Training Systems and Labor Mobility

A Comparison between Germany and Sweden

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Abstract

The impact of general and specific training on income and mobility is an important issue for the discussion around human capital as well as the design of educational systems. Using data from two retrospective life-history surveys this paper examines the impact of more general school-based vocational training (Sweden) and more specific apprenticeship training (Germany) on inter-firm, inter-occupational, and inter-industrial mobility. The results show that workers with a school-based vocational degree move more frequently between occupations, while no difference in firm and industrial mobility can be discerned.

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1. Introduction

It is well known that the amount of schooling and vocational training obtained by young workers is related to income and employment during working life. Less agreement exists regarding the importance of how this training is acquired. In particular there is an intense policy debate around whether or not vocational training should be offered within the general educational system, and how it should be organized if it is to be provided.

Central to this debate is the question of whether mobility of those with firm-based vocational training differs from those who received their vocational training in schools. From both the macroeconomic and individual standpoint, it is often argued that the individual level mobility necessitated by structural change requires a mobility facilitating training system (e.g. Thurow 1992). However, excessive mobility is also often said to be undesirable for the economy as a whole and the individual, in particular during the early stages of a career (e.g. Stern et al. 1995, Baily et al. 1992). While it may be difficult to establish the optimal level of mobility, an assessment of the mobility differentials related to current systems of vocational training would seem like a prerequisite for educational reform.

In principle there are two alternative ways to supply the labor market with trained workers. The first possibility would be to rely solely on firms to provide in-house training. The second possibility is to organize vocational training as school-based training, devoid of any firm specific content. In practice, vocational training in most countries takes place somewhere in between these two extremes. The US and Japan are probably the industrialized countries most closely corresponding to the first model, with little training being provided within the general educational system. Nonetheless, at least in the case of the US there are a substantial number of community colleges offering vocational courses of various kinds.

The training systems of a number of European countries also exhibit a substantial degree of firm related training. However, most of this is provided within the general educational system in the shape of apprenticeship training coupled with some general education. This type of system is frequently identified

with the dual system in Germany, but also exists in the other German speaking countries as well as in Denmark and the Netherlands. The school-based alternative is most extensively developed in some other European countries, notably Finland, France, Norway, and Sweden. As with the apprenticeship system these provide a mixture of school and firm-based vocational training, but the emphasis is here reversed. Instead of supplementing workplace training with a minimal amount of general education, most vocational skills are here taught in a classroom setting and a greater weight is also given to general education. Workplace experience is here limited to brief spells of firm-based training.

Several arguments suggest that the mobility associated with firm-based training differ from that of school-based. Training on the job will by necessity contain elements very specific to this particular job and firm, while training for the same occupation received in school will lack these elements. This may imply that a greater proportion of school-based training is transferable between different jobs, firms, and employers. It should be noted that apprenticeships systems in Continental Europe not only provide apprentices with firm specific training, they also intended to deliver transferable occupational skills with certifications attesting the acquisition of these skills. Nevertheless, the presence of firm specific elements is often the main argument for firm-based training, whereas proponents of the school-based training system laud its generality.

Furthermore, providing apprenticeship training is not costless to firms. To meet these costs, firms are often believed to strive for a long-term employment relationship, one that extends beyond the training period. Finally, workers may search for a career first before looking for the optimal employer (as in the model by Neal 1999). Apprentices will acquire extensive work experience during their training, something which may make their later job search more efficient and considerably reduce job-shopping (cf. Winkelmann 1996a). These arguments all suggest that school-based training should be associated with greater mobility than firm-based training.

However, recent research on mobility among apprenticeship trained workers in Germany suggest that the links between vocational training and mobility are less straightforward. Mobility after completion of an apprenticeship is relatively

high, both between firms and occupations (see Winkelmann 1996a and b, Harhoff and Kane 1997, Franz and Zimmermann 1999). Hence, it has been suggested that a non-negligible percentage of the training is general. If this is the case, it becomes much less certain that the mobility outcomes of an apprenticeship system differ from those of a system in which vocational training is supplied in schools rather than in firms.

It therefore seems as if two issues need further investigation. Does an apprenticeship system really reduce mobility, and if it does what kind of mobility? Modern human capital literature focuses primarily on firm-specific considerations analyzing the distinction between general and specific human capital as introduced by Becker (1962, 1964). The theoretical literature (e.g. Oi 1962, Ben-Porath 1967, Parsons 1972, Hashimoto 1981 and Parsons 1986 to name but a few) and empirical studies (see for instance Mincer 1974, Willis 1986, Abraham and Farber 1987, Altonji and Shakotko 1987, Topel and Ward 1992, Farber 1994) usually pay attention to firm separations only. Although occupational and industry specific skills are equally likely to influence mobility, there is just a limited literature on the subject (see Neal 1995 and 1999, Winkelmann 1996b, Mertens 1997 and 1998, Burda and Mertens 2001).

This paper tries to fill some of these gaps in the literature by examining the link between different types of human capital and labor market mobility. Specifically, we focus on whether the impact of apprenticeship training on firm, occupation and industry mobility differs from that of vocational training in schools. One natural setting for such an investigation is Germany, as the dual system has been the focus of much attention and as some school based vocational training also exists. However, full-time vocational schooling in Germany is relatively rare and very occupation specific, so self-selection into different types of training becomes a major issue. An alternative way of examining this question is to supplement the German evidence with information from another country in which school based training is the norm. We here compare mobility patterns of apprenticeship trained workers in Germany with that of vocationally trained workers in Sweden, who receive their training in full-time schools. Since the apprenticeship system in Germany and the system of school based vocational

training in Sweden are the standard routes to vocational qualifications in the two countries, the two groups could be expected to be relatively similar.

The outline of the paper is as follows. Sections 2 and 3 describe the vocational education systems in more detail and review the most important theoretical and empirical literature. In Section 4 we look into the effect of training on mobility using two comparable retrospective life history data sets from Germany and Sweden. In both data sets individuals who enter the labor market between the early 70s and the mid-80s are observed up until the early 1990s. In the analyses, the impact of training on the hazard rates of leaving a firm, an occupation and an industry are examined. Section 5 concludes.

2. Two systems of vocational education

The basis for this paper is the similarities and differences in the way vocational training at the upper secondary level is provided in Germany and Sweden. The key aspects are the general structure of the programs and the relative weight of workplace training in the two systems.

The core of the German system of vocational training consists of the apprenticeship, or dual, system. The starting age of an apprenticeship is between 16 and 19 depending on which track was followed in school. In the period studied here, around 50 % of German youths between 16 and 19 years of age took part in the apprenticeship system (Schober-Brinkmann and Wadensjö 1991).[1] Basically all sectors of the economy offer training and there exist roughly 360 different nationally recognized apprenticeship programs today, which usually last two to three and a half years depending on the occupation. The system is often referred to as the "dual system of vocational training" as trainees receive school education at public vocational schools (*Berufsschule*) 1-2 days per week and on-the-job training within firms 3-4 days per week.

[1] For more detailed information in English, see e.g. Steedman (1993), Franz and Soskice (1995), Soskice (1994) and Winkelmann (1997), European Commission (1995), Wagner (1999).

Full-time vocational schools (e.g. *Berufsfachschule*) also exist. However, they are of minor importance in comparison with the dual system. In addition, training is only offered in a limited number of specific occupations, e.g. nursing.

To ensure the quality of the training there are legal requirements for the minimum amount of material that has to be covered. The curricula are developed in close cooperation between employers associations, trade unions and government institutions like the Federal Institute for Vocational Training (*Bundesinstitut für Berufsbildung*, BiBB). Furthermore, there are special requirements for the training staff and examinations are set externally. However, as Winkelmann (1996a, p. 660) notes, "how much of workplace experience involves training rather than productive work is an open question. The different programs vary considerably in their training content, and while an apprentice in the crafts sector (say, a chimney sweep) will quickly do much of the work of a normal employee, many programs in the industrial sector maintain a high training component throughout the apprenticeship." Moreover, firms often train in training shops, rather than directly at the workplace.[2]

The Swedish system of vocational training was reformed in the early 1970s. Public school-based vocational training then became the preferred means of supplying youth with training, and vocational training was integrated into upper secondary education. We will here focus on the situation in the 70s and 80s, and ignore the subsequent reforms in the early 1990s, since this is the period covered by our data.

The starting age was generally around 16 to 17 years of age. The proportion of 16 to 18 year-olds receiving vocational training in upper secondary school increased slowly in the period studied here, starting from 33 % in 1975 and rising to 43 % in 1985 (Statistics Sweden, 1988). The Swedish system of vocational training was during this period characterized by having around 25 nationally recognized programs, with subdivisions a total of approx. 60 certificates. While these programs attracted the majority of the vocational students, there were also a

[2] The most recent studies that come to that conclusion are Bardeleben (1994) and Bardeleben et al (1995). For an overview of these and older studies see Harhoff and Kane (1997).

number of more specialized courses. In either case, the duration of training was generally two years, and most training was obtained in school. The time spent in a workplace varied substantially, but a rough estimate based on survey results is that an average of around one afternoon a week was allotted to firm-based training (SOU 1986).

Both traditional apprenticeships, in which all training takes place within the firm, and dual system apprenticeships existed in Sweden, but were extremely limited. This holds in particular for apprenticeships of the German type, which seem mainly to have existed on paper. Traditional apprenticeships were basically limited to a few craft occupations.

The right to change, to add, and eliminate programs resided with the national government, and so were decision regarding curricula. Decisions were preceded by extensive reviews, with both employer organizations and trade unions were involved. They also had representation on various consultative bodies dealing with issues related to curricula etc.

The German system thus differs from the Swedish in that it offers more specific training, more disaggregated and specialized vocational training, and earlier work experience. While the German system may be more sensitive to employers' needs, the supply of apprenticeships may be less flexible than the supply of school-based vocational training slots and quality control may be more difficult.

3. The linkages between the system of vocational training and labor mobility

3.1. Theoretical links

As already mentioned in the introduction little has been written on the effects of different types of vocational training on mobility. Most models of training instead focus on the provision and financing of firm specific and general training with resulting consequences for earnings possibilities and worker/firm separations. Nevertheless, these theories yield some indirect hypotheses about the relationship

between training type and subsequent mobility. The theory of job shopping by Johnson (1978) also gives some suggestions regarding the effects of education on worker mobility. These theories will be discussed in turn.

The common view suggests that on-the job investments in general human capital are borne by the worker (see Becker, 1962). If firms financed the training, workers would have an incentive to quit and work for another employer. The competitors do not provide general training because they will be able to offer a higher wage rate equal to workers' increased marginal product. Firms will only invest in general human capital if workers can be bound to the firm in some way. The problem should not disappear when workers and the firm share costs, so workers are expected to pay for their general training. It follows that workers should also be able to capture the rents of general human capital accumulation, e.g. in the form of wages and mobility opportunities.

In contrast, the standard analysis of investments in firm-specific human capital argues that investments are shared by the worker and the firm (see Becker, 1962; Oi, 1962; Parsons, 1972, Hashimoto, 1981; Parsons, 1986). Employers may be willing to finance firm-specific human capital acquisition among their workers, because marginal products outside the firm are not influenced by this investment. Obviously, the firm should be interested in paying for specific training if the investment pays off in the form of higher worker productivity. Workers will in turn invest in specific human capital if this increases their wages above the level they would receive elsewhere. It follows that labor mobility should be lower when specific human capital is present. Without specific human capital an increase in outside opportunities (neglecting mobility costs) will lead to quits.

Industry- and occupation-specific human capital investments have to be rated somewhere in-between general and firm-specific human capital, as these investments increase productivity in more than one firm, but not in every job. Investments into these types of specific human capital could also be expected to reduce mobility.

Nevertheless, two crucial issues are here why firms provide general training and to what extent workers may be retained even in a situation when training is general. As for the first question, Acemoglu and Pischke (1998, 1999) developed

a model where firms provide their workers with general training because they, relative to other firms, have superior information about worker ability. This gives firms monopsony power over workers, limiting the workers' possible gains from mobility.[3]

Regarding the second question, Soskice (1994) suggested that the German works councils and trade unions are able to limit poaching by other firms and therefore constrain mobility enough to allow firms to reap the benefits of training. Harhoff and Kane (1997) on their part proposed an argument based on unobserved heterogeneity in worker costs of mobility.[4] Workers with high mobility costs stay in the firm and pay for their own training as well as that of workers who leave the training firm. Finally, Franz and Soskice (1995) argued that general human capital and specific human capital are complements in training. When firms' production technology requires some firm specific components it might be less costly to train apprentices than external workers due to this complementarity. The upshot of these arguments is that despite the occupational component in apprenticeship training there may still be a mobility reducing effect.

Another very important aspect is what influence work experience during the apprenticeship period has on later job search decisions. Already Johnson (1978) shows that education can have a mobility reducing effect. In his job-shopping model Johnson argues that some characteristics of potential job offers cannot be known without actual employment experience: "For example, workers' tastes and abilities with respect to the job or occupation will likely be apparent only *after* some experience in the job. Job shopping is the search for a suitable job when workers cannot predict perfectly either their performance in or their liking for a particular job (p. 261)". Education might therefore act just like a first job "to narrow the uncertainty a worker feels about his own abilities, which in turn should reduce the role of learning about abilities on the job". Compared to school based

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[3] They show that German data fits their model better than predictions from the specific human capital model.

[4] Evidence that apprentices who stay with their training firm earn less than those who leave (Harhoff and Kane 1997, p. 181) suggest that there might indeed be some truth in this, although conflicting results have also been found (Euwals and Winkelmann 2001). Moreover,

vocational training apprenticeship training will be more likely to reduce uncertainty as apprentices have the opportunity to experience features of both the job and the workplace as well as their practical abilities prior to entering the labor market.

3.2. Empirical Evidence on Training and Mobility

There are two empirical issues of relevance to this paper: the type of training provided within the apprenticeship system and the impact of training type on subsequent careers. As regards the former, there is relatively little direct evidence on the type of human capital acquired during training periods. According to Franz and Soskice (1995) the fact that firms invest into apprenticeship training speaks in favor of (at least some) firm specific training, as it is more expensive to teach company-specific skills to externally hired workers. Winkelmann (1996b) also notes that there is likely to be both some firm specific and general human capital.

Lacking direct evidence, an indirect strategy of examining mobility (and sometimes wage) effects is commonly used to infer something about the type of training. Winkelmann (1996a) reports that 13% of those completing an apprenticeship experience an immediate unemployment spell. Still, those with university or post-secondary full-time school training experience higher rates of post training unemployment incidence. Winkelmann (1996a) refers to two different possible explanations for why apprenticeship graduates experience a smoother transition to work. First, their early attachment to the labor force may provide workplace experience that promotes efficient search. Second, search issues do not arise for a large percentage of young workers at all, as 69% stay with their training firm after the apprenticeship. Similar results are reported by Booth and Satchell (1995) for the UK. They look at young workers in the 1970s and find that completed apprenticeships significantly reduce the (voluntary and involuntary) exit rates from a job. As they argue this indicates that both employers

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Franz and Zimmermann (1999) have shown that firms with high training costs retain a larger proportion of their trained workers.

and youths with completed apprenticeships wish to continue the employment relationship.

However, Franz and Zimmermann (1999) report that 50% of all young workers have left their training firm within the first two years, and only 30% stay with their firm five years after the apprenticeship (see also Winkelmann 1996a). Harhoff and Kane (1997) report basically the same average retention rates of 30% after 5 years, but report higher retention rates for workers in large firms. Moreover, they show that this is a long-term phenomenon (since the 1950s). These findings seem to indicate that firm specific human capital is of less importance than casually assumed, and that workers are equipped with portable skills.[5]

In addition, other studies have shown that there is some occupational mobility, although there is less occupation than job mobility (see e.g. Hofbauer and Nagel 1987; Hennings 1991; Werwatz 1998). Hofbauer and Nagel (1987) report that 40% leave their training occupation, as measured by the 2-digit occupational code, within 5 ½ years.[6] The amount of occupational mobility found when using subjective measures of occupational change is usually somewhat lower than when using code based measures, but still significant (Werwatz 1998, also compare Herget et al. 1988). Along these lines Werwatz (1998) has shown that the majority of workers who switch from their training occupation do not experience wage losses. Moreover, among those workers who switch occupation only a minority report to use very little or none of the skills acquired during the apprenticeship.

As far as industrial mobility is concerned, Winkelmann (1996b) reports that vocational training tends to be associated with less mobility than primary and secondary general education. It is however unclear whether there are any differences between various types of training.

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[5] Steedman (1993) for example notes that apprenticeship training provides occupation specific skills with high substitutability among jobs within the same occupation.

[6] This corresponds to findings for other countries with apprenticeship training like the Netherlands where high rates of e.g. technically trained people work in non-technical occupations (see Borghans et al. 1995).

3.3. Summary

Both theory and evidence thus suggest that firm- and occupation specific skills are not the sole type of human capital acquired during apprenticeship. The overview also points to some issues neglected in previous research. Most studies to date deal with the direct transition from training to work, and if later job turnover is looked at it is often only the first job after the apprenticeship. Little is however known about subsequent mobility. Moreover, most studies have focused on firm-shifts, and there has been less interest in occupational and industrial mobility. Nevertheless, the latter are most likely to give an indication of the types of human capital acquired during training periods, and it is also of direct relevance for the policy discussion. Is vocational training in Germany more specific than in Sweden? Does this reduce mobility after training?[7]

4. Labor market mobility in Germany and Sweden

4.1. Data

The German data is taken from the German Life History Study (GLHS), while the Swedish data comes from the Swedish Level of Living Survey (LLS). The GLHS contains information on representative samples of different German birth cohorts. The analyses here are based on the cohorts born 1954-1956 and 1959-1961, interviewed in 1989, who entered the labor market roughly between 1968-1975. The sample size is around 2000 men and women. The LLS is a survey among representative samples of the Swedish population, and the data used here comes from the survey conducted in 1991. The sample analyzed here, see sample restrictions below, consists of around 1000 men and women, who generally were born between 1955 and 1965.

[7] It should here be remembered that occupational and industrial mobility in Germany is rather low on average and often linked to involuntary separations (compare Mertens 1997; Mertens 1998; Burda and Mertens 1998, 1999). Previous comparative research has also shown, that mobility in Sweden is on average higher than in Germany (see e.g. DiPrete 2001, DiPrete 1997).

These two surveys share many features. Of primary relevance here is the retrospective work histories contained in the two surveys. Both work histories include information on self-defined career episodes (jobs, unemployment etc.) with a duration of at least one month. The GLHS includes retrospective career information starting from the date of graduation up until the time of interview. As for the LLS, the work history information only comprises information for part of the sample, and then only going back to the first job of at least six months duration. In addition to having had a six-month job, those answering the biography questions were required to have had no more than 15 jobs after this initial six-month job. To make the two data sets comparable, the LLS restrictions have been imposed on the more detailed GLHS data.

The work histories analyzed thus commence with the first job with a duration of at least six months that began after the completion of the respondents' highest educational degree. With respect to vocational education, this implies that some but not all apprentices will be in the same firm were their apprenticeship was completed. Regrettably, there is no information available on how often this is the case. Due to reforms in the Swedish educational system, described above, the analyses are also limited to those entering the labor market no earlier than 1975.

The overall structure of the work history information is thus very similar. This is also the case with the information used for the creation of the three dependent variables: firm shifts, occupational shifts, and shifts of industry. For each self-defined job in the work history, information was gathered as to whether this job was at the same workplace as the job most immediately preceding it. Inter-firm mobility has here been defined as a job change involving a change of employers.

Each job spell also includes information on the type of work tasks performed. In the GLHS, this information is the basis for an occupational coding according to the International Standard Classification of Occupations 1968 (ISCO-68). This is a systematic four-level classification of occupations in the civilian working population. Each level provides successively finer detail; starting from major groups (of which there are eight) and moving through minor groups (83) and unit groups (284) down to occupational categories (1506). The basis for

the classification is the type of work performed. A typist is here found in occupational category 32140 Typists, unit group 321 Stenographers, typists and teletypists, minor group 32 Stenographers, typists and card- and tape-punching operators, and in major group 3 Clerical and related workers. A construction carpenter is found in occupational category 95415 Construction carpenters, unit group 954 Carpenters, joiners and parquetry workers, minor group 95 Bricklayers, carpenters and other construction workers, and in major group 7/8/9 Production and related workers, transport equipment operators and laborers. The GLHS occupations are coded at the three-digit level, that is the unit group level.

The LLS data contain similar information on work tasks, which in turn form the basis for an occupational coding according to the Nordic Classification of Occupations 1985 (*Nordisk Yrkesklassificering*, NYK-85). This is a modified version of the ISCO, so the basis for the classification in the NYK is again the type of work performed. The occupations are here coded at the five-digit level. To make the data comparable, the Swedish data has been recoded into ISCO-68 at the three-digit level. Inter-occupational mobility has then been defined as a job change involving a change in three-digit ISCO. A job shift from typist to stenographic secretary (ISCO 32120) is not considered as a change of occupation, while a shift to office clerk (39310) is. Likewise, a shift from construction carpenter to wood shipwright (95440) does not equal an occupational shift, while a change to roof thatcher (95360) does.

Finally, the firms or employers have been classified as belonging to different industries. To each job spell in the GLHS information on the industry (or sector of employment) of the firm was collected. Respondents were asked to distinguish between 28 sectors, e.g. mining, steel, finance, public railway, non-profit. The LLS includes information on the type of production carried out at the firm. This is the basis for a classification of the industry to which the firm may be said to belong. Industries are classified according to the Swedish Standard Industrial Classification of all Economic Activities 1969 (*Svensk standard för näringsgrensindelning*, SNI-69). Although this is a six-level classification of industries, the LLS data only distinguishes industries at a five-digit level. The GLHS and LLS data have been recoded into 16 industries (see Appendix, Table

A1). Inter-industrial mobility has consequently been defined as a shift between two of these industries.

The educational indicators have been Elementary + Secondary lower general, Secondary vocational school, Secondary vocational apprentice, Secondary advanced general, Tertiary (see Appendix, Table A2 for precise definitions). While primarily interested in effects associated with vocational training, we have included the other groups as interesting comparison groups. Given the general similarity in university education, it would for example appear less likely that any difference found in the effects of vocational education is due to the content of the programs if we at the same time find differences among those with university degrees. Any differences would then seem likely to be associated with other factors.

Finally, we have excluded agricultural workers and self-employed as they could be expected to display very distinct mobility patterns and as they are of no major relevance for the debate on vocational training.[8] We also excluded German vocational school graduates, as they are a very select group. However, including them in analysis did not change our major results.[9] Otherwise we have included all employees with valid observations on the variables of interest.

4.2. Model

We examine duration data, i.e. the duration from entry into a firm, occupation, or industry until entry into next firm, occupation or industry or right censoring at the time of interview (note that periods not employed are included in the spell). The basic tools to model duration data are survival functions $\overline{F}(x)$ and hazard functions $h(t)$ at some duration t. Duration t is commonly defined as a measure

[8] Some German civil servants (*Beamten*) have very strong mobility disincentives, such as guaranteed lifetime employment and exceptional health and pension benefits. They are therefore likely to show different mobility patterns, and we have experimented with excluding them. Our basic results, however, remained unchanged and they have been included in the analyses.

[9] However, if we look at differences between vocationally schooled and apprenticeship trained workers within Germany, we find that apprentices tend to be more mobile between occupations (see Appendix, Table A3). This is likely the consequence of occupational segmentation were vocational school training only is offered for some select occupations.

of length of a spell between certain events. $\overline{F}(t)$ gives the probability that a duration will last longer than t. Formally for continuous time:

$$\overline{F}(t) = P[T \geq t] = 1 - F(t) = 1 - \int_0^t f(s)ds \tag{1}$$

with $F(t)$ denoting the distribution function.

Roughly speaking, the hazard function $h(t)$ is the rate at which spells are completed after duration *t*, given that they last at least until *t*. For continuous duration the hazard function $h(t)$ is defined by

$$h(t) = \frac{f(t)}{1 - F(t)} = \frac{f(t)}{\overline{F}(t)} \tag{2}$$

with $f(t)$ denoting the density function for some duration t.

However, individuals might face different risks of terminating a spell according to their environmental and individual characteristics. Furthermore, the risk might change over the duration of a spell, an observation commonly subsumed under the heading 'duration dependence'. Consequently, the hazard function should be modeled such that it not only depends on time but also on covariates i.e.:

$$h(t) = \theta(t; x) \tag{3}$$

We choose the popular Semi-Parametric Proportional Cox Model as a basis for our estimation. The effects of covariates on the hazard rate are in this model restricted to be proportional, that is

$$\theta(t; x) = \theta_0(t) \exp(x'\beta) \tag{4}$$

The major advantage of this model is that it leaves the form of the so-called 'baseline hazard' $\theta_0(t)$ unspecified. Thus, no special assumption concerning the duration dependence is necessary.

In the search for vocational specific mobility effects we have employed a simple step-by-step strategy. Starting with a model with only the educational variables, we introduce other factors known to be related to mobility. We begin with personal variables, and then extend the model by introducing firm, industry

and business cycle indicators. Apart from dummies for industry (the 16 industries listed in Table A1) the variables included are "sex", "experience", "number of previous switches", "parents' educational level", "firm size", "not employed", "unemployment rate", and "industrial growth rate". The definitions of the independent variables used can be found in Appendix A, Table A2, which also provides some descriptive statistics. To assume that these have similar effects in the two countries would however seem a fairly strong restriction. Therefore the effects of these variables are allowed to be country specific. We thus model the hazard rate as

$$\theta(t;x) = \theta_0(t)\exp(x'\beta_j) \tag{5}$$

where j = Germany, Sweden. The country specific effects are modeled through the inclusion of interaction terms of all covariates with a dummy that equals 1 for all Swedish observations.

Nonetheless, despite the additional heterogeneity allowed for in this model, there may still be unobserved country specific factors affecting the transition rate. This may bias the training effects to the extent that such unobserved heterogeneity is correlated with the educational indicators. In an attempt to account for this we have modeled country specific baseline hazards. By allowing the baseline hazard to vary between the two countries we thus model unobserved country differences not captured by the rest of the model. We then have

$$\theta(t;x) = \theta_{j0}(t)\exp(x'\beta_j) \tag{7}$$

In the final model we thus take a number of mobility related factors into account, allow the effects of these to vary between the countries and also allow the overall rate of transition to be country specific.

4.3. Results

A first impression of the mobility differences between the two countries is provided by *Table 1* showing the mean and distribution of completed durations for each of the three mobility types. It is immediately evident that those who move between firms, occupations, and industries do so earlier in Sweden than in

Germany. That the pace actually is quicker in Sweden is also in all three cases confirmed by simple models including only a country dummy (not shown). [10]

The importance of educational level for inter-firm mobility is examined in *Table 2*. Model I shows the simple relationship between attained level of education and the rate of transition between firms. The left-hand column here shows the main effects, whereas the right-hand column contains the interaction terms. In our specification the main effects are the German effects, while the interaction terms indicate the difference between the German and the Swedish effects. Starting with the results for Germany, there are clear differences in inter-firm mobility according to educational level. Those with vocational training and those with a university degree are thus less mobile than the reference group with no more than basic upper secondary education. The least mobile group consists however of those with an advanced upper secondary degree.

The results for the difference between the educational effects in Germany and Sweden show that each Swedish group has a higher rate of mobility than their German counterpart. Implied by the table is also that the educational effects within Sweden are less pronounced than those within Germany. As can be seen from the table, the latter varies between –0.254 for vocationally trained workers and –0.668 for secondary advanced general. The Swedish effects can be calculated from adding up the German effect and the Swedish difference, and the Swedish range between 0.115 and 0.208 is far lower than in Germany.

Adding indicators for personal, firm, and business cycle factors reduces the importance of education, within Germany as well as between the countries. As can be seen in Table 2 Model II, German university graduates are inseparable from the comparison group while vocational students differ less than initially. This is also the case for those with an advanced upper secondary degree, although they still are the most stationary group. There are no differences within Sweden, but vocational and advanced upper secondary students have higher rates of mobility than their German equals do. This is not affected by the further addition of industry dummies in Model III.

[10] The results can be obtained from the authors upon request.

Allowing for unobserved country specific factors through the inclusion of separate baseline hazards in Model IV does however remove most of the remaining educational differences. The only group that still stands out is German graduates with advanced upper secondary degrees who are distinctly less mobile than all other categories.

Turning then to inter-occupational mobility the importance of education is examined in *Table 3*. Model I again shows the basic mobility differences among the educational groups. The pattern evident here is somewhat akin to the one described in connection with Model I in Table 2. There are indications of differences among the German graduates, this time with a middle category made up of those with vocational training or advanced upper secondary degrees and with the university graduates being the clearly least mobile. All Swedish groups are again more mobile than their German counterparts, and as in Germany the least mobile Swedish group appears to be the university graduates.

The addition of control variables in Model II and III has only a limited impact on the educational effects. Although the reference group still is more mobile than the others the differences within Germany diminish somewhat. The consequences of the introduction of country specific baseline hazards in Model IV are instead of greater interest. Graduates with advanced upper secondary degree no longer differ from each other and transition rates among German and Swedish university graduates are now indistinguishable as well. The only Swedish category that now has a significantly higher transition rate than the corresponding German group is in other words those with a vocational education.

The results pertaining to inter-industry mobility are presented in *Table 4*. Starting with Model I, we see a by now familiar pattern. There are again rather marked mobility differences among the German educational groups, with the university educated being the least mobile. The differences between the German and Swedish educational effects are all significant, but there are hardly any differences within Sweden.

As was the case in the previous analyses, the addition of the personal, firm, and business cycle variables in Model II reduces the educational effects. The main consequence is that the only significant country effect now is the distinction

between German and Swedish vocational training, something which is unaffected by the later of industry dummies in Model III. However, the introduction of separate baseline hazards in Model IV removes this distinction as well.

To summarize, the initial analyses all show marked differences in mobility between the different educational categories in Germany and Sweden. These inter-country differences also tend to remain after personal, firm, industrial, and business cycle factors have been taken into account. This holds for the vocational training differences, but also for difference related to general upper secondary education at an advanced level. However, in the case of inter-firm and inter-industrial mobility all remaining educational differences, including the one related to vocational training, disappear once unobserved country specific factors are taken into account, that is once the country specific baseline hazards are introduced. The only instance were a difference related to vocational training prevails, that is the only analysis where the results are independent of model specification, is in the case of inter-occupational mobility.[11]

5. Summary and conclusions

The impact of general and specific training on labor market mobility is an important issue for the discussion around human capital as well as the design of educational systems. This paper focused on the question of whether different types of vocational training influence mobility significantly. While theory suggests that specific human capital should reduce worker mobility, recent empirical results indicate that mobility following apprenticeships in Germany seems to be relatively high. The question thus remains whether apprenticeship training reduces mobility at all. To answer this question, we looked at the impact of more general school-based vocational training like in Sweden and more

[11] These analyses have been extended in two directions. First, we have estimated separate models for men and women. Second, we have examined differences in the educational effects over the work life estimating separate models for each consecutive job. The results for these analyses basically confirm the ones reported in Tables 2 to 4 and are therefore not reported here (the analyses may however be obtained from the authors upon request).

specific apprenticeship training like in Germany on firm, occupational, and industrial mobility.

That no stable differences in inter-firm mobility can be discerned suggests that the proportion of truly firm specific skills acquired during a German apprenticeship is rather low in relation to the transferable skills obtained. It also implies that there is little evidence for one of the purported advantages of an apprenticeship system in relation to a system with school based vocational training: it does not eliminate unnecessary and detrimental job shopping during the early stages of the career and does not simplify labor market entrance.

On the other hand, our results on inter-occupational mobility suggest that the German labor market indeed is more structured around training occupations than in Sweden where vocational training is school based. We observe lower inter-occupational mobility among apprentices indicating that the skills obtained are less general than those gained through vocational school. This would seem to contradict claims that completion of an apprenticeship is a signaling device of worker quality rather than of occupational skill acquisition (Heckman 1994, Heckman, Roselius and Smith 1994). Whether this is desirable or not is of course difficult to say. However, it is undoubtedly disadvantageous if individual careers require occupational mobility.

Such a limitation does not pertain to the possibilities of adapting to structural change in the economy. That we do not find any firm differences in inter-industrial mobility indicates that both educational systems are equally conducive to industrial relocation. Although it would appear to reduce occupational flexibility over the work career, with regard to economic adjustment the choice between vocational training systems would seem rather inconsequential.

References

Abraham, Katharine G. and Henry S. Farber (1987) "Job Duration, Seniority, and Earnings", *American Economic Review*, 77 (3), 278-297.

Acemoglu, Daron and Jörn-Steffen Pischke (1998), "Why do Firms Train? Theory and Evidence", *Quarterly Journal of Economics*, 113 (1), 79-119.

------ (1999), "The Structure of Wages and Investment in General Training", *Journal of Political Economy*, 107 (3), 539-572.

Altonji, Joseph G. and Robert A. Shakotko (1987), "Do Wages Rise with Job Seniority?", *Review of Economic Studies*, 54 (July), 437-459.

Baily, Martin, Gary Burtless and Robert E. Litan (1993), *Growth with equity: economic policymaking for the next century*.Washington, D.C.: Brookings Institution.

Bardeleben, Richard von (1994), "Kosten und Nutzen der betrieblichen Berufsaubildung", in: Sabine Liesering, Karen Schober and Manfred Tessaring (eds.), Die Zukunft der dualen Berufsausbildung, *Beiträge zur Arbeitsmarkt- und Berufsforschung 186*, Institut für Arbeitsmarkt- und Berufsforschung, Nürnberg.

Bardeleben, Richard von, Ursula Beicht and Kálám Fehér (1995), "Betriebliche Kosten und Nutzen der Ausbildung : repräsentative Ergebnisse aus Industrie, Handel und Handwerk", *Berichte zur beruflichen Bildung 187*, Bielefeld: Bertelsmann.

Becker, Gary S. (1962), "Investment in Human Capital: A Theoretical Analysis", *Journal of Political Economy*, 70 (5), S9-S49.

Becker, Gary S. (1964), Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education, New York: Columbia University Press for National Bureau of Economic Research (NBER).

Ben-Porath, Yoram (1967), "The Production of Human Capital and the Lifecycle Model of Earnings", *Journal of Political Economy*, 75 (4), 352-365.

Booth, Alison and Stephen Satchell (1995), "On apprenticeship qualifications and labour mobility", in Alison Booth and Dennis Snower (eds.) *Acquiring skills: Market failures, their symptoms and policy responses*, Cambridge University Press.

Borghans, Lex, Andries de Grip and Wendy Smits (1995), "Labour market mobility of technically educated persons", Research Centre for Education and the Labour Market, Maastricht, mimeo.

Burda, Michael and Antje Mertens (2001), “Arbeitsplatzverlust und Lohnentwicklung - Eine empirische Analyse für Westdeutschland”, *Konjunkturpolitik*, Beiheft Nr. 48.

------ (2001), “Estimating Wage Losses of Displaced Workers in Germany”, *Labour Economics* 8, 15-41.

CEDEFOP (1999), *Vocational education and training in Sweden*, European Centre for the Development of Vocational Training (CEDEFOP), Thessaloniki.

Di Prete, Thomas A., Paul M. de Graaf, Ruud Luijkx, Michael Tåhlin and Hans-Peter Blossfeld (1997), "Collectivist versus Individualist Mobility Regimes? Structural Change and Job Mobility in Four Countries", *American Journal of Sociology*, 103: 318 – 358.

DiPrete, Thomas A. (2001), "Life Course Risks, Mobility Regimes, and Mobility Consequences: A Comparison of Sweden, Germany, and the U.S.", Duke University, *mimeo*.

European Commission (1995). *Structures of the education and initial training systems in the European Union.* Luxembourg: Office for Official Publications of the European Commission.

Euwals, Rob and Rainer Winkelmann (2001), "Why Do Firms Train? Empirical Evidence on the First Labour Market Outcomes of Graduated Apprentices", Discussion Paper No. 319, IZA, Bonn.

Farber, Henry S. (1994), “The Analysis of Interfirm Worker Mobility”, *Journal of Labor Economics*, 12 (4), 554-593.

Franz, Wolfgang and David Soskice (1995), “The German Apprenticeship System”, in: Buttler et al. (eds.), *Institutional Frameworks and Labor Market Performance*, London: Routledge, 208-234.

Franz, Wolfgang and Volker Zimmermann (1999), “Mobilität nach der beruflichen Erstausbildung: Eine empirische Studie für Westdeutschland”, *Jahrbücher für Nationalökonomie und Statistik*, 219 (1+2), 143-164.

Harhoff, Dietmar and Thomas J. Kane (1997), “Is the German Apprenticeship System a Panacea for the U.S. Labor Market?” *Journal of Population Economics*, 10, 171-196.

Hashimoto, Masanori (1981), “Firm-Specific Human Capital as a Shared Investment”, *American Economic Review*, 71 (3), 475-482.

Heckman, James (1994), “Is Job Training Oversold?” *The Public Interest*, 115 (Spring), 91-115.

Heckman, James, Rebecca L. Roselius and Jeffrey A. Smith (1994), "U.S. Education and Training Policy: A Re-evaluation of the underlying assumptions behind the New Consensus", in: Lewis C. Solmon and Alec R. Levenson (eds.), *Labor Markets, Employment Policy and Job Creation*, Westview Press: Boulder, 83-121.

Herget, Hermann, Klaus Schongen, Gisela Westhoff (1988), "Berufsausbildung abgeschlossen - was dann? Ergebnisse einer Längsschnittuntersuchung zum Übergang der Jugendlichen nach Abschluß einer betrieblichen Berufsausbildung in das Beschäftigungssystem", *Berichte zur Beruflichen Bildung* 85, Bonn, Berlin: Bundesinstitut für Berufsbildung, 119-127.

Hofbauer H. and Nagel E. (1987), "Mobilität nach Abschluß der betrieblichen Ausbildung", *Mitteilungen aus der Arbeitsmarkt- und Berufsforschung*, 1/87, 45-73.

Johnson, William R. (1978), "A Theory of Job Shopping", *Quarterly Journal of Economics*, 92 (May), 261-278.

Mincer, Jacob (1974), *Schooling, Experience and Earnings*, New York: Columbia University Press for National Bureau of Economic Research.

Mertens, Antje (1997), "Industrielle und berufliche Mobilität - Eine Untersuchung auf Basis der IAB –Beschäftigtenstichprobe", *Mitteilungen aus der Arbeitsmarkt- und Berufsforschung*, 3/1997, 663-670.

------ (1998), *Labor Mobility and Wage Dynamics - An Empirical Study for Germany in Comparison with the United States*, Ph.D. thesis Humboldt University Berlin and Aachen: Shaker Verlag.

Neal, Derek (1995), "Industry-Specific Human Capital: Evidence from Displaced Workers", *Journal of Labor Economics*, 13 (4), 653-677.

------ (1999), "The Complexity of Job Mobility among Young Men", *Journal of Labor Economics*, 17 (2), 237-261.

Oi, Walter Y. (1962), "Labor as a Quasi-Fixed Factor", *Journal of Political Economy* 70 (5), S538-S555.

Parsons, Donald O. (1972), "Specific Human Capital: An Application to Quit Rates and Layoff Rates", *Journal of Political Economy* 80 (3), 1120-1143.

------ (1986), "The Employment Relationship: Job Attachment, Work Effort, and the Nature of Contracts", in Orley Ashenfelter and Richard Layard (eds.), *Handbook of Labor Economics*, Volume II, Amsterdam: North and Holland, 789-848.

Schober-Brinkmann, Karen, and Eskil Wadensjö (1991). “Contrasting Forms of Youth Training and Employment in Sweden and FR Germany”, in Paul Ryan, Paolo Garonna and Richard Edwards (eds.), *The Problem of Youth: The Regulation of Youth Employment and Training in Advanced Economies*, London: Macmillan.

Statistics Sweden (1988). *Yearbook of Educational Statistics 1988.* Stockholm: Statistics Sweden.

Steedman, Hilary (1993), “The Economics of Youth Training in Germany”, *The Economic Journal*, 103 (September), 1279-1291.

Stern, David, Neal Finkelstein, James R. Stone III, John Latting and Carolyn Dornsife (1995), *School to Work: Research on Programs in the United States*. Washington, D.C.: Falmer Press.

Soskice, David (1994), “Reconciling Markets and Institutions: The German Apprenticeship System”, in Lisa M. Lynch (ed.), *Training and the Private Sector - International Comparisons*, Chicago and London: University of Chicago Press, 25-60.

SOU (1986). *En treårig yrkesutbildning. Del 1, Riktlinjer för fortsatt arbete.* SOU 1986:2. Stockholm: Utbildningsdepartementet.

Topel Robert H. and Michael P. Ward (1992), "Job Mobility and the Careers of Young Men", *Quarterly Journal of Economics*, 107 (2), *445*-479.

Thurow, Lester (1992). *Head to head the coming economic battle among Japan, Europe, and America*. New York: Morrow.

Wagner, Karin (1999), "The German Apprenticeship System under Strain", in Culpepper P. and David Finegold (eds.), The German Skill Machine, Berghahn Books.

Willis, Robert J. (1986), "Wage Determinants: A Survey and Reinterpretation of Human Capital Earnings Functions", in Orley Ashenfelter and Richard Layard (eds.), *Handbook of Labor Economi*cs, Volume I, Amsterdam: North-Holland.

Winkelmann, Rainer (1994), *“Apprenticeship and After: Does it Really Matter”*, Center for Economic Policy Research, Discussion Paper 1034.

------ (1996a), “Employment Prospects and Skill Acquisition of Apprenticeship-Trained Workers in Germany”, *Industrial and Labor Relations Review*, 49 (4), 658-672.

------ (1996b), “Training, Earnings and Mobility in Germany”, *Konjunkturpolitik*, 42 (4), 275-98.

------ (1997), “How Young Workers get Their Training: A Survey of Germany versus the US”, *Journal of Population Economics*, 10 (2), 159-170.

Werwatz, Axel (1998), *Mobility after Apprenticeship - How Effective is the German Apprenticeship System?*, Humboldt University Berlin, mimeo.

TABLES

Table 1. Mobility by spell duration and country. Men and women.

Completed spell duration, in years	Switch at the end of the spell, %					
	Inter-firm mobility		Inter-occupational mobility		Inter-industry mobility	
	G	S	G	S	G	S
< 1	28	33	26	29	26	29
1 – 2	22	26	21	26	21	26
2 – 3	13	15	12	16	12	15
3 – 4	8	8	9	9	8	9
4 – 5	7	5	7	6	7	7
5 – 6	5	3	5	4	5	5
6 – 7	4	2	4	2	4	3
7 – 8	3	2	3	2	3	2
8 – 9	3	1	3	1	3	1
9 – 10	2	1	3	2	3	1
> 10	5	2	7	2	8	2
Total	100	98	100	99	100	100
Mean compl. duration	3.10	2.28	3.46	2.48	3.56	2.48

Table 2. Interaction model of inter-firm mobility. Men and Women. Standard errors in parentheses.

	I		II		III		IV	
Controls	None		Personal + firm + business cycle		Personal + firm + business cycle		Personal + firm + business cycle	
Industry dummies	No		No		Yes		Yes	
Stratified baseline	No		No		No		Yes	
	German effect	Swedish difference	German effect	Swedish difference	German effect	Swedish difference	German effect	Swedish difference
Secondary adv. general	-0.603*** *(0.112)*	0.654*** *(0.136)*	-0.601*** *(0.120)*	0.572*** *(0.152)*	-0.503*** *(0.122)*	0.421*** *(0.155)*	-0.408*** *(0.124)*	0.279* *(0.158)*
Secondary vocational	-0.177*** *(0.046)*	0.353*** *(0.061)*	-0.120* *(0.062)*	0.210** *(0.089)*	-0.093 *(0.064)*	0.152* *(0.092)*	-0.009 *(0.068)*	0.025 *(0.096)*
Tertiary education	-0.329*** *(0.094)*	0.327*** *(0.108)*	-0.170 *(0.110)*	0.099 *(0.135)*	-0.087 *(0.113)*	0.100 *(0.140)*	0.023 *(0.115)*	-0.064 *(0.142)*
Not employed	1.343*** *(0.048)*	-0.060 *(0.074)*	1.478*** *(0.055)*	-0.248*** *(0.085)*	1.466*** *(0.055)*	-0.241*** *(0.085)*	1.453*** *(0.056)*	-0.233*** *(0.086)*
Female			-0.194*** *(0.049)*	-0.091 *(0.075)*	-0.174*** *(0.053)*	-0.002 *(0.083)*	-0.119** *(0.054)*	-0.088 *(0.085)*
Employment experience			-0.000 *(0.001)*	-0.001 *(0.001)*	-0.001 *(0.001)*	0.000 *(0.001)*	-0.002 *(0.001)*	0.000 *(0.001)*

Table 2 – continued	I		II		III		IV	
	German effect	Swedish difference	German effect	Swedish difference	German effect	Swedish difference	German effect	Swedish difference
No. of previous switches			0.182*** *(0.026)*	0.006 *(0.030)*	0.191*** *(0.027)*	-0.026 *(0.031)*	0.188*** *(0.027)*	-0.006 *(0.032)*
Parents ed., lower sec.			-0.049 *(0.067)*	0.060 *(0.092)*	-0.011 *(0.068)*	-0.001 *(0.094)*	0.066 *(0.072)*	-0.123 *(0.098)*
Parents ed., higher sec.			0.033 *(0.139)*	0.231 *(0.156)*	0.098 *(0.141)*	0.142 *(0.152)*	0.200 *(0.142)*	-0.008 *(0.160)*
Firm size–medium			-0.286*** *(0.050)*	0.072 *(0.076)*	-0.223*** *(0.054)*	0.025 *(0.081)*	-0.207*** *(0.055)*	-0.024 *(0.082)*
Firm size–large			-0.631*** *(0.073)*	0.153 *(0.113)*	-0.500*** *(0.082)*	0.075 *(0.122)*	-0.486*** *(0.082)*	0.043 *(0.122)*
Industry empl. growth			0.032*** *(0.010)*	-0.019 *(0.014)*	0.047*** *(0.013)*	-0.023 *(0.016)*	0.061*** *(0.014)*	-0.047*** *(0.017)*
National unempl. rate			-0.029** *(0.014)*	0.016 *(0.034)*	-0.019 *(0.014)*	-0.031 *(0.040)*	-0.020 *(0.016)*	-0.176*** *(0.052)*
Log likelihood	-22895.2		-22690.4		-22644.8		-20534.2	
LR Chi^2	1010.1		1419.8		1510.8		1496.1	

Notes: No. of subjects = 2569, no. of obs = 29039, no. of failures = 3144. *** is significance at the 1% level, ** at the 5%-level and * at the 10% level.

Table 3. Interaction model inter-occupational mobility. Men and women. Standard errors in parentheses.

	I		II		III		IV	
Controls	None		Personal + firm + business cycle		Personal + firm + business cycle		Personal + firm + business cycle	
Industry dummies	No		No		Yes		Yes	
Stratified baseline	No		No		No		Yes	
	German effect	Swedish difference	German effect	Swedish difference	German effect	Swedish difference	German effect	Swedish difference
Secondary adv. general	-0.549*** *(0.134)*	0.782*** *(0.155)*	-0.549*** *(0.141)*	0.628*** *(0.173)*	-0.462*** *(0.143)*	0.481*** *(0.176)*	-0.338** *(0.145)*	0.270 *(0.179)*
Secondary vocational	-0.596*** *(0.057)*	0.720*** *(0.074)*	-0.494*** *(0.075)*	0.540*** *(0.105)*	-0.450*** *(0.077)*	0.484*** *(0.108)*	-0.339*** *(0.081)*	0.294*** *(0.113)*
Tertiary education	-0.965*** *(0.137)*	0.496*** *(0.158)*	-0.880*** *(0.154)*	0.340* *(0.187)*	-0.728*** *(0.159)*	0.222 *(0.193)*	-0.582*** *(0.161)*	-0.015 *(0.195)*
Not employed	1.356*** *(0.059)*	-0.041 *(0.088)*	1.401*** *(0.087)*	-0.143 *(0.114)*	1.441*** *(0.089)*	-0.180 *(0.117)*	1.508*** *(0.093)*	-0.257** *(0.121)*
Female			-0.267*** *(0.063)*	0.016 *(0.092)*	-0.270*** *(0.068)*	0.108 *(0.102)*	-0.172** *(0.071)*	-0.030 *(0.104)*
Employment experience			-0.001 *(0.002)*	0.000 *(0.002)*	-0.001 *(0.002)*	0.001 *(0.002)*	-0.001 *(0.002)*	0.000 *(0.002)*

Table 3 – continued	I		II		III		IV	
	German effect	Swedish difference	German effect	Swedish difference	German effect	Swedish difference	German effect	Swedish difference
No. of previous switches			0.255*** *(0.048)*	-0.061 *(0.053)*	0.259*** *(0.050)*	-0.088 *(0.055)*	0.248*** *(0.050)*	-0.067 *(0.056)*
Parents ed, lower sec.			-0.096 *(0.090)*	0.239** *(0.116)*	-0.048 *(0.092)*	0.175 *(0.119)*	0.092 *(0.099)*	-0.038 *(0.126)*
Parents ed, higher sec.			0.029 *(0.191)*	0.394* *(0.208)*	0.095 *(0.193)*	0.334 *(0.211)*	0.265 *(0.196)*	0.100 *(0.215)*
Firm size–medium			-0.143* *(0.087)*	-0.038 *(0.110)*	-0.084 *(0.092)*	-0.100 *(0.117)*	0.017 *(0.096)*	-0.245** *(0.120)*
Firm size–large			-0.291*** *(0.116)*	-0.007 *(0.149)*	-0.208* *(0.127)*	-0.093 *(0.162)*	-0.119 *(0.130)*	-0.203 *(0.164)*
Industry empl. growth			0.043*** *(0.013)*	-0.036** *(0.016)*	0.056*** *(0.017)*	-0.024 *(0.020)*	0.036* *(0.021)*	-0.062*** *(0.022)*
National unempl. rate			0.014 *(0.018)*	0.040 *(0.041)*	0.026 *(0.018)*	-0.014 *(0.048)*	0.082*** *(0.018)*	-0.229*** *(0.062)*
Log likelihood	-14574.9		-14471.3		-14422.7		-13041.6	
LR Chi^2	901.39		1108.60		1205.74		1124.40	

Notes: No. of subjects = 2482, no. of obs = 27877, no. of failures = 2026. *** is significance at the 1% level, ** at the 5%-level and * at the 10% level.

Table 4. Interaction model inter-industrial mobility. Men and women. Standard errors in parentheses.

	I		II		III		IV	
Controls	None		Personal + firm + business cycle		Personal + firm + business cycle		Personal + firm + business cycle	
Industry dummies	No		No		Yes		Yes	
Stratified baseline	No		No		No		Yes	
	German effect	Swedish difference	German effect	Swedish difference	German effect	Swedish difference	German effect	Swedish difference
Secondary adv. general	-0.522*** *(0.132)*	0.695*** *(0.163)*	-0.448*** *(0.143)*	0.492*** *(0.185)*	-0.359*** *(0.146)*	0.394** *(0.189)*	-0.250* *(0.149)*	0.202 *(0.193)*
Secondary vocational	-0.429*** *(0.062)*	0.579*** *(0.082)*	-0.278*** *(0.081)*	0.341*** *(0.116)*	-0.248*** *(0.083)*	0.338*** *(0.120)*	-0.148* *(0.088)*	0.159 *(0.125)*
Tertiary education	-0.970*** *(0.160)*	0.491*** *(0.185)*	-0.650*** *(0.177)*	0.137 *(0.215)*	-0.577*** *(0.180)*	0.258 *(0.221)*	-0.452*** *(0.183)*	0.042 *(0.224)*
Not employed	1.572*** *(0.062)*	-0.164* *(0.097)*	1.746*** *(0.074)*	-0.427*** *(0.113)*	1.732*** *(0.075)*	-0.392*** *(0.114)*	1.750*** *(0.076)*	-0.445*** *(0.116)*
Female			-0.297*** *(0.068)*	0.029 *(0.102)*	-0.307*** *(0.074)*	0.260** *(0.112)*	-0.237*** *(0.076)*	0.142 *(0.114)*
Employment experience			0.003 *(0.002)*	-0.004* *(0.002)*	0.003 *(0.002)*	-0.003 *(0.002)*	0.002 *(0.002)*	-0.003 *(0.002)*

Table 4 – continued	I		II		III		IV	
	German effect	Swedish difference	German effect	Swedish difference	German effect	Swedish difference	German effect	Swedish difference
No. of previous switches			0.274*** *(0.054)*	-0.014 *(0.059)*	0.268*** *(0.055)*	-0.039 *(0.060)*	0.267*** *(0.055)*	-0.026 *(0.061)*
Parents ed, lower sec.			-0.038 *(0.097)*	0.123 *(0.128)*	-0.003 *(0.099)*	0.089 *(0.131)*	0.112 *(0.106)*	-0.094 *(0.139)*
Parents ed, higher sec.			-0.161 *(0.233)*	0.571** *(0.251)*	-0.080 *(0.234)*	0.467* *(0.253)*	0.061 *(0.237)*	0.258 *(0.257)*
Firm size–medium			-0.104 *(0.071)*	-0.190* *(0.105)*	-0.026 *(0.076)*	-0.272** *(0.115)*	0.007 *(0.077)*	-0.326*** *(0.116)*
Firm size–large			-0.381*** *(0.096)*	-0.173 *(0.151)*	-0.214** *(0.110)*	-0.370** *(0.169)*	-0.187* *(0.110)*	-0.390** *(0.169)*
Industry empl. growth			0.013 *(0.013)*	-0.039** *(0.017)*	0.027* *(0.017)*	-0.002 *(0.020)*	0.043** *(0.018)*	-0.027 *(0.022)*
National unempl. rate			-0.051*** *(0.019)*	0.092** *(0.045)*	-0.048*** *(0.019)*	0.115** *(0.052)*	-0.046** *(0.022)*	-0.089 *(0.069)*
Log likelihood	-12105.8		-11956.8		-11876.8		-10734.7	
LR Chi^2	862.95		1160.97		1321.06		1302.63	
Notes: No. of subjects = 2501, no. of obs = 28153, no. of failures = 1685. *** is significance at the 1% level, ** at the 5%-level and * at the 10% level.								

Appendix

A1. Industries

Industry 1	Agriculture (incl. forestry and fisheries)
Industry 2	Energy and mining
Industry 3	Chemical industry
Industry 4	Rubber, plastics
Industry 5	Stone, glass
Industry 6	Metals, engineering
Industry 7	Wood, paper, printing
Industry 8	Leather and textiles
Industry 9	Food and tobacco
Industry 10	Construction
Industry 11	Trade (wholesale and retail)
Industry 12	Traffic and communication
Industry 13	Credit and insurance
Industry 14	Other services
Industry 15	Private households
Industry 16	Government and social security

A2. Independent variables

Variable	Definition	Mean	St. dev.
Elementary + secondary lower general	Compulsory and lower level sec. schooling (*Haputschule, Realschule, Grundskola,* or two years non-vocational *Gymnasium*)	0.22	0.41
Secondary vocational school	Sec. level voc. training, school-based degree (*Berufsfachschule* or voc. *Gymnasium*)	0.10	0.30
Secondary voc. apprentice	Sec. level vocational training, apprenticeship degree (*Lehre*)	0.47	0.50
Secondary advanced general	Full maturation degree (*Abitur* or 3-4 years non-vocational *Gymnasium*)	0.07	0.26
Tertiary	Tertiary level degree (*Fachhochschule* or university)	0.13	0.34
Sex	Woman = 1	0.46	0.50
Employment experience	Employment experience at start of spell (mo.)	29.93	54.97
No. of previous switches	Number of firm, occupational, or industry switches at start of spell	0.69	1.12
Parents education – basic	Highest educational qualification of the parents, compulsory	0.26	0.44
Parents education – lower secondary	Highest educational qualification of the parents, lower secondary	0.63	0.48
Parents education – higher secondary	Highest educational qualification of the parents, higher secondary or above	0.11	0.31
Firm size – small	No. of employees less than 20	0.47	0.50
Firm size – medium	No. of employees greater than or equal to 20 and less than 500	0.38	0.48
Firm size – large	No. of employees greater than or equal to 500	0.16	0.36
Not employed*	= 1 if not employed, 0 if employed (modeled time-varying)	0.16	0.36
Unemployment rate*	National yearly unemployment rate (modeled time-varying)	4.11	1.98
Industrial growth rate*	National yearly employment growth rate in industry of empl. (modeled time-varying)	0.46	2.88

Note: All statistics based on spells (n = 5910), except for * which are based on sub-spells (n = 27877).

Table A3. Determinants of labor mobility: Cox model for Germany. Men and women. Standard errors in parentheses.

	Inter-firm	Inter-occupation	Inter-industry
Compulsory education	0.028 *(0.082)*	0.523*** *(0.108)*	0.239** *(0.115)*
Secondary adv. general	-0.492*** *(0.119)*	0.107 *(0.149)*	-0.070 *(0.149)*
Secondary voc. apprenticeship	0.033 *(0.064)*	0.200** *(0.092)*	0.108 *(0.096)*
Tertiary education	0.006 *(0.102)*	-0.172 *(0.153)*	-0.154 *(0.167)*
Not employed	1.503*** *(0.050)*	1.535*** *(0.084)*	1.804*** *(0.070)*
Female	-0.122*** *(0.045)*	-0.174*** *(0.060)*	-0.185*** *(0.064)*
Employment experience	-0.001 *(0.001)*	0.000 *(0.002)*	0.003* *(0.002)*
No. of previous switches	0.179*** *(0.025)*	0.253*** *(0.044)*	0.281*** *(0.049)*
Parents education, lower secondary	-0.011 *(0.064)*	0.053 *(0.091)*	0.003 *(0.096)*
Parents education, higher secondary	0.120 *(0.122)*	0.173 *(0.175)*	0.129 *(0.188)*
Firm size – medium	-0.219*** *(0.047)*	0.000 *(0.086)*	-0.053 *(0.067)*
Firm size – large	-0.558*** *(0.068)*	-0.122 *(0.111)*	-0.347*** *(0.092)*
Industry empl. growth	0.035 *(0.010)*	0.041*** *(0.013)*	0.011 *(0.013)*
National unempl. rate	-0.022 *(0.014)*	0.024 *(0.019)*	-0.050** *(0.020)*
No. of subjects	1808	1791	1799
No. of failures	2185	1243	1112
No. of obs.	22009	21213	21486

Note: Comparative educational group = vocational school. *** is significance at the 1% level, ** at the 5%-level and * at the 10% level. *Source:* GLHS. Own calculations.