbill (1994: 252) have shown that on average the unadjusted standard errors from the weighted analysis are about 80% of the observed standard errors of the coefficients. In other words, the unadjusted standard errors are off by 20%. They may be downwardly or upwardly biased for that magnitude. The question arises as to whether the weighted effects would remain different from the unweighted ones if the accuracy of the estimated standard errors could be further improved. If the standard error is downwardly biased, a correction of

the bias would enlarge the difference. If it is upwardly biased, an adjustment would decrease the significance level. In any case, since the weighted standard errors are moderate and the weighted effects of advanced training and retraining among women are strong (see Table 1), a correction of the standard error in either direction is unlikely to make a significant difference.

18. These variables were not available in the event-history datafile.

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Appendix

Table A1. *Means and Standard Deviations*

	Means (standard deviation)			
	Upward mobility		Downward mobility	
Variable definition	**Men**	**Women**	**Men**	**Women**
Further education				
Occupational updating				
Regular participation (yes = 1)	0.08 (0.27)	0.05 (0.23)	0.09 (0.27)	0.06 (0.24)
Occasional participation (yes = 1)	0.14 (0.35)	0.14 (0.34)	0.15 (0.36)	0.13 (0.34)
Never participated (never = 1)	0.71 (0.46)	0.76 (0.43)	0.68 (0.46)	0.75 (0.43)
Advanced training (yes = 1)	0.06 (0.24)	0.03 (0.16)	0.09 (0.29)	0.04 (0.19)
Retraining (yes = 1)	0.03 (0.16)	0.02 (0.13)	0.04 (0.19)	0.03 (0.17)
Cohort* (1949–1951 = 1)	0.49 (0.50)	0.50 (0.50)	0.50 (0.50)	0.49 (0.50)
Basic education*				
Primary (yes = 1)	0.05 (0.22)	0.10 (0.29)	0.05 (0.22)	0.11 (0.32)
Secondary (yes = 1)	0.05 (0.21)	0.12 (0.32)	0.06 (0.23)	0.14 (0.35)
Apprenticeship (yes = 1)	0.76 (0.43)	0.63 (0.48)	0.75 (0.43)	0.61 (0.49)
Middle school + degree (yes = 1)	0.06 (0.23)	0.11 (0.31)	0.06 (0.24)	0.10 (0.30)
College/university (yes = 1)	0.09 (0.28)	0.04 (0.20)	0.08 (0.27)	0.04 (0.20)
Previous occupational status[a]	40.57 (11.30)	38.09 (11.63)	43.42 (11.64)	39.93 (11.70)
Authority at work place[b]	0.26 (0.64)	0.19 (0.55)	0.31 (0.70)	0.22 (0.59)
Labour-force experience[c]	22.85 (35.96)	24.67 (32.443)	27.23 (38.63)	27.40 (34.70)
Labour-force interruption[d]	0.07 (0.26)	0.12 (0.32)	0.11 (0.32)	0.14 (0.34)
Job episode yes = 1	0.84 (0.37)	0.74 (0.44)	0.85 (0.35)	0.74 (0.44)
Public sector yes = 1	0.20 (0.40)	0.27 (0.45)	0.20 (0.40)	0.31 (0.46)
Service sector yes = 1	0.38 (0.49)	0.73 (0.44)	0.39 (0.49)	0.74 (0.44)
Firm size (continuous)	2.69 (1.49)	2.31 (1.37)	2.27 (1.50)	2.35 (1.38)

[a]Using Treiman's scores.
[b]Using Bornschier's (1984) scale.
[c]Months worked before the event.
[d]An interruption of more than 2 years.
*These variables are time-constant; the remaining variables are time-variant.