Nontechnical summary

This paper considers training, mobility and wages together in order to test whether firm provided training inhibits a specific component. From a human capital perspective, company training increases the productivity of a match, while from an informational perspective, it improves the knowledge about the quality of a particular job match. From both points of view, training is expected to have positive effects on wages, and zero or negative effects on mobility, and on wage effects of mobility. Wages contain information about the productivity change or the updated knowledge through training, and so does mobility. We use these interrelations in order to test empirically whether training exhibits mainly general or specific human capital in two particular ways.

First, mobility effects of training can serve as a test whether training contains a firm-specific content but are also interesting in themselves. One reason is that mobility can disturb the investment decision of a firm that decides about providing training. Also, mobility can be efficiency enhancing if bad employer-employee matches are dissolved which were detected due to training. Mobility is expected to increase or to remain unchanged if training contains mostly general human capital, while we expect a decreasing mobility when training is mostly specific and not portable between employers. Hence, we use regressions explaining mobility with training participation as explanatory variable as a first test whether training generates general or specific human capital.

As a second empirical test, we consider wage effects of mobility after training. In the light of rent sharing between employers and employees, we expect a positive or zero wage effect of a job change after general training, while specific capital should decrease wages after a job change. So, wage effects of mobility can be seen to discriminate between those two forms of human capital. To evaluate the wage effects of mobility, we use reported wages directly, but, in addition, we use the judgement of employees whether they profited from their last job change or not, a unique feature of the dataset.

We try to identify a causal effect of training on mobility and on the wage effect of a job change to discriminate between specific and general human capital. As proposed by modern search theory, we take into account endogenous mobility in the wage regression. We also consider endogeneity of the training decision with respect to the mobility decision because wage effects of mobility might be covered by the endogenous choice of being mobile.

Summarising, we find that the empirical evidence is in favour of training inhibiting job, firm or occupation specific capital. We find that the probability of being mobile is negatively correlated with the probability of participating in training. Further, we find that both the partial correlation and the wage effects of (exogenous) mobility are negative for the group of training participants. Furthermore, using a subjective measure whether individuals profited from their last job change or not, we find that if individuals change their job due to exogenous reasons they profit less from the job change than those individual which voluntary changed their job.

Training, Mobility, and Wages: Specific versus General Capital

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Abstract: This paper considers training, mobility decisions and wages together to test for specificity of human capital contained in company training courses. We empirically analyse the relationship between training, mobility and wages in two ways. First, we analyse the correlation between mobility and training. In a second step, we consider wage effects of mobility taking training participation into account. Our results suggest that there is some specific human capital, which is incorporated into training and lost when moving between jobs. We conclude that training generates specific capital, without being able to distinguish whether the training wage markup in the firm which provided training is due to a productivity increase or whether training generates information on the job match.

Keywords: training, mobility, wages, search, job matching
JEL-Classification: J31, J41, J62

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1 Introduction

Firms invest in training activities in order to raise the level of qualification of their work force and to secure strong economic performance. In Germany, about 40% of the employees obtain training during one year (see Berichtssystem Weiterbildung for data for the year 2000[1]). Employees aged between 35 and 50 have the highest training participation shares. In 2001, firms in Germany invested almost 17 billions Euro in training their workforce (see Weiß (2003)). Hence, firm provided training is considered one of the major post school investments in human capital. Human capital plays an important role in the process of economic growth and individuals' labour market outcomes are linked to their educational attainment. Wage effects of training have been examined and discussed extensively in the literature (see e.g. Pischke (2001), Kuckulenz and Zwick (2003), Buechel and Pannenberg (2004) and Juerges and Schneider (2004) for Germany or **?** for a review of microeconometric studies). Labour turnover and training is in the focus of fewer papers.[2] This paper considers training, mobility decisions and wages together and concentrates on mobility effects and wage effects of mobility after training. More specifically, we interpret mobility effects and wage effects of mobility in terms of the specificity of the skills that have been acquired in training courses. [3]

The effect of training on the probability of moving between jobs is important since it reveals information about the nature of training in which an individual participated. Therefore, it is a test of whether training is mainly general or mainly specific. But, the mobility decision is also interesting for other reasons. The investment decision in training on the side of the firm and on the side of the individual is influenced by (expected) mobility. Firms are expected to invest in general training of the workforce only if they are able to appropriate part of the productivity increase. This implies that firms are only then likely to invest in general training if they can restrict workers' mobility afterwards, or if firms expect the mobility of workers to be small. Another reason for why mobility effects of training are interesting is that it might be explicitely the desired result (see, eg, **?**). Training might be performed to separate good from bad matches and, thus, mobility of the bad matches is the desired result (eg, trainee programs might be partly performed for this reason). Finally, in a more macroeconomic sense, the low labour mobility that is caused by market frictions might be responsible for the fact that often firms pay for general training (see Acemoglu and Pischke (1999b)).[4]

Closely linked to the question of mobility of individuals after training participation are wage effects of mobility if individuals have participated in training before. This

[1] Berichtssystem Weiterbildung VIII, Integrierter Gesamtbericht zur Weiterbildungssituation in Deutschland, Bundesministerium für Bildung und Forschung (BMBF), Bonn

[2] Early work that is concerned with specific training and turnover is e.g. Oi (1962) and Deere (1987).

[3] Observationally equivalent to specific skills in many respects is training that generates information about the quality of a particular match and that is lost upon termination of the match. For an empirical attempt to distinguish between these two kinds of specific capital, see Nagypál (2004).

[4] Recognize that from this point of view there is no causal effect of training on mobility.

is interesting because the wage effect of a job change to a new firm reveals information about the skills of an individual which are transferable across firms. Following Loewenstein and Spletzer (2000), we interpret the empirical effect of training on wages as an indicator for the degree of specificity of the training obtained. We test whether workers who change their job after training are paid less than those workers which do not change their job after training. A "high" wage of job movers after training may indicate that employers share costs of and returns to general training. A "low" wage of job movers, in contrast, might indicate that firm (job) specific skills are lost and productivity in the new firm is lower (see also **?**, **?** and Gerfin (2004).

The specificity of the contents of training courses is interesting for several reasons. If firm-provided training is general there might exist a hold-up problem, a case of underinvestment. Then, there is scope for government intervention. Second, the specificity of training investments has been discussed in the context of international differences in labour mobility and unemployment developments (see, eg, Wasmer (2003)). The degree of specificity of company provided training has also been discussed theoretically and empirically with German data by **?** and Acemoglu and Pischke (1999b). They find that under certain conditions, firms are willing to invest in general training and show with German survey data that indeed, part of firm provided training in Germany is general (see also **?** who provide conditions under which firms provide general training).

Former evidence has shown that in Germany, a large part of the skills obtained in firm provided training are general. We use two empirical tests to investigate whether training provides participants also with specific skills. First, we test whether training participation is correlated with mobility and whether it increases or decreases the probability of individuals to change the job. Second, controlling for the endogeneity of job mobility we look at the wage effects of job changes for individuals that have participated in training and for individuals that have not. Both pieces of evidence are interesting on their own and can serve to discriminate between specific and general human capital.

The paper is set up as follows. First, we take the reader to the theoretical foundations of our analysis and discuss human capital models that allow for rent-sharing and briefly discuss mobility models. Second, we discuss mobility effects of training and line out our estimation strategy. Third, we consider wage effects of mobility after training and discuss the empirical strategy. Fourth, we introduce our data set and show some descriptive statistics. Fifth, we describe our empirical results. Finally, we sum up, conclude and give an outlook.

2 Theory

2.1 Human Capital Investment and Rent Sharing

The benchmark for theoretical approaches to explain the effects of continuing training is Becker's human capital theory (1962,1964). Assuming that investments in training raise labour productivity, Becker distinguishes two kinds of human capital moulded by training investments: general and firm specific human capital. General training raises workers' productivity inside and outside the current firm. Hence, general human capital generated by continuing training is also usable at potential new employers. Examples for general training are computer or language courses. Firm specific training, in contrast, raises workers' productivity only at the current employer. Human capital investments in firm specific training can therefore only be used in the current firm. In practice, it is difficult to find examples for purely firm specific training (see e.g. Booth and Snower (1996)). One example are courses on firm specific production processes. The theoretical discussion revolves the questions under which conditions investments in continuing training are undertaken and how costs and gains are shared between employer and employee.

According to standard human capital theory in a competitive labour market, general training should be fully financed by the employee. The investment can either be direct if the employee pays for all direct costs, or indirect by receiving lower wages while being trained and/or before training participation. The investment in general human capital raises labour productivity and wage to the same extent because workers are paid their marginal productivity (more precisely their outside option). This implies that employees can reap the full rent of their investment. Firms are expected not to finance general training of their employees because otherwise they would lose workers to other firms, which can outbid the training firm since they did not bear any of the training costs. Investment costs for firm specific human capital, however, are shared between employer and employee (see Hashimoto (1981) or Leuven and Oosterbeek (2001)). Standard human capital theory therefore predicts productivity gains from both general and specific training which translate fully or partly into higher wages, depending on the specificity of the training and on how rents are shared.

Becker's central assumptions of perfect competition and complete capital markets have been subject to criticism in the past (see e.g. Acemoglu and Pischke (1999a), Ohashi (1983), Katz and Ziderman (1990), Chiang and Chiang (1990), Chang and Wang (1996) or Leuven (2005)). Prendergast (1993) notes that the vague nature of firm specific human capital makes it difficult for firms to compensate workers according to the productivity increase. Allowing imperfect markets by introducing e.g. asymmetric information (there might be an informational difference between current and potential employers about the increase in productivity resulting from training) or transaction costs (searching for a new job or recruitment of new workers), it can be shown that firms are also willing to finance general training because they are able to (partly) gain

from this investment (see e.g. Acemoglu and Pischke (1999a)). As a result, workers do not reap the full rent from investments in general training and, accordingly, wage mark-ups of workers participating in continuing training are lower than they would be in a competitive market. Nonetheless, also these models predict positive wage effects from training participation as long as investments are not fully paid by firms which are in a position to capture the full rent. The informational asymmetry in human capital investments is likely to lead to underinvestment. This will be especially the case if training is general (see e.g. Chang and Wang (1996)). In their model, Chang and Wang (1996) show that under asymmetric information neither the firm nor the worker can expect the market to fully recognise the value of the investment in training. Referring to psychological contract reasoning, Galunic and Anderson (2000) argue that investment in general training may be valuable for firms due to a positive impact on worker commitment to the firm. The same holds for reciprocity and gift exchange arguments. As stressed by Leuven (2005), while the recent training literature is concerned with strategic interaction and rent sharing, there is hardly any empirical evidence on these recent developments. This seems to be due to difficulties in testing the hypothesis arising from the theoretical literature which are based on concepts not observed in data.

We are not aware of theoretical models in the training literature which explicitly show the relationship between training participation, mobility, and wage effects (of mobility). Nevertheless, like previous papers (for Germany see e.g. Christensen (2001)), using insights from the theories discussed above, we can hypothesise how investments in human capital influence job mobility. If training generates a rent due to higher worker productivity, it depends on how this rent is shared whether the employer wants to keep the trained worker or the employee has an incentive to stay with the firm. From the employer's point of view this implies that as long as there is a rent generated by training, a firm prefers to lay off workers that haven't obtained training to those workers which have participated in training. If a worker gains from participation in training and cannot be sure to obtain the same wage mark up from another employer (e.g. due to asymmetric information or specificity of training), the probability for a trained worker to quit and search for a new job will be lower than for a non-trained worker.

2.2 Mobility

Discussing mobility effects of training from the point of view of standard human capital theory is complicated for two reasons. First, consider figure **??**. Human Capital theory does not discuss any of these different kinds of job changes, but it can principally incorporate two of them, namely the ones we call exogenous. In the classical human capital world there is no incentive to change a job for financial motives, since individuals are paid their outside option. Allowing for rent-sharing in the financing of training means that there could be such an incentive, but why would firms want to pay for

general training? Second, even if we allow, for example in a model with rent sharing for these different sorts of mobility the model is not closed in the sense that we have an explicite model where mobility is included and modelled. Rather, we discuss plausibility arguments why individuals change jobs and why they could earn more in other jobs.

These leads us to models that explicitly allow for and explain endogenous kinds of mobility. Search frictions offer an explanation why it could be interesting for firms to invest in general human capital (see e.g. Acemoglu (1997)) and why this can have mobility effects. Search models give up the hypothesis that firms have some market power: search frictions on the labour market create monopsony power. Monopsony power itself implies that it can be optimal for different firms to pay different wages for identical labour. This, of course, gives scope for a sort of mobility that is not present in a world where individuals are paid their outside option, i.e. mobility in order to improve upon the wage ("endogenous" mobility in our diction). The advantage of the models allowing for monopsony power of firms is that they allow for both endogenous and exogenous mobility in a closed model (see e.g. Burdett and Mortensen (1998)).

Unfortunately, to our knowledge, there are no models that discuss the training decision in a model with endogenous wage dispersion because of search frictions.[5] So, our analysis respects search theoretic arguments – especially in the econometric analysis – and discusses the impacts of search theory on search behaviour both in the hypotheses and in the interpretation of the results. But, we cannot explicitly derive hypotheses that stem from the interaction of search and training.

We interpret mobility effects of training in a partial search model, i.e. a model which does not include an endogenous wage distribution. If mobility after training increases, this means that the outside option is better on average. That is, outside offers are not more frequent but are accepted more often. This can happen, when training imparts general skills that are not (fully) paid for in the current firm. On the other hand, if mobility decreases after training the opposite is true. While wage offers are assumed to arrive at a constant frequency they are accepted less often; the outside option is worse. This can be the case, when training contains specific skills which is (partly) paid for by the firm. Wage offers from outside the firm are then less often accepted.

Now, take wage effects of mobility. When wages are higher after a job change, we know that it cannot be true that individuals are paid their outside option. If wage effects are positive after training, we interpret this as a strong case for endogenous mobility (as defined above) and conclude that firm or job specific human capital is not important as compared to other factors driving wages. On the contrary, if wages decrease after a job change after training, it is plausible that there has been some specific capital that is lost through the job change. Then, this could be explained fully by exogenous

[5] Acemoglu and Pischke (1999b) use the interaction of search frictions and training decisions to explain firms' investments in general human capital. Their model is in the spirit of the matching literature (see e.g. Pissarides (2000)) and not in the tradition of the wage posting literature and therefore does not allow for endogenous wage dispersion.

mobility, stemming from exogenous shocks and destroying the specific capital of the match.[6] We would not need search theory then.

We will discuss both mobility effects and wage effects of mobility and outline estimation strategies in the next sections in more detail.

3 Mobility Effect of Training

3.1 Specific versus General Human Capital

For training that generates (job, employer, occupation, or task) specific human capital, there is no unique solution of how to assign the existing rent between employer and employee. The employer might want to pay the individual a wage above the outside option in order to prevent the individual from changing the employer. It might be a reasonable strategy for an employer to provide specific training to workers and to finance this via a low employee turnover and higher wages. Another argument for wages above the outside option might be that there exists a hold-up problem, if an individual is able to extract ex-post a part of the (quasi-)rent by renegotiating after training costs are sunk. So, negative mobility effects of training are to be expected in case where training imparts specific skills, and where individuals capture a non-zero part of the return to investment in training.

If training provides individuals with general skills, this should not alter the mobility decision in a competitive market. If, however, the market is not competitive, the effect on mobility is less clear. Mobility may not be unaffected by investments in general skills since market imperfections can turn technologically general into de facto specific skills (see Acemoglu and Pischke (1999b)). This is the case, when mobility is constrained or, when the outside wage offer (distribution) does not increase one by one with (the productivity effect of) general skills. It is conceivable that the employing firm does not fully recognise the general skills from training for whatever reason. Then, there could be a mobility increasing effect of general training if other firms are willing to pay for the increased productivity. Hence, for training generating general human capital we expect zero or positive effects on mobility.

We summarise the expected effects of training on mobility that we deduced from human capital and job matching theory in figure 1.

3.2 Estimation Strategy

We assume that the error term in the decision of being mobile is normally distributed and therefore model the mobility decision as a Probit model. According to this model,

[6] Notice that, if this were true, an IV estimator would find (asymptotically) the same effect as the normal LS estimator.

the probability of changing the employer depends on a vector X, which in our case contains individual characteristics, job characteristics and firm characteristics,[7] on a parameter vector β and on the unobservable error term ϵ.

$$(1) \qquad y* = Prob(Y = 1) + \epsilon = \Phi(\beta\prime X + \gamma * T) + \epsilon$$

$Y = 1$ means an employer change, T means training participation, γ is the effect of training on the probability to change the job and $y*$ can take the values zero and one.

The model is estimated by maximising the likelihood function as it is standard with binary choice models, where the likelihood function is the product of the cumulated density function (of the normal distribution) for job changers and of the survivor for job stayers.

Note however, that training might be endogenous with respect to mobility, for example in the case where there is specialisation in search or in training as suggested in Antel (1986). In order to generate exogenous variation of the probability of training participation, we use variation in the share of collective (or firm) agreements per economic sector in which training is included. Since it is easier to interpret the results, although we estimate an instrumental variable Probit, too, we display the results for a linear instrumental variable model.[8] Further, we do not use the instruments directly in the IV procedure, but we use the predicted values from a first stage Probit model for training participation as instrument, since this procedure has some nice robustness properties (see Wooldridge (2002), p. 623ff.). We estimate a Probit model for training participation including all covariates from the job change equation plus the external identifying variable. The predicted value from this model is then used as instrument in a standard IV approach. When estimating the model as 2SLS, we use a robust estimator for the variance-covariance matrix, since standard errors are heteroscedastic by construction, when estimating a binary response model as linear regression model.

[7] Notice that both firm and job characteristics refer to the current job, i.e. the job an individual changes to. We are aware that this is a critical assumption, but unfortunately, we do not have data on the previous job. Therefore, we only include these characteristics as controls rather than giving an interpretation as (causal) effects on mobility. For the standard interpretation as coefficient we would need to assume that job and firm characteristics are unaffected by the job change, which is a strong assumption. In the empirical application, especially sectors have a strong partial correlation with mobility, which we do not want to omit. So, basically the coefficient interpretation requires that the job change remains in the same sector.

[8] Instrumental variable methods for Probit models are discussed for example in Newey (1987). Results from an instrumental variable Probit estimation are available upon request. They do not differ in sign and significance from the results we display here.

4 Wage Effect of Mobility

4.1 Specific versus General Human Capital

Discussing the wage effect of mobility after training, the human capital approach predicts wage losses if training has provided the individual with specific skills. In the case of general training, under rent sharing, individuals might be paid below their outside option. In this case, there could be wage gains from a job change. For this to be true, it does not matter whether mobility is endogenous or exogenous.[9]

The following hypotheses arise from human capital theory. If training provides individuals with (job, employer, occupation or task) specific skills and if returns are shared, a job (occupation, task) change after training is predicted to have a negative effect on wages, while there is no theoretical prediction for a job change without training. If a job change also invokes a negative coefficient, then the effect of a job change after training is bigger in absolute value. In case of general skills and the presence of rent sharing between employer and employee, the predicted coefficient of a job change after training is positive or zero, because it is not sure whether the part of the rent which is captured by the firm providing training is also obtained by a new employer. Therefore, estimating the coefficient of job change in a wage regression after participating in training gives a hint whether training is mainly firm specific or general. We complement the analysis by examining wage effects of mobility without training. Using occupational and major task changes instead of employer changes helps us detecting on which level training is specific. Is it specific to the employer, the occupation, a task, or a single job?

We collect the theoretical hypothesis in figures 2 and 3.

[9] From this point of view, individuals get their outside option if they change jobs, independently of whether job–to–job transitions are exogenous or endogenous.

Mobility Effects of Training	Human Capital Theory (general hc)	Human Capital Theory (specific hc)
Voluntary Mobility (individual decides)	0/+	–
Involuntary Mobility (firm decision)	0/+	–

Figure 1: Mobility effects of training in the light of human capital theory

Wage effects of Mobility	Human Capital Theory (general hc)	Human Capital Theory (specific hc)
Voluntary Mobility (individual decides)	0/+	-
Involuntary Mobility (firm decision)	0/+	-

Figure 2: Wage effects of mobility from the theoretical point of view

Training effect on wage effects of Mobility	Human Capital Theory (general hc)	Human Capital Theory (specific hc)
Voluntary Mobility (individual decides)	0	–
Involuntary Mobility (firm decision)	0	–

Figure 3: Training effect on wage effects of mobility from the theoretical point of view

4.2 Estimation Strategy

Our approach is to estimate a Mincer-equation and to interpret the coefficient of job change after training. Doing this, we control for a variety of demographic variables, including the variables of an enhanced Mincer-equation experience and tenure and the square of both. When estimating, we treat mobility effects for the group of training participants and individuals that have not participated in training separately, because training participants and non-training participants might be systematically different.

However, there are some remarks to make. The above analysis implies that in order to evaluate the wage effect of job–to–job transitions after training, we simply compare wages of job movers and stayers. This is not sufficient however because the decision to change a job depends on various factors such as previous training and can be endogenous. This is the case, since there are several sorts of mobility (see figure **??**). Mobility is endogenous when the mobility decision is taken because of the outside wage, while mobility is exogenous when mobility takes place for reasons that do not depend on the outside wage. It is not problematic to use exogenous mobility in a wage regression, while the use of endogenous mobility leads to bias.

Notice that if individuals are paid their outside option, mobility cannot be endogenous. If individuals are not paid their outside option and if the decision to change a job is taken as assumed in search theory, there is a problem of endogeneity. To see this, recognise that from this point of view, the decision to change a job is made on the basis of the current wage and outside wage offers that arrive at irregular time intervals and that are random draws from a wage offer distribution. Hence, wage and job mobility are determined simultaneously.

Still, involuntary job mobility is not enough to guarantee exogeneity of the job change variable with respect to the wage (see figure **??**). Using information whether the partner is working, too, and whether there are children in schooling age can help us to identify the wage effect of exogenous and involuntary mobility, while using explicit information on voluntariness of the job change can help us to assess the wage effect of voluntary job (and occupational) changes. We base our analysis of wage effects of job moves both upon a comparison of stayers and movers accounting for endogeneity and upon the direct appraisal of the individuals whether the job change ameliorated their professional position or not.[10]

Our estimation strategy therefore takes endogeneity of job changes into account by using instruments. Both for training participants and for non-training participants we exclude a dummy whether the partner is employed and a dummy for children below 6 years and the dummy for children between 6 and 17 years from the wage regression

[10]For the same reason, for which a job change is endogenous in a wage regression, tenure is also endogenous. By including the number of previous employers, however, we can account for a source of endogeneity in tenure.

while allowing the number of children being correlated with the wage.[11] In addition, we choose a robust variance-covariance estimator, since wages are in general assumed to be heteroscedastic.

An alternative approach to evaluate the job change effect for training participants and non training participants is to use the direct subjective judgement of individuals whether they profited from the job change or not and to explain this dummy variable by participation in training. Clearly, we restrict our attention to job changers in this case. Note that there is no reason to suppose endogeneity in this case, since we restrict our attention to job changers. There would be a problem of endogeneity if the training participation decision depends on the perceived returns to future mobility.

5 Data

We use a rich data set, compiled from a representative sample of 0.1 percent of all individuals employed in Germany. The BIBB/IAB "Qualification and Career survey" ("Berufliche Qualifikation und Erwerbsarbeit") is jointly ascertained by the Research Institute of the Federal Labour Office (Institut für Arbeitsmarkt- und Berufsforschung, IAB Nürnberg) and the Federal Institute for Vocational Training (Bundesinstitut für Berufsbildung, BIBB Berlin). The survey is implemented every seven years, but it is not a panel. We will use the latest wave available, which is from the survey in 1998/99. It comprises more than 34.000 employees. The cross-section data on employed individuals in Germany contain detailed information on the qualification and the professional career of each individual, the organisational and technological environment of jobs, and the qualifications demanded for jobs. Furthermore, information about the employer and some personal attributes are included. Specifically, we use the following variables (see also table A1 in the appendix for the complete list with detailed descriptions and table A2 for a German translation of selected variables):

- The wage variable is log midpoints of earnings from 18 categories. We use midpoints of the intervals in the same way other authors have done it (see e.g Kuckulenz and Zwick (2003) or Pfeiffer and Reize (2001)).[12]
- The first key variable is participation in training during the last five years. First, it is asked whether the individual participated in courses or seminars in this time

[11] Theoretically, it is plausible that the fact whether the partner is employed or not does not have an impact on the wage but on job mobility. The same is true for the children variables. The instruments fulfill the minimum requirement that they have explanatory power in the first stage (explaining mobility) and that they are insignificant in the wage regression.

[12] The first category includes all earnings below 600 DM, the second includes earnings from 600 DM until 1,000 DM. The following categories comprise earnings intervals of 500 DM up to 6,000 DM. From 6,000 DM to earnings of 10,000 DM, the intervals are in steps of 1,000 DM. The next category comprises earnings from 10,000 DM until 15,000 DM and the last category includes all earnings of 15,000 DM, and above. Most earnings can be found in the categories between 3,000 DM and 5,000 DM, see table A1 in the appendix for descriptive statistics.

period. Second, it is asked in which year the course took place.[13] By combining both questions, we obtain dummies for participation in training in either one specific year or in several years. Since we know when training took place, we can use this information later to distinguish between training before or after job changes. An important measurement problem of our training variables is that they do not include information on the length and costs of the training attended. Hence, we cannot control for training intensity when estimating effects on wage and mobility.

- The second key variable is job change. We cannot directly observe this variable. To construct the job change variable and the date of job change, we use information on the number of employers together with the question since when one works for the actual employer. It is also asked why people have changed the employer and whether they profited from the job change. We use the judgement of the individual whether it has profited from the employer change directly as endogenous variable, in order to assess the effect of training on job change.[14]

- To control for selection into training in the wage regressions, we use several identifying variables. The external identifying variables for training participation originate from questions on changes in the workplace during the period in which training took place (1996 - 1998). We use two variables: technical restructuring (introduction of new production techniques, machines, production materials or computer programmes), and organisational restructuring (re-organisation of departments or work groups).[15] To generate more variation in this instrument, we also construct and use a counter for the number of restructuring measures that had been processed in the firm where the individual is employed. Furthermore, individuals were asked to state in which specific fields they see the need for themselves to participate in continuing training. There are 18 different fields in which subjective need for training can be indicated. This information will be used for our external identifying variables for the participation in training courses, because these variables are correlated with training but not with wages. Again, we use a counter to generate a variable "need for training" with more variation than a dummy variable would have. To instrument training participation in the mobility equation, we imputed data from the Continuing Vocational Training Survey (CVTS 2000) about sectoral shares of firms and shares of firms by employment

[13] There are two questions on the participation in continuing training. First, "Please think about the last five years, i.e. the time from 1994 until today. Did you attend during this time any seminars or courses which serve your continuous process of education?" Second, "In which year did the course take place?"

[14] Note that the job change variable not only includes direct job–to–job transitions. It also includes for example individuals that transit through unemployment, before working for the next employer. For comparison reasons, we have constructed a job change variable for individuals that are never unemployed before the interview. The results do not differ by much, though.

[15] Of course, our instruments fulfill the requirements that they are significant in the first stage and insignificant in the second stage.

size that include continuous training in their collective bargaining agreement.[16]

- As discussed above, job changes are partly endogenous in the wage regression. In principal, there is some nice information on exogenous job changes in the data set, which we can use as instruments, namely firm closure, and occupational changes for health or family reason.[17] In the wage regression, unfortunately these instruments do not generate enough variation or are surprisingly not exogenous. Hence, we use two further variables as instruments who cause variation in the job change equation but not in the wage equation. Firstly, we use information on the fact whether the employed individual has a partner that is employed, too. It is reasonable to assume (and is empirically shown) that this variable is not related to an individuals earnings, while it is very realistic to think that the individual is more connected regionally, so that there are less job offers and therefore less employer changes. As a second variable, we use the dummy whether the individual has children between 6 and 17 years. To see why, in the wage equation we control for the number of children, since this is (significantly) correlated with the wage. But, we think (and show) that whether the children are in schooling age or not does affect mobility while it should (and empirically does) not affect earnings.

- Further explanatory variables are those found in the Mincer-equation, i.e. actual work experience (and its square), [18] job tenure (and its square), former unemployment, and dummies for the highest educational achievement.[19] These variables are related to the situation in 1998/1999.

- Along with these standard variables, we also include some dummies capturing the professional status, such as blue-collar or white-collar worker, civil servant or different sophistication levels of tasks.

- In addition, we use the following job characteristics: computer use, profit-sharing, bonus payments, overtime work, whether a job is temporary, and main job contents. These variables allow us to control a large part of the individual heterogeneity between the employees.[20] Some of these variables (for example, overtime work) can be interpreted as indicators for intrinsic motivation.

- Additional control variables explaining earnings are personal attributes. We include dummies for females, having children, and German nationality.

[16] The CVTS data is from 1999 and therefore fits well to the BIBB/IAB data set.

[17] In former version of the paper we have estimated training participation equations using job changes as an explanatory variable and using the above instruments. In this estimation these instruments worked quite nice.

[18] We know when the individual started his or her first job and we include dummies for discontinuation such as unemployment.

[19] In Germany, the highest schooling degree is more informative for the level of education than years of schooling (see Georgellis and Lange (1997)).

[20] Some of these variables may also be endogenous in the earnings equation. We do not control this, however, because the variables mainly serve as control variables for employee heterogeneity.

- Finally, we also control for the firm size and we include a dummy indicating whether the individual lives in East or West Germany because earnings as well as costs of living still differ between the two regions.

Hours worked vary widely in the data and we found a number of implausibly high reported values. Therefore, we only use full-time[21] employees.

6 Descriptive evidence

During the last five years, 44 percent of the employees attended at least one continuing vocational training course or seminar. This proofs that for a large part of the employees, training takes place. Of those workers who participated, almost 50 percent participated last year (1998), 20 percent participated 2 years ago in the last training course or seminar, and for the remaining employees, the last training took place more than 2 years ago. When looking at all employees, around 70 percent have changed the job at least once, i.e. they worked at least for 2 different employers. During last year, almost 12 percent of the employees changed their job.[22] Several reasons why the last job ended are distinguished in our data set. In particular, 66 percent of the individuals state that it was their own desire to leave the former employer, 12 percent had to leave because the firm wanted them to, 7 percent left because their fixed term contract ended and 15 percent state that the firm went bankrupt. In their new job, 70 percent of the job changers are more happy than before, for 21 percent the situation is unchanged, and 9 percent of the individuals state that they are less happy in the new job than they were in the old job. Not surprisingly, out of those individuals which change the job because it was their own desire to do so, 80 percent are more happy in their new job. Likewise, 17 percent of those individuals that did not want to leave the firm state that the situation in the new job is worse than in the old one. Combining training and mobility, it is interesting to know whether individuals are less likely to change jobs after they participated in training. Given the descriptive statistics, this seems to be the case. After 1994, 23 percent of the employees have changed their job but only 11 percent of those which took part in training during this time period changed their job afterwards.

[21] We include only employees working 30 hours and above per week. We also use a dummy for working overtime in order to take hours worked into account.

[22] The number of job changes is slightly higher in our data set compared to other German data sets (see e.g. Fitzenberger and Garloff (2004)). The reason is that we do not observe job-to-job transitions directly and hence, some individuals which enter a new job after staying home or after being unemployed for a while are also included as job changers.

7 Empirical Results

7.1 Mobility Effect of Training

There is a negative partial correlation between training and mobility as individuals that have participated in training before 1997, change jobs less often after 1997 than otherwise comparable individuals. If we take into account that participation in training might be endogenous with respect to the mobility decision, the effect of training, instrumented by exogenous variation in the participation probability through collective agreements, increases in absolute value but gets insignificant (see tables 1 and 2).[23] The number of previous employers increases the probability of a job change and points to the fact that the number of previous job changes can be taken as a sufficient statistics for future job changes. This is in accordance with specialisation in search or specific training as proposed by Antel (1986) or with the hobo syndrome by Ghiselli (1974).

We cannot easily compare OLS and IV estimates since in the IV case our estimates are not significant. Interpreting the point estimates, however, means that exogenous training participation has, on average, a bigger negative effect on labour mobility than training participation in the population. That is, if somebody is admitted exogenously to training, he is more likely to stay in the firm. This is counterintuitive and contradicts the Antel (1986) story where people are assumed to specialise in training or search. However it has to be noted also, that the variance increases.

Additionally, because of this counterintuitive result, we perform a Durbin-Wu-Hausman test for exogeneity of training given the instruments. We fail to reject exogeneity for the instruments in use. From this we conclude that we should not overinterpret the IV results and we prefer the Probit results. Summarising, the results point to a negative effect of training on mobility. This is consistent with training inhibiting specific capital for the employer or the match and what is lost upon job change.

[23] To see that there might be an endogeneity problem, recognise that an individual who wants to change the employer is maybe not interested in investing in employer specific human capital. The first stage results are printed in the appendix.

Table 1: (B0) Does training affect labour mobility?

Variable	Coefficient	(Std. Err.)
Training before 1997	-0.092*	(0.046)
Individual Characteristics		
(Not Married, Household with 2 Members, Household with 3 Members, Household with 4 Members, Female, Lower Secondary School, Entrance to University for Applied Sciences, High School Diploma, Without School Leaving Certificate, Full-Time Vocational School, Master Craftsman, University for Applied Sciences, Children, child<6y)		
Number of previous Employers	0.275**	(0.016)
Professional Experience	-0.057**	(0.008)
Professional Experience Squared	0.001**	(0.000)
Unemployment	0.438**	(0.036)
Age	-0.037**	(0.006)
East Germany	0.095*	(0.046)
Without Professional Degree	-0.155**	(0.055)
University	0.225*	(0.092)
Partner Employed	-0.104†	(0.056)
child6to17y	0.107†	(0.064)
child>18y	0.171*	(0.075)
Job Characteristics		
(Computer Work Station, Overtime, Profit-Sharing)		
Temporary Work	0.852**	(0.054)
Incentive Wage	-0.113*	(0.048)
Working Hours	0.096**	(0.029)
Firm Characteristics		
(Firm with 50-99 Employees, Firm with more than 1000 Employees, White-Collar Worker, Industrial Sector, Handcraft Sector, Trade Sector, Agricultural Sector)		
Firm with 1-4 Employees	0.197**	(0.061)
Firm with 5-9 Employees	0.140**	(0.052)
Firm with 100-499 Employees	-0.169**	(0.052)
Firm with 500-999 Employees	-0.170*	(0.084)
Public Service Sector	-0.258**	(0.064)
Other		
(Firm Failure, Occupational Change (Health), Occupational Change (Family), Intercept)		
Restructuring	-0.062**	(0.011)
Need for Training	0.037**	(0.014)
N	9335	
Log-likelihood	-3676.619	
$\chi^2_{(49)}$	1682.093	

Significance levels : † : 10% ∗ : 5% ∗∗ : 1%

Table 2: (B2) Does exogenous training participation affect labour mobility?

Variable	Coefficient	(Std. Err.)
Training before 1997	-0.318	(0.243)
Individual Characteristics		
(Not Married, Household with 3 Members, Household with 4 Members, Female, Children, Lower Secondary School, Entrance to University for Applied Sciences, High School Diploma, Without School Leaving Certificate, Full-Time Vocational School, Master Craftsman, University for Applied Sciences, University)		
Number of Employers	0.062**	(0.005)
East Germany	0.041*	(0.016)
Professional Experience	-0.018**	(0.002)
Professional Experience Squared	0.000**	(0.000)
Unemployment	0.107**	(0.011)
Age	-0.008**	(0.001)
Household with 2 Members	-0.020*	(0.009)
Without Professional Degree	-0.038*	(0.015)
Job Characteristics		
(Computer Work Station, Overtime, Profit-Sharing)		
Temporary Work	0.275**	(0.021)
Incentive Wage	-0.0232*	(0.011)
Working Hours	0.033**	(0.011)
Firm Characteristics		
(Firm with 5-9 Employees, Firm with 50-99 Employees, Firm with more than 1000 Employees, White-Collar Worker, Civil Servant, Industrial Sector, Handcraft Sector, Trade Sector, Agricultural Sector, Private Household Sector)		
Firm with 1-4 Employees	0.063**	(0.019)
Firm with 100-499 Employees	-0.037**	(0.012)
Firm with 500-999 Employees	-0.036†	(0.020)
Public Service Sector	-0.037†	(0.020)
Other		
(Restructuring, Firm Failure, Occupational Change (Family), Occupational Change (Health))		
Need for Training	0.013†	(0.007)
Intercept	0.379**	(0.067)
N		8098
R^2		0.146
$F_{(44,8053)}$		42.591

Significance levels : † : 10% * : 5% ** : 1%

7.2 Wage Effects of Mobility

Looking at the second test for specific versus general human capital, as expected, both the partial correlation and the wage effect of an employer change for the subgroup of training participants is negative (see tables 3 to 4). Both least squares and IV-methods yield a significant negative coefficient and the effect increases in magnitude when endogeneity of the employer change is taken into account.[24] An exogenous job change is associated with a higher wage loss than an endogenous job change, where individuals decide to change a job because of a higher wage, as we would expect. Clearly, in the individuals' decision to change a job the wage that an alternative job would pay, plays a crucial role. This is confirmed by our results. The fact that both endogenous and exogenous employer changes yield a wage loss for the group of training participants was predicted from the hypothesis that training incorporates a substantial share of employer or job specific capital. This confirms the results from the previous section. Recognise however, that the difference between the IV estimator and the OLS estimator implies that there is endogenous mobility, pointing to the fact that a simple human capital interpretation is not admissible.

Table 3: (C0) Participants in training: Does a job change affect wages?

Variable	**Coefficient**	**(Std. Err.)**
Job Change after Training	-0.028†	(0.017)
Individual Characteristics		
(Number of Employers, Professional Experience, Company Tenure Squared, Household with 4 Members, Not Married, Foreigner, Handicapped, Without School Leaving Certificate, Full-Time Vocational School)		
Age	0.008**	(0.002)
East Germany	-0.322**	(0.013)
Household with 2 Members	-0.018†	(0.009)
Household with 3 Members	-0.048*	(0.020)
Female	-0.159**	(0.012)
Children	0.043**	(0.010)
Lower Secondary School	-0.059**	(0.013)
Entrance to University for Applied Sciences	0.069**	(0.016)
High School Diploma	0.063**	(0.018)
Without Professional Degree	-0.087**	(0.030)
University for Applied Sciences	0.098**	(0.020)
University	0.225**	(0.021)
Professional Experience Squared	0.000**	(0.000)
Company Tenure	0.008**	(0.002)
Unemployment	-0.065**	(0.010)
Master Craftsman	0.072**	(0.012)

Continued on next page...

[24]The first stage estimation can be found in the appendix.

... table 3 continued

Variable	Coefficient	(Std. Err.)
Job Characteristics		
Temporary Work	-0.057**	(0.018)
Computer Work Station	0.082**	(0.012)
White-Collar Worker	0.139**	(0.014)
Overtime	0.031*	(0.013)
Profit-Sharing	0.099**	(0.016)
Incentive Wage	0.041**	(0.012)
Working Hours	0.109**	(0.009)
Firm Characteristics		
(full set of sectoral dummies)		
Firm with 1-4 Employees	-0.067**	(0.024)
Firm with 5-9 Employees	-0.056**	(0.019)
Firm with 50-99 Employees	0.049**	(0.015)
Firm with 100-499 Employees	0.072**	(0.013)
Firm with 500-999 Employees	0.090**	(0.018)
Firm with more than 1000 Employees	0.113**	(0.017)
Other		
Intercept	7.208**	(0.102)
N		4552
R^2		0.546
$F_{(85,4466)}$		64.932

Significance levels : † : 10% * : 5% ** : 1%

Since search theory predicts a negative effect of job changes also in the absence of specific capital,[25] we consider the population of non-training participants and wage effects of job changes in this group next (see tables 10 to 12 in the appendix). The correlation is also negative but the point estimate is smaller than for the group of training participants. The effect is significant only at the 10% interval. Taking the endogeneity of employer changes into account and using a dummy variable for whether the partner is employed and for the age of children as instruments, yields an insignificant positive coefficient for job change. This is an astonishing result, since it implies that exogenous job changes are better on average with respect to the wage than all job changes. It could be (though not very plausible) that endogenous job changes are dominated by layoffs on the side of the firm and not by voluntary job changes on the side of the workers. In this case, indeed, it seems intuitive that exogenous layoffs are a positive selection in the group of job changers and therefore perform better in terms of wage changes than the average. Summarising, (exogenous) job changes seem to have

[25]This is the so called wage ladder effect, the effect from self-selection in higher paying jobs.

Table 4: (C2) Participants in training: Does an exogenous job change affect wages?

Variable	Coefficient	(Std. Err.)
Job Change after Training	-0.074*	(0.035)
Individual Characteristics		
(Professional Experience, Company Tenure Squared, Household with 4 Members, Not Married, Foreigner, Handicapped, Without School Leaving Certificate, Full-Time Vocational School, Number of Employers)		
Professional Experience Squared	0.000**	(0.000)
Company Tenure	0.006*	(0.003)
Unemployment	-0.063**	(0.010)
Age	0.008**	(0.002)
East Germany	-0.321**	(0.013)
Household with 2 Members	-0.018*	(0.009)
Household with 3 Members	-0.048*	(0.020)
Female	-0.159**	(0.012)
Children	0.043**	(0.010)
Lower Secondary School	-0.060**	(0.013)
Entrance to University for Applied Sciences	0.068**	(0.016)
High School Diploma	0.063**	(0.018)
Without Professional Degree	-0.088**	(0.029)
Master Craftsman	0.072**	(0.012)
University for Applied Sciences	0.097**	(0.020)
University	0.223**	(0.021)
Temporary Work	-0.049*	(0.019)
Job Characteristics		
(Civil Servant)		
Computer Work Station	0.080**	(0.012)
Overtime	0.030*	(0.013)
Profit-Sharing	0.097**	(0.016)
Incentive Wage	0.041**	(0.012)
Working Hours	0.108**	(0.009)
White-Collar Worker	0.138**	(0.014)
Firm Characteristics		
(full set of sectoral dummies)		
Firm with 1-4 Employees	-0.066**	(0.024)
Firm with 5-9 Employees	-0.055**	(0.019)
Firm with 50-99 Employees	0.049**	(0.015)
Firm with 100-499 Employees	0.072**	(0.013)
Firm with 500-999 Employees	0.090**(0.018)	
Firm with more than 1000 Employees	0.113**	(0.017)
Other		
Intercept	7.247**	(0.102)
N	4553	
R^2	0.545	
$F_{(84,4468)}$	65.669	

Significance levels : † : 10% * : 5% ** : 1%

no significant effect on wages for the group of non-training participants. This means that individuals are paid their outside option on average.

Finally, we use information, where individuals judge themselves whether they profited from their last job change (see table **??**). A Probit model for the group of job changers with training (before the job change) as explanatory variable yields a negative coefficient, which is significant. Note that a specialisation in training or search does not predict endogeneity of training in this equation, because it predicts a correlation between job change and training but not a correlation between the wage change through a job change and training.[26] We conclude that training participation seems to have a negative effect on the propensity to improve upon the perceived position through a job–to–job change. In our view, this is the best evidence because it is the most direct evidence on the specifity of training substance. It is clearly in favour of training inhibiting specific human capital, which is lost when switching to a different job.

Comparing occupational changes to job changes, we have to note first that our instruments, which worked well for employer changes, seem to perform less good for occupational changes. With methods not controlling for endogeneity of job changes and/or training, we find that the partial correlation of occupational changes and wages is somewhat larger in absolute value than the correlation of employer changes and wages for the group of training participants while it is smaller in absolute value for the group of non-training participants. That suggests that training is even more occupation specific than employer specific. For the group of non-training participants the effect of an occupational change is significantly positive, which remains true also when instrumenting job changes with the dummy indicating that the partner is employed and with the dummy for children in a certain age group. For major changes of tasks we estimate smaller effects, which are again rarely significant. Considering voluntary mobility only, the results change in the expected direction, in the sense that voluntary mobility is expected to have a positive impact on wages, but are rarely significant.

8 Conclusion

All in all, the results suggest that there is a negative correlation of training with job change and for failing to reject exogeneity, we conclude that it is a causal effect. As far as the wage is concerned, there are stable causal negative effects of both employer and occupational changes on wages for the group of training participants. For the group of non-training participants the picture is less clear. This suggests that training indeed has a specific component which is lost for exogenous and endogenous, for voluntary and involuntary job changes. Note, that this is also consistent with training generating information on the quality of a particular match. Then, job specific capital in the

[26] In addition, we found in the mobility estimation that the Null of exogeneity could not be rejected, so that this sort of endogeneity is probably not present.

Table 5: (F0) Effect of training on subjective change in the position after an employer change (Probit model)

Variable	Coefficient	(Std. Err.)
Training1	-0.167*	(0.082)
Individual Characteristics		
(Professional Experience Squared, Company Tenure, Company Tenure Squared, Age, Household with 2 Members, Household with 3 Members, Household with 4 Members, Female, Children, Not Married, Foreigner, Handicapped, Lower Secondary School, Entrance to University for Applied Sciences, High School Diploma, Without School Leaving Certificate, Without Professional Degree, Full-Time Vocational School, Master Craftsman, University for Applied Sciences)		
Number of Employers	0.077*	(0.032)
Professional Experience	-0.033*	(0.015)
Unemployment	-0.396**	(0.075)
East Germany	-0.195*	(0.082)
University	-0.405*	(0.168)
Job Characteristics		
(Profit-Sharing, Incentive Wage, Working Hours)		
Temporary Work	-0.192*	(0.082)
Computer Work Station	0.161†	(0.089)
White-Collar Worker	0.344**	(0.093)
Overtime	0.313**	(0.075)
Firm Characteristics		
(Firm with 1-4 Employees, Firm with 5-9 Employees, Firm with 50-99 Employees, Firm with 100-499 Employees, Firm with 500-999 Employees, Firm with more than 1000 Employees, full set of sectoral dummies)		
Other		
(instrument1)		
Restructuring	-0.041*	(0.020)
Intercept	2.034*	(0.812)
N		2794
Log-likelihood		-997.356
$\chi^2_{(80)}$		224.358

Significance levels : † : 10% ∗ : 5% ∗∗ : 1%

form of information is lost when a match dissolves. For the group of training non-participants it seems also to be the case, that the partial correlation structure is such that job changes come along with lower wages in the new job.

Using the direct judgement from job changers whether they profited from job change or not, seems to bear the best information however, since it is easier to find the adequate control group. We can easily take the group of individuals that has profited from a job change and compare training participants and non-participants. Here, we find that training reduces the probability of an amelioration through a job change. Thus, from

this view, too, training can be interpreted as incorporating employer (job) specific human capital. From the results for occupational changes, it also incorporates capital that is specific to a particular occupation.

Summing up, the evidence points to the fact that most training seems to generate specific capital. This specific capital can be existent as a real productivity increase in the respective firm or equivalently as information about the quality of the match. We do not find evidence for training incorporating general human capital. However, it could well be the case that every training measure also contains some general human capital, but not only. In this sense, our findings are somewhat in contradiction to recent findings that most training is general.

A Appendix

Table 6: List of Variables Used

Variable	**Share/ Average**	**Notes**
School Attainment		
Without School Leaving Certificate	2.01%	
Lower Secondary School	36.45%	
Intermediate Secondary School	35.56%	Reference category
Entrance to		
University for Applied Sciences	7.24%	
High School Diploma	18.73%	
Vocational Training		
Without Professional Degree	10.15%	
Full-Time Vocational School	2.22%	Several years of professional training in school; reference category
Dual Apprenticeship	59.30%	Several years of professional training in school and on-the-job
Master Craftsman	10.46%	
University for Applied Sciences	6.42%	
University	10.66%	
Training		
Courses and Seminars	43.86%	Participation in courses and seminars during the last 5 years
Courses and Seminars before 1997	16.77%	Participation in courses and seminars before 1997
Professional Career		
Professional Experience	21.02 years	Years from first job until today

Table 6: List of Variables Used (continued)

Variable	Share/ Average	Notes
Company Tenure	11.76 years	Years from starting to work for a company until today
Unemployment	30.37%	Dummy = 1 if a person was ever employed, otherwise 0
Professional Status		
Unskilled Blue-Collar Worker	11.90%	Worker without professional degree
Skilled Blue-Collar Worker	18.53%	Worker with degree from dual apprenticeship system or full-time vocational school; Reference category
Assistant Foreman	2.52%	
Master/Foreman	2.18%	
Unskilled White-Collar Worker	3.68%	
White Collar-Worker With Simple Tasks	8.35%	
White Collar-Worker With Difficult Tasks	18.57%	
High-Skilled White-Collar Worker	19.50%	
Executive White-Collar Worker	5.53%	
Job Change	69.40%	
Job Change after Training	11.26%	Dummy = 1 if there is job change after training, Dummy = 0 if there is training and no job change after
Training1	23.54%	Dummy = 1 if training takes place before possible job change, Dummy = 0 if there is no training
Job Change (1984 - 1994)	63.91%	Job Change between 1984 and 1994
Job Change after 1994	22.64%	
Training before 1997	16.77%	
Occupational Change	32.90%	
Occupational Change after Training	5.80%	
Task Change	28.86%	
Task Change after Training	9.22%	
Number of Employers		5 Categories: 1, 2, 3, 4, 5 or more employers
Task Change after Training	9.22%	
Occupational Change (Health)	1.81%	Occupational Change for Health Reasons
Occupational Change (Family)	2.64%	Occupational Change for Family Reasons
Firm Failure	14.72%	
Workplace Characteristics		
Computer Work Station	54.59%	Work routine includes using the computer

Table 6: List of Variables Used (continued)

Variable	Share/ Average	Notes
Temporary Work	7.77%	
Overtime	78.50%	Dummy = 1 if a person works overtime, otherwise 0
Profit-Sharing	7.64%	
Incentive Wage	19.13%	
Working Hours	4.14	
Job Content		13 Categories: training, testing, procurement, organisation, marketing, developing, manufacturing, negotiating, supervising, research, repairing, counselling, monitoring
Individual Characteristics		
Children	45.39%	Dummy = 1 if a person has at least one child, otherwise 0
Child<6y	14.92%	Dummy = 1 if a person has at least one child below 6 years, otherwise 0
Child6to17y	28.94%	Dummy = 1 if a person has at least one child above 6 and below 17 years, otherwise 0
Child6to17y	10.84%	Dummy = 1 if a person has at least one child above 18 years, otherwise 0
Foreigner	5.43%	Dummy = 1 if a person does not have a German Nationality, otherwise 0
Not Married	8.42%	
Female	32.24%	
Handicapped	3.78%	
Partner Employed	38.51%	
Size of Household		3 Categories: 2, 3 or 4 household members
Identifying Variables		
Technical Restructuring	24.68%	
Organisational Restructuring	15.77%	
Restructuring	2.33	Number of restructuring measures (1997/98)
Need for Training	1.13	Number of areas with a subjective need for training
Instrument1	9.05	Share of firms, where training is part of the collective agreement (industrial level)
Employer Characteristics		
Size of Firm		7 Categories: number of employees is 1-4, 5-9, 10-49 (reference category), 50-99, 100-499, 500-999,

Table 6: List of Variables Used (continued)

Variable	Share/ Average	Notes
		and 1000 and more
East Germany	19.80%	
Economic Sector		46 Categories
Trade Sector	12.30%	
Industrial Sector	25.80%	
Private Household Sector	0.36%	
Public Service Sector	26.95%	
Handcraft Sector	17.45%	
Agricultural Sector	1.34%	
Good Economic Situation	80.82%	Dummy = 1 if the company is in a good economic situation, otherwise 0

Table 7: Translation of Selected Variables

English	German
Training	
Quality Circle	Qualitätszirkel
Trade Fair	Fachmesse
Internship	Praktikum
Lecture	Fachvortrag
Specialist Literature	Fachliteratur
School Attainment	
Without School Leaving Certificate	Ohne Abschluss
Lower Secondary School	Hauptschule
Intermediate Secondary School	Realschule
Entrance to University for Applied Sciences	Fachhochschulreife
High School Diploma	Abitur
Vocational Training	
Without Professional Degree	Ohne Ausbildung
Full-Time Vocational School	Berufsfachschule
Apprenticeship	Lehre
Master Craftsman	Meister
University for Applied Sciences	Fachhochschule
University	Universität
Professional Status	
Unskilled Blue-Collar Worker	Angelernter Arbeiter
Skilled Blue-Collar Worker	Facharbeiter
Assistant Foreman	Vorarbeiter
Master/Foreman	Meister
Unskilled White-Collar Worker	Ausführender Angestellter
White-Collar Worker with Simple Tasks	Angestellter mit einfacher Tätigkeit
White-Collar Worker with Difficult Tasks	Angestellter, der schwierige Aufgaben nach allgemeiner Anweisung selbständig erledigt
High-Skilled White-Collar Worker	Angestellter, der selbständige Leistungen in verantwortungsvoller Tätigkeit erbringt oder begrenzte Verantwortung für die Tätigkeit anderer trägt
Executive White-Collar Worker	Angestellter mit umfassenden Führungsaufgaben und Entscheidungsbefugnissen
Civil Servant in Clerical Grade	Beamter im einfachen oder mittleren Dienst
Civil Servant in Higher Service	Beamter im gehobenen Dienst
Civil Servant in Senior Service	Beamter im höheren Dienst

Table 8: (B1) First stage: Probit model for participation in training

Variable	Coefficient	(Std. Err.)
instrument1	0.012*	(0.005)
Restructuring	0.101**	(0.009)
Need for Training	0.064**	(0.012)
Individual Characteristics		
(Age, Not Married, Household with 2 Members, Household with 3 Members, Female, Children, Entrance to University for Applied Sciences, High School Diploma, Without School Leaving Certificate, Full-Time Vocational School, University for Applied Sciences, University)		
Number of Employers	0.029*	(0.013)
East Germany	0.155**	(0.039)
Professional Experience	0.035**	(0.007)
Professional Experience Squared	-0.001**	(0.000)
Unemployment	0.107**	(0.036)
Household with 4 Members	-0.200*	(0.094)
Lower Secondary School	-0.160**	(0.040)
Without Professional Degree	-0.229**	(0.057)
Master Craftsman	0.121*	(0.050)
Job Characteristics		
(Temporary Work, Profit-Sharing, Incentive Wage)		
Computer Work Station	0.262**	(0.037)
White-Collar Worker	0.235**	(0.043)
Overtime	0.191**	(0.039)
Working Hours	0.097**	(0.029)
Firm Characteristics		
(Firm with 1-4 Employees, Firm with 50-99 Employees, Firm with 100-499 Employees, Firm with 500-999 Employees, Firm with more than 1000 Employees, Industrial Sector, Handcraft Sector)		
Firm with 5-9 Employees	-0.186**	(0.055)
Trade Sector	-0.143**	(0.055)
Public Service Sector	0.145**	(0.052)
Other		
Intercept	-2.731**	(0.187)
N		11451
Log-likelihood		-4501.486
$\chi^2_{(41)}$		962.448

Significance levels : † : 10% * : 5% ** : 1%

Table 9: (C1) First stage: Probit model for employer change

Variable	Coefficient	(Std. Err.)
Partner Employed	-0.243*	(0.120)
Individual Characteristics		
(child6to17y, Number of Employers, Professional Experience, Professional Experience Squared, Age, Household with 2 Members, Household with 3 Members, Household with 4 Members, Female, Not Married, Foreigner, Lower Secondary School, Entrance to University for Applied Sciences, High School Diploma, Without School Leaving Certificate, Without Professional Degree, Full-Time Vocational School, Master Craftsman, University for Applied Sciences)		
Company Tenure	-0.364**	(0.081)
Company Tenure Squared	-0.034**	(0.013)
Unemployment	0.365**	(0.076)
East Germany	0.182†	(0.093)
Handicapped	0.440*	(0.205)
University	-0.232†	(0.138)
Job Characteristics		
(White-Collar Worker, Overtime, Profit-Sharing, Incentive Wage, Working Hours)		
Temporary Work	0.286**	(0.098)
Computer Work Station	-0.321**	(0.094)
Firm Characteristics		
(Firm with 1-4 Employees, Firm with 5-9 Employees, Firm with 50-99 Employees, Firm with 500-999 Employees, Firm with more than 1000 Employees, full set of sectoral dummies)		
Firm with 100-499 Employees	-0.208*	(0.103)
Other		
(Intercept)		
N		5114
Log-likelihood		-883.444
$\chi^2_{(84)}$		779.817

Significance levels : † : 10% * : 5% ** : 1%

Table 10: (D0) Non-participants in training: Does a job change affect wages?

Variable	Coefficient	(Std. Err.)
Job Change after 1994	-0.006	(0.012)
Individual Characteristics		
(Household with 2 Members, Household with 3 Members, Household with 4 Members, Without School Leaving Certificate, Full-Time Vocational School, Company Tenure Squared)		
Number of Employers	0.016**	(0.003)
Professional Experience	0.005**	(0.002)
Professional Experience Squared	0.000**	(0.000)
Company Tenure	0.007**	(0.002)
Unemployment	-0.057**	(0.008)
Age	0.005**	(0.001)
East Germany	-0.279**	(0.010)
Female	-0.184**	(0.009)
Children	0.045**	(0.007)
Not Married	0.020†	(0.011)
Foreigner	-0.044**	(0.016)
Handicapped	-0.045*	(0.022)
Lower Secondary School	-0.028**	(0.009)
Entrance to University for Applied Sciences	0.081**	(0.018)
High School Diploma	0.060**	(0.015)
Without Professional Degree	-0.083**	(0.011)
Master Craftsman	0.059**	(0.012)
University for Applied Sciences	0.130**	(0.023)
University	0.246**	(0.023)
Job Characteristics		
(Civil Servant)		
Temporary Work	-0.101**	(0.016)
Computer Work Station	0.103**	(0.009)
Overtime	0.070**	(0.008)
Profit-Sharing	0.088**	(0.015)
Incentive Wage	0.063**	(0.008)
Working Hours	0.071**	(0.009)
White-Collar Worker	0.085**	(0.009)
Firm Characteristics		
(Firm with 50-99 Employees, full set of sectoral dummies)		
Firm with 1-4 Employees	-0.068**	(0.016)
Firm with 5-9 Employees	-0.036**	(0.011)
Firm with 100-499 Employees	0.061**	(0.010)
Firm with 500-999 Employees	0.090**	(0.016)
Firm with more than 1000 Employees	0.112**	(0.012)
Other		

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... table 10 continued

Variable	Coefficient	(Std. Err.)
Intercept	7.414**	(0.067)
N		9274
R^2		0.421
$F_{(84,9189)}$		70.312

Significance levels : † : 10% * : 5% ** : 1%

Table 11: (D1) First stage: Probit model for employer change

Variable	Coefficient	(Std. Err.)
Partner Employed	0.163	(0.103)
Individual Characteristics		
(Age, East Germany, Household with 2 Members, Household with 4 Members, Female, Children, Not Married, Foreigner, Handicapped, Lower Secondary School, High School Diploma, Master Craftsman, Entrance to University for Applied Sciences, Full-Time Vocational School, University for Applied Sciences, University)		
child6to17y	-0.370**	(0.130)
Number of Employers	1.347**	(0.049)
Professional Experience	0.211**	(0.016)
Professional Experience Squared	-0.005**	(0.000)
Company Tenure	2.881**	(0.122)
Company Tenure Squared	-0.738**	(0.025)
Unemployment	0.171*	(0.073)
Household with 3 Members	-0.255*	(0.124)
Without School Leaving Certificate	-0.693**	(0.209)
Without Professional Degree	-0.405**	(0.109)
	0.109†	(0.058)
	-0.156†	(0.081)
Job Characteristics		
(Computer Work Station, White-Collar Worker, Overtime, Profit-Sharing, Temporary Work)		
Working Hours	0.109†	(0.065)
Firm Characteristics		
(Firm with 1-4 Employees, Firm with 5-9 Employees, Firm with 50-99 Employees, Firm with 100-499 Employees, Firm with 500-999 Employees, Firm with more than 1000 Employees, full set of sectoral dummies)		
Other		
Intercept	-4.241**	(0.650)
N		18354
Log-likelihood		-985.291
$\chi^2_{(85)}$		1593.582

Significance levels : † : 10% ∗ : 5% ∗∗ : 1%

Table 12: (D2) Non-participants in training: Does an exogenous job change affect wages?

Variable	Coefficient	(Std. Err.)
Job Change after 1994	-0.011	(0.010)
Individual Characteristics		
(child6to17y, Household with 2 Members , Household with 4 Members, Not Married, Without School Leaving Certificate, Full-Time Vocational School, Company Tenure Squared)		
Number of Employers	0.018**	(0.003)
Professional Experience	0.007**	(0.001)
Professional Experience Squared	0.000**	(0.000)
Company Tenure	0.007**	(0.001)
Unemployment	-0.059**	(0.006)
Age	0.006**	(0.001)
East Germany	-0.286**	(0.007)
Household with 3 Members	-0.030**	(0.011)
Female	-0.172**	(0.007)
Children	0.058**	(0.007)
Foreigner	-0.036**	(0.013)
Handicapped	-0.047**	(0.015)
Lower Secondary School	-0.047**	(0.007)
Entrance to University for Applied Sciences	0.082**	(0.011)
High School Diploma	0.072**	(0.010)
Without Professional Degree	-0.086**	(0.010)
University for Applied Sciences	0.121**	(0.013)
University	0.242**	(0.014)
Master Craftsman	0.075**	(0.008)
Job Characteristics		
(Firm with 50-99 Employees, Civil Servant)		
Temporary Work	-0.097**	(0.012)
Computer Work Station	0.104†	(0.006)
Overtime	0.065**	(0.007)
Profit-Sharing	0.088**	(0.011)
Incentive Wage	0.055**	(0.006)
Working Hours	0.094**	(0.006)
White-Collar Worker	0.110**	(0.007)
Firm Characteristics		
(full set of sectoral dummies)		
Firm with 1-4 Employees	-0.072**	(0.012)
Firm with 5-9 Employees	-0.044**	(0.009)
Firm with 50-999 Employees	0.030**	(0.009)
Firm with 100-499 Employees	0.070**	(0.007)
Firm with 500-999 Employees	0.095**	(0.011)
Firm with more than 1000 Employees	0.124**	(0.009)
Other		
Intercept	7.259**	(0.052)
N	34	16035
R^2		0.502
$F_{(85,15949)}$		170.416

Significance levels : † : 10% ∗ : 5% ∗∗ : 1%

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