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The East German Experience

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Abstract

We analyze the effectiveness of publicly financed training and retraining programs in east Germany as measured by their effects on individual re-employment probabilities after training. These are estimated by discrete hazard rate models on the basis of individual-level panel data. We account for unobserved individual heterogeneity in both the training participation and outcome equation. The latter differentiates between transitions into "stable" and "unstable" employment after the completion of a training program. Our findings are that in the first phase of the east German transition process, when the institutions delivering the training programs were being set up, there are no positive effects of training on the probability to find stable employment. For the period of September 1992 to November 1994, when the institutional structure for the programs was in place, we find positive effects of both on–the–job and off–the–job training for women, and positive effects of off–the–job training for men.

Non–Technical Summary

Previous research on the employment effects of publicly financed training and retraining programs (PFTP) in east Germany has shown mixed results. To some extent, this can be related to the use of different data sources and methodological approaches. Here, we follow the microeconometric approach to the evaluation of the employment effects of these programs. In contrast to previous related research, we take into account the exact timing of events and also distinguish between stable and unstable employment subsequently to participation in a PFTP. On the basis of the Labor Market Monitor for east Germany, we estimate the employment effects of PFTP separately for men and women and for two subperiods. To take into account heterogeneity in training courses to some extent, we also distinguish between on–the–job and off–the–job training.

In accordance with most previous research, we find positive employment effects of PFTP in east Germany. However, these effects are rather small and differ both by gender and between the first and second time period. For the first period, we find that staying unemployed was preferable to participating in PFTP regarding the chances of subsequently finding stable employment. In the second period, when the institutional structure of the training programs was in place, both on–the–job and off–the–job training turns out to be preferable to unemployment for women. For men, only off–the–job training seems to have positive employment effects. The differences between the two periods can be explained by the changes in both the types of PFTP offered and the qualitity of courses. In the first phase of the transition process, when an infrastructure for effective PFTP had yet to be set up, a large share of courses were of rather poor quality and of very short duration offering only basic job counselling information. Our results indicate that the success of PFTP not only depends on individual behavior but also to a large extent on institutional arrangements.

1 Introduction

Publicly financed training programs (PFTP) form an important part of "active" labor market policies in east Germany. Compared to west Germany and most other OECD countries, the number of participants in and expenditures on such programs have been very high. They peaked in 1992 when a yearly average stock of about 500,000 people participated in such programs. Subsequently, this number declined substantially and stabilized at a level of about 200,000 participants. Compared to west Germany, where about the same number of people participated in publicly financed training programs in the year 1996, this is still an astonishingly large number given the much smaller east German labor force. In 1996, average expenditures per participant were about DM 34,000 and total gross costs in that year amounted to almost DM 4,7 billions, which was only a little less than for west Germany. Net costs per trainee as calculated by the Federal Labor Office (*Bundesanstalt für Arbeit*) by deducting expenditures saved on unemployment benefits and contributions to the social security system were about DM 11,000; total net costs of PFTP in east Germany amounted to almost DM 2,3 billion in that year.

While PFTP are widely viewed as a prerequisite for preventing unemployment in east Germany to increase from its already high level, the effectiveness of these programs in improving individual re-employment prospects is surprisingly little discussed in the public policy debate. Evaluation of PFTP and other labor market programs is only in the beginning in Germany. Since experimental data which would allow identification of the average training effect with less arbitrary assumptions are generally not available in Germany, the few empirical studies have to rely on non-experimental data of modest size and informational content. These evaluation studies are based on two techniques. First, microeconometric models which try to take into account potential selectivity in program participation along the lines of Heckman and Robb (1985), Heckman and Hotz (1989). Second, the statistical matching approach associated with Rubin (1979) and Rosenbaum and Rubin (1983, 1985). For east Germany, these studies yield conflicting results concerning the employment effects of PFTP. It is not clear whether these differences derive from the particular methodology employed, the evaluation criteria used, or the different data sets and time periods analyzed.

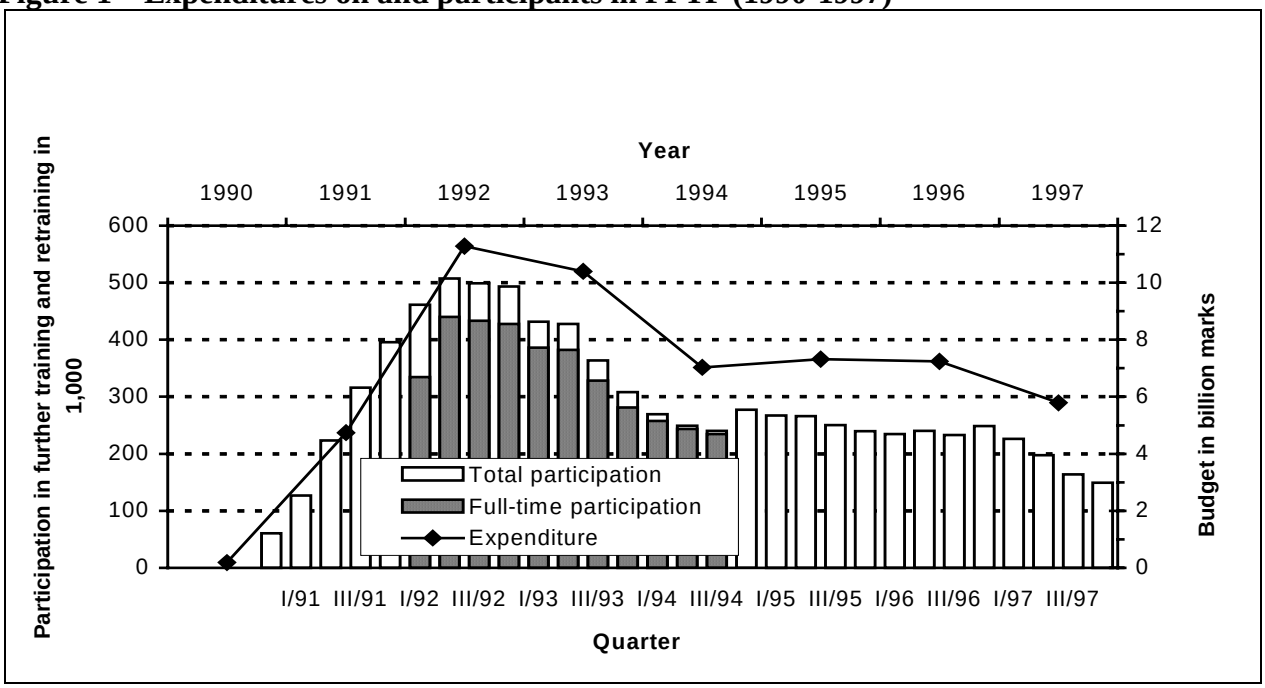
Following most of the previous literature for east Germany, we apply the microeconometric approach to evaluate the employment effects of PFTP. In contrast to previous research, we distinguish between "stable" and "unstable" employment after participation in PFTP, which we contrast with the employment prospects of an unemployed person not participating in training. In the next section, we briefly describe the structure and development of PFTP in east Germany. Previous studies of the employment effects of PFTP in east Germany are surveyed in section 3. Our evaluation methodology is set out in section 4, and the data are

described in section 5. In section 6 we present the estimation results, and section 7 concludes.

2 The Development and Structure of Publicly Financed Training Programs in East Germany

Publicly financed training is considered an important part of "active" labor market policy by the German government and the Federal Labor Office. After unification, PFTP have been extended tremendously to ease the east German transition process. In view of the dramatic employment decline in east Germany PFTP have not only been used as means of investing in partially obsolete human capital inherited from the socialist past, but also to keep people off the dole and to avoid social hardship associated with long-term unemployment (see Buttler and Emmerich, 1994).

Figure 1—Expenditures on and participants in PFTP (1990-1997)



Source: Amtliche Nachrichten der Bundesanstalt für Arbeit (Official Bulletin of the Federal Labor Office); various issues.

The scope of PFTP in east Germany is unique in both the national and international context (see, e.g. OECD, 1993, 1997; Puhani and Steiner, 1996). Figure 1 shows the development of participants in and expenditures on publicly financed training in east Germany after reunification.[1] In the first period of the transition process, PFTP were massively built up both in terms of expenditures and participants. At that

[1] If not stated otherwise, the mentioned facts are taken from the official bulletin of the Federal Labor Office (Amtliche Nachrichten der Bundesanstalt für Arbeit), various issues. At the time of writing, the amount of expenditures of PFTP for 1997 are not publicly available yet.

time, the great majority of all participants were trained on a full-time basis. Thereafter, the government scaled the programs down until 1994, when quarterly expenditures on training as well as the number of participants stabilized. The recent reduction of public expenditures resulted in a marked reduction in the number of particpants to about 150,000 by the end of 1997.

The legal basis for PFTP is the Work Support Act (*Arbeitsförderungsgesetz*, AFG). For east Germany, this law came into effect together with German Economic, Monetary, and Social Union on July 1st, 1990. However, there were, and there still are, some important special regulations that only refer to east Germany. Aside from the AFG, there are special regulations by the Federal Ministry of Labor and Social Affairs or the Board of Governors (*Verwaltungsrat*) of the Federal Labor Office (*Bundesanstalt für Arbeit*), especially the so-called "*Anordnung Fortbildung und Umschulung*" which was amended in 1993. The Federal Labor Office is hierarchically structured into regional and local labor offices. Within the rules set out in the AFG and the special accompanying regulations as well as the budget allocated to them, the local labor offices decide to whom a PFTP is offered.

In principle, this decision depends on whether training is considered "necessary" to re-integrate an unemployed person into work. However, in order to ease the transition process and to avoid the hardship associated with long-term unemployment, the rules were interpreted in a very flexible way in east Germany, so that virtually everybody hit or threatened by unemployment had a chance of receiving public support for training, at least during the first phase of the transition process. In practice, there are certain equity-driven criteria in the selection of participants in publicly financed training. In particular, women, older and disabled workers are named as target groups for training to facilitate their transition into employment (Blaschke, Plath, and Nagel, 1992).

There are clear incentives to join a training program once an offer is received from the labor office. First, the labor office has the right to suspend the payments of unemployment benefits if such an offer is rejected by the unemployed person. Second, the labor office offers a special allowance during training called *Unterhaltsgeld*. This allowance was 73% (65%) of previous net earnings for those with (without) children before December 1993 and equal to the respective income replacement ratio for the unemployed of 67% (60%) afterwards. In addition, the period this allowance is paid does not count into the eligibility period for unemployment benefits. Provided an individual fulfilled the criteria mentioned before, he or she was entitled to PFTP until December 1993, whereas the decision to offer training has become more discretionary on the side of the labor office since then.

In general, three types of PFTP can be distinguished: short training courses, continuous training in an old occupation, and retraining. Short training courses lasted

up to six weeks and were dominated by courses which provided job search skills and information about work opportunities, or improve basic skills of the unemployed. For this type of PFTP, a completed vocational qualification or work experience was generally not required. These courses, which were disproportionately taken by women in the first phase of the transition process, were abolished in 1993, but several similar short-term courses which are taken by a relatively small number of people remain in effect. On the other hand, retraining and, especially, continuous training have become quantitatively more important during the transition process. While the shares of courses devoted to retraining in east Germany was almost 60% in 1993, it declined to less less than 40% in 1996. Correspondingly, the share of courses offering continuous training increased to almost 60% by 1996.

For retraining, the maximum duration of the course is normally two years and is completed with a publicly approved examination. About two thirds of all retraining courses effectively last between one and two years, while the great majority of all courses offering continuous training fall between 7 and 12 months (more than 60% in 1996). These courses are limited to a maximum duration of one year unless they provide a publicly approved examination. Overall, the distribution of the duration of training courses changed considerably over time. While more than 40% of all publicly financed training courses in 1991 lastet less than 4 months, and only about 18% more than 12 months, these shares changed to, respectively, 16% and 30% in 1994 (Müller and Plicht, 1997, Table 85).

The compostion of participants in PFTP also changed considerably during the transition process. The share of participants entering a PFTP from unemployment increased from 75.3% in 1992 to 95.9% 1994, while the share of formerly long-term unemployed participants increased from 13.2% to 34% (Eichler and Lechner, 1996, Table 3.8). Participation rates also differ by gender, age and education. As for gender, the higher particpation rates of females correspond to their higher unemployment share of about 60%. Normalizing participation rates by relative group size shows that a disproportionately large share of people without vocational qualification and younger people are participating in PFTP. As these differences already indicate, participation in PFTP is probably a highly selective process and this poses a difficult problem for the evaluation of the effectiveness of PFTP. There have been several attempts to overcome this problem in the evaluation studies for east Germany, to which we now turn.

3 Previous Empirical Studies for East Germany

There are several recent studies evaluating the employment effects of PFTP in east Germany, the main results of which we summarize in this section. These studies use non-experimental data and are based on either microeconometric models or the so-called statistical matching approach, or both. In the former approach the effect

of participation in a PFTP on some outcome variable, like an individual's future unemployment probability, is modelled. Potential selectivity in PFTP participation is usually corrected using standard econometric methods along the lines of Heckman and Robb (1985) and Heckman and Hotz (1989). Studies based on the statistical matching approach associated with Rubin (1979) and Rosenbaum and Rubin (1983, 1985) try to overcome the fundamental selectivity problem by constructing a comparison group of non-participants with the same observable characteristics as the group of participants and then compare the average outcome variable. The data used in these studies either come from the Socio-Economic Panel for east Germany (GSOEP-east) or the Labor Market Monitor (LMM). The GSOEP is a widely used panel data set[2], the LMM which is also used in this study will be briefly described below.

The various studies also differ with respect to the observation period, the evaluation criteria used and the specification of the outcome variable. On the basis of a discrete-time hazard rate model estimated on the GSOEP-east, Pannenberg (1995) finds that participation in PFTP had no significant effect on the transition rate from unemployment in the first phase of the east German transition process (1990 - 1992), whereas in a subsequent study (Pannenberg, 1996) he finds a significantly positive effect for the period 1990 to 1994. In this latter study, the author also tests for selectivity bias in the outcome equation. On the basis of the pre-program test proposed by Heckman and Hotz (1989), the hypothesis that training participants and non-participants differ significantly in their employment chances before the training course cannot be rejected. Hence, it is not clear whether the positive correlation between this variable and the unemployment transition rate found in this study can be interpreted in a causal sense.

Potential selectivity bias is controlled for in the microeconometric studies by Fitzenberger and Prey (1995, 1996, 1998) on the basis of the LMM covering the period 1990 to 1994. Estimating differences in employment probabilities between participants and non-participants before and after participation in PFTP, these authors interpret their results as indicative for positive employment effects of PFTP provided outside the firm, whereas there seem to be no positive effects of publicly financed training if provided within the firm. That is, the positive employment effects of PFTP reported by these authors refer to a difference-in-difference interpretation in the sense that participants' employment probabilities relative to those for non-participants before PFTP were worse than after the program (for a similar approach see Heckman, Ichimura and Todd, 1997, pp. 612ff). On the basis of the LMM, Fitzenberger and Prey (1997) compare the employment effects of PFTP derived from a microeconometric model with those obtained from the

[2] Details on the GSOEP can be obtained from the webserver of the German Institute of Economic Research (DIW) in Berlin (http://www.diw–berlin.de/soep/).

statistical matching approach and conclude that they do differ, but due to the large confidence bands associated with the matching technique in relatively small samples, these differences are not statistically significant.

In contrast, applying statistical matching techniques, Lechner (1996) concludes on the basis of the GSOEP-east that there have been no significant positive average effects from PFTP on the employment probabiltiy of participants in the period 1990 to 1994. The difference to the results obtained by Fitzenberger and Prey may derive from Lechner's use of the GSOEP-east, which is considerably smaller than the LMM used by the former authors. Alternatively, it may also be related to the different application of the matching procedure by these authors. Lechner constructs the control group in such a way that its average employment probability before entrance into a PFTP is not statistically different from that of group of participants. In contrast, Fitzenberger and Prey allow for remaining differences in this probability between the two groups after matching and interpret them in the difference-in-difference sense referred to above.

Staat (1997) also uses the GSOEP-east but estimates effects of PFTP on the duration on unemployment on the basis of a hazard rate model. Instrumenting the training participation dummy in the hazard rate model to account for potential selectivity-bias, the author finds no statistically significant effects of PFTP on the duration of unemployment. The author also investigates whether training has an effect on the stability of employment found after the program and finds rather negative results. Overall, his results suggest that participants in PFTP are worse off than those who did not participate in such programs.

Finally, applying several popular estimation procedures, Hübler (1997a) shows on the basis of the LMM for the period 1993 to 1994 that the estimated effects of PFTP seem to be rather sensitive to the particular methodology employed. As in Fitzenberger and Prey (1995, 1996, 1997), the author also finds that participants' employment probabilities before PFTP were significantly lower than those of non-participants. Furthermore, effects of PFTP within one respectively two years differ, and these effects also differ by gender. Whereas employment prospects of men participating in PFTP improve within two periods, there seems to be a negative employment effect for females associated with an increased transition rate out-of-the-labor-force. Hence, it seems important to account for gender differences when evaluating the employment effects of PFTP.

The diversity of the existing studies makes it difficult to trace back the different results on special features of any study. Nevertheless, the analyzes using the LMM, all find some positive effects of the east German training measures (Hübler, 1997a; Fitzenberger and Prey, 1995, 1996, 1998). The fact that Lechner (1996) finds no significant employment effects of PFTP could be related to his use of the GSOEP-east, because the relatively small number of observations available in this data set

makes the identification of any significant effects based on the statistical matching approach difficult. In contrast, using the same data set but a microeconometric model, which yields more efficient, if possibly inconsistent esimates, could explain the positive employment effect of PFTP reported by Pannenberg (1996). However, this conflicts with the results obtained by Staat (1997) on the basis of the same data set and a similar econometric approach.

In the following, we present our own study of the employment effects of PFTP which is based on a microeconometric model estimated on data from the LMM. As described in the next section, the model differs in various aspects from those used in the studies reviewed above.

4 Evaluation Methodology

In order to evaluate the employment effects of PFTP one needs to define an appropriate observable outcome variable, specify how PFTP might affect this variable and account for other observable and unobservable factors which may affect the outcome variable aside from training. Our methodological approach differs from previous studies with respect to the definition of the outcome variable, in that we explicitly distinguish between different forms of employment after the completion of a training course. As the most important criterion for the public evaluation of PFTP in east Germany is its potential to increase the future re-employment probability of formerly unemployed people, we compare the re-employment chances of trainees with the counterfactual outcome had they remained unemployed instead of entering a training course. This focus differs from other studies reviewed in section 3, which do not restrict the comparison group to the unemployed. A particularly difficult problem arises from the potential selectivity of participation in PFTP, i.e., its dependence on similar factors which also determine the outcome variable. In the following, we propose a new approach to overcome this problem.

4.1 Treatment of Selection Bias

The essence of the sample selection problem is that participants in PFTP may differ from the non–participants, who act as the comparison group, in both observed and unobserved characteristics. If this potential selectivity-bias is not taken into account, one is likely to obtain biased estimates of the employment effects of training programmes. The standard econometric solution to this problem is to correct for potential selectivity-bias in the outcome equation on the basis of a training participation equation estimated for the combined sample of participants and non-participants in training.

More formally, we can write the outcome and participation equations as

$$Y_{ijt}^{*} = X_{it}'\beta_j + \delta_j D_{it} + u_{it}$$

$$D_{it}^{*} = Z_{it}'\gamma + v_{it}$$

Y_{ijt}^{*} is the latent index which defines the outcome variable of interest for individual *i*. In our context, this outcome is the hazard rate from either unemployment or training into labor force state *j*, i.e., the conditional probability to leave unemployment (training) for that state in time period *t*, given the individual has been unemployed (in a PFTP) until time *t*. The second equation refers to the selection into training, where D_{it}^{*} is the latent index which determines the transition from unemployment into training at time *t* for individual *i*. Selection bias can arise through a correlation between *u* and *Z* (selection on observables), or through a correlation between *u* and *v* (selection on unobservables).

As for the *selection on observables*, it can be treated by the linear control function estimator (see, for example, Heckman and Hotz, 1989). The idea here is to assume that the conditional expection of *u* given *X* and *Z* is linear in *Z*. In this case, including the *Z* variables in the outcome equation controls for selection on observables.[3] To account for *selection on unobserables*, we assume the following error-components specification for the outcome and selection (training participation) equations

$$u_{it} = \varepsilon_i + \eta_{it}$$

and

$$v_{it} = \mu_i + \xi_{it}$$

ε_i^m and μ_l^m are time-invariant individual effects with expectations $E(\varepsilon_i) = E(\mu_i) = 0$, and variances $E\left[(\varepsilon_i)^2\right] = \sigma_\varepsilon^2$ and $E\left[(\mu_i)^2\right] = \sigma_\mu^2$. η_{it} and ξ_{it} are identically and independently distributed error terms which vary both with time and across individuals, with $E(\eta_{it}) = E(\xi_{it}) = 0$, and variances $E\left[(\eta_{it})^2\right] = \sigma_\eta^2$ and $E\left[(\xi_{it})^2\right] = \sigma_\xi^2$. Furthermore, we assume that error components in each equation are uncorrelated with each other and that the time-varying component is serially uncorrelated.

If we impose the restriction that the covariance between u_{it} and v_{is} is constant for all *t* and *s*, it can be shown that the correlation between the error terms in the PFTP participation and the respective outcome equation has a rather small upper-bound

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[3] To condition on observable factors (or some function of them) is also the basis for the statistical matching approach. In principle, this approach can be extended to account for certain types of unobservables as well (see Heckman, Ichimura and Todd, 1997).

(see the appendix). In particular, in the case where we have no unobserved individual heterogeneity in both the participation and outcome equations, this bound is given by $1/T$ where T is the total number of intervals (months) observed. In our application T = 50 months, which implies an upper bound for the correlation coefficient of 0.02. In the appendix we also show numerically that the correlation between u and v becomes negligible if there is no unobserved heterogeneity in either of the two equations.

As we show below on the basis of the estimated heterogeneity components in the outcome and the PFTP participation equations, the effects of unobserved heterogeneity seem in fact to be negligible in our application. Hence, it seems safe to ignore unobserved heterogeneity in the estimation of the employment effects of PFTP and control for selectivity by including the same observed variables as in the participation equation in the outcome equation.

4.2 Specification of the Outcome and Participation Equations

We specify our outcome and participation equations as duration models.[4] Compared to most of the studies summarized in section 3 this has the great advantage that both the time spent in a PFTP and the time between its completion and the beginning of a subsequent employment spell are considered in the estimation. Thus, both calendar-time effects and process-time effects ("duration dependence") can be taken into account in the comparison of future employment outcomes of PFTP participants and previously unemployed non-participants. As Ham and LaLonde (1996) stress, this may be important in order to effectively control for selectivity bias if the outcome variable relates to the duration of (un-) employment. Because the duration data are only observed in monthly intervals in the LMM we specify discrete hazard rate model to account for the large number of ties.

The hazard rate for transitions from unemployment or training into labor force state j in discrete time t is the probability (Pr) of exit into state j at time t conditional on the event that the person has remained in unemployment (training) up to time $t-1$. In our application, the j exit states are training, employment, and other labor force states in the PFTP *participation model* and "stable" employment, "unstable" employment, and non-employment in the *outcome models*. The definition of the exit state space differs between the participation and outcome models. In the participation model, we specify the transition rate from unemployment into PFTP with employment and other labor force states as the remaining exit states. Other

[4] For similar applications see Ridder, 1986, Gritz, 1993, Ham and LaLonde, 1997, Hujer, Maurer and Wellner, 1997a, 1997b, and Staat, 1997.

labor force states include short–time work, retirement, unemployment, and out–of–the–labor–force.

The distinction between the exit states in the outcome models is intended to capture the effect of training on the stability of the subsequent employment spell to some extent, given the relatively short observation period. These states are defined as

- *stable employment:* the person finds *regular* employment and is still employed in the twelfth month after the PFTP or training spell ended. Regular employment does not include short–time work, public works or vocational training.
- *unstable employment:* the person finds a regular job during the twelve months after the end of the spell but leaves it before the end of the twelve–months' period.
- *non-employment:* the person is not regularly employed for even one month during the twelve–months' period after the spell ended, where employment in PFTP and public works programs are also included in this category.

If the person is still in training or unemployment at the end of the observation period, or if the employment status is missing at least for one out of the twelve months for any reason, spells in the outcome models are treated as *right–censored* in the estimation.

Note that there is a given "risk period" of 12 months for each observation starting immediately after the end of the training (unemployment) spell. This is a very important condition for comparability of the outcome variable, which is often not observed in evaluation studies based on comparisons of outcomes at particular points in time, as is the case for pure panel studies. Our definition of stable employment takes into account that, due to the well-known length-bias in stock-sampling, someone who is employed at a particular point in time is likely to be observed in the middle of a relatively long employment spell (see also Winter–Ebmer and Zweimüller, 1996). Hence, an interrupted employment spell of, say, six months at the end of the risk period of twelve months is to be interpreted differently with respect to an individual's employment stability compared to a completed six-month employment spell, i.e. non-employment at the end of the risk period.

Of course, we cannot tell whether an employment spell is really stable because we do not observe the employment history of the people in our sample after November 1994. However, our classification procedure at least assures that those who find employment within the first twelve months after their training or unemployment spell, but lose their job before the twelfth month, are correctly identified as not having gained stable employment within the risk period. Indeed, using the likelihood ratio test for equality of two states in the multinomial logit model

proposed by Cramer and Ridder (1991), we found that stable and unstable employment according to our classification are in fact two distinct categories.

For the PFTP participation and outcome models, the hazard rate is formally defined as

$$\lambda_{ij}^{k}\left(t\middle|x_i(t),\varepsilon_i^m\right)=\Pr\left[T_{ik}=t,J=j\middle|T_{ik}>t-1,x_i(t),\varepsilon_i^m\right]$$

where k denotes the k^{th} spell in unemployment or training, j denotes the j^{th} exit state, ε captures unobserved individual heterogeneity, and $x_i(t)$ is a time varying vector of observed covariates. Note that there can be more than one unemployment or training spell per person, and these spells are correlated due to the heterogeneity term. The distribution of ε is specified non–parametrically with the restrictions

$$E\left[\varepsilon_i\right]=\sum_{m=1}^{M}\Pr\left(\varepsilon_i^m\right)\varepsilon_i^m=0,\text{ and }\sum_{m=1}^{M}\Pr\left(\varepsilon_i^m\right)=1,$$

where M is the number of discrete mass-points necessary to account for unobserved heterogeneity in the sample (see, e.g., Heckman and Singer, 1984). It is assumed that ε is orthogonal to the time–varying covariates $x_i(t)$.

The hazard rate in the k^{th} spell in unemployment or PFTP into state j at time t is specified as

$$\lambda_{ij}^{k}\left(t\middle|x_i(t),\varepsilon_i^m\right)=\frac{\exp\left(\alpha_j(t)+\beta_j'x_i(t)+\varepsilon_i^m\right)}{1+\sum_{l=1}^{J}\exp\left(\alpha_l(t)+\beta_l'x_i(t)+\varepsilon_i^m\right)},$$

where $\alpha_j(t)$ are process time dummy variables specifying a non–parametric baseline hazard. Assuming the spells of different persons are independent, the likelihood function for the sample is given by

$$L=\prod_{i=1}^{n}\sum_{m=1}^{M}\Pr\left(\varepsilon_i^m\right)\prod_{k=1}^{K_i}\prod_{j=1}^{J}\left[\lambda_{ij}^{k}\left(t_i\middle|x_i(t_i),\varepsilon_i^m\right)\right]^{\delta_{ikj}}\prod_{\tau=1}^{t_i}\left(1-\lambda_i^{k}\left(\tau\middle|x_i(\tau),\varepsilon_i^m\right)\right)$$

where δ_{ijk} equals one if the k^{th} spell of individual i ends in state j at time t, and zero otherwise.

We estimate a participation model for the transition from unemployment into training and two outcome models. The first outcome model refers to the transition of trainees into stable employment and other labor force states, respectively. The second outcome model refers to the transition of unemployed non–trainees into stable employment and other labor force states. By estimating the outcome models

for the group of participants and the group of non-participants separately, we allow the coefficients of all explanatory variables to differ between the two groups.[5]

4.3 Cumulated Transition Probabilities

We define the employment effect of PFTP as the difference of the cumulated transition probability (*ctp*) into employment within the first 12 months after the end of training and unemployment, respectively. Formally, the cumulated transition probability after *t* months is defined as

$$ctp_{ij}(t) = \sum_{\tau=1}^{t} S_i\left(\tau - 1 \middle| x_i(\tau)\right)\lambda_{ij}\left(\tau \middle| x_i(\tau)\right),$$

with $$S_i\left(t-1 \middle| x_i(1)\ldots x_i(t_i-1)\right) = \sum_{m=1}^{M} \Pr\left(\varepsilon_i^m\right)\prod_{\tau=1}^{t-1}\left(1-\lambda_i\left(\tau \middle| x_i(\tau), \varepsilon_i^m\right)\right)$$

and $$\lambda_{ij}\left(t \middle| x_i(t_i)\right) = \frac{\sum_{m=1}^{M} \Pr\left(\varepsilon_i^m\right) \times \lambda_{ij}\left(t_i \middle| x_i(t_i), \varepsilon_i^m\right) \times \prod_{\tau=1}^{t-1}\left(1-\lambda_i\left(\tau \middle| x_i(\tau), \varepsilon_i^m\right)\right)}{S_i\left(t-1 \middle| x_i(1)\ldots x_i(t-1)\right)},$$

where *S* denotes the survivor function and λ_j is the transition rate into state j in discrete time τ. The survivor function gives the probability of still remaining in unemployed (training) after *t* months. The 12-months' *ctp* into stable employment of person *i* thus is the probability that person *i* has found stable employment within the first 12 months after the beginning of the training or unemployment. The 12-months' *ctp* for the transtion into unstable employment and non-employment have an analogous interpretation.

The definition of the *ctp* explicitely takes into account the time someone has spent in training and thus allows one to directly compare the outcome of a PFTP and an unemployment spell. Given the distribution of the duration of PFTP and the length of the observation period available to define a common risk-period (see section 4.2), it seems sensible to define the *ctp* for a period of 12 months. Since the great majority of all training spells end within this 12-months' period, we also take into account that a PFTP is typically not terminated prematurely even if a job offer would become available during the course.

For each person, *S* and λ can be derived given parameter estimates from the discrete hazard rate models described above. The simulated *ctp* for both groups can then be obtained by plugging the x(t)–variables of the trainees into the outcome model for the unemployed non–trainees. This gives the 12-months' *ctp* for the trainees had

[5] This is equivalent to estimating the model jointly for trainees and non-trainees with all explanatory variables interacted with the training dummy.

they not received training. Given that our controls for observed and unobserved characteristics effectively remove all differences other than training between the two groups, the difference in the distribution of the *ctp* between trainees and the simulated distribution had the trainees stayed unemployed can be interpreted as the causal employment effect of training.

5 Data and Variables

The Labor Market Monitor (*Arbeitsmarktmonitor*, LMM) of the Institute of Labor Market Research (*IAB*) of the German Federal Labor Office is a representative panel survey of the east German working–age population. The panel contains eight waves. They refer to the months of November 1990, March 1991, July 1991, November 1991, May 1992, November 1992, November 1993, and November 1994. In the first wave about 0.1 percent of the working–age population or 10,751 persons had been interviewed. Extra samples were added to the original sample in waves 5 and 6. All of these persons were interviewed in each wave following their admission into the sample, except they died, moved to west Germany or refused finally to answer[6]. Nevertheless, the sample size shrunk down to 5,377 in wave 8 (November 1994).

The LMM contains information on socio–economic characteristics like age and education, participation in all ALMP measures, and the employment status. From the first wave onwards the interviewees were asked when they participated in training measures and whether they received a training allowance (*Unterhaltsgeld*) from the labor office. From this information we constructed spells on the labor force state with monthly information. The spells were constructed for the period of January 1989 to November 1994. The following table shows the distribution of exits from unemployment and training. The exit state in the training participation model refers to the employment state in the first month after the transition from the unemployment state. For the outcome models, the exit state are defined as described in section 4.2.

[6] A general introduction to the LMM is provided by Hübler (1997b).

Table 1—Target labor force states in the training participation and outcome models.

	participation model		unemployment model		training model	
exit into	spells	percent	spells	percent	spells	percent
stable employment	—	—	518	16.73	604	34.63
employment (full– or part–time)	818	23.35	—	—	—	—
training	553	15.79	—	—	—	—
other labor force states	703	20.06	—	—	—	—
unstable employment	—	—	151	4.88	79	4.53
non-employment	—	—	724	23.39	241	13.82
right censored	1,429	40.79	1,702	54.99	820	47.02
total	3,503	100.00	3,095	100.00	1,744	100.00

Source: LMM; own calculations.

The same set of control variables is included in both the participation and the outcome models. Aside from personal characteristics they include firm size, industry and regional dummies, indicators of an individual's previous employment history, and income variables. Definitions and means of these variables are given in Tables A1 and A2 of the appendix. In case of the unemployment benefit variables, the unemployed usually give the amount of benefit they receive at the date of interview. The replacement ratio is estimated by dividing the amount of unemployment benefit by the estimated wage. This estimated wage is obtained from an empirical wage equation which is not reported here, but available from the authors upon request. All amounts are in 1990 real Deutsche Marks.

We split the observation period into two subperiods, *viz.* January 1989 to August 1992, and September 1992 to November 1994, respectively. The reason for this split is the fact that in the first period training measures were just being set up in east Germany, and there were many complaints about the bad quality of the training programs at that time. In particular, the courses were quite general and did not really focus on the specific needs of the trainees (see section 2). This changed in the second period, when the institutional structure of the training programs became settled. This development obviously suggests that a structural break may have occurred between the two periods.

We control for differences in on–the–job and off–the–job training by including a dummy variable for off–the–job training. As can be seen from Table A1, about two–thirds of training participants in our sample were trained off the job. Since we already distinguish between two subperiods as well as betweeen men and women, it does not seem feasible to estimate the equations separately for on–the–job and off–the–job trainees.

6 Estimation Results

6.1 Sample Selectivity

We test for potential selectivity–bias due to the presence of unobserved heterogeneity by comparing the maximum likelihood value between models with a different number of mass-points for the heterogeneity component in both the participation and outcome equations. In addition, we use the Akaike Information Criterium (AIC). The values of (minus two-times) the natural logarithms of the log likelihood (LnLik) and the AIC from our estimated hazard rate models (see Tables A3 and A4 in the appendix) are given in the following table.[7]

Table 2—Tests for unobserved heterogeneity in the PFTP participation and outcome models

unobserved	training model		unemployment model		participation model	
heterogeneity	–2LnLik	AIC	–2LnLik	AIC	–2LnLik	AIC
0 mass–points	7398.23	–3806.12	11733.90	–6015.95	15206.95	–7953.57
2 mass–points	7391.82	–3804.91	11727.02	–6014.51	15203.31	–7955.03
3 mass–points	7391.82	–3806.91	11727.02	–6016.51	—	—

Source: Estimated hazard rate models (see Tables A3 and A4 in the appendix).

According to the AIC, we have two heterogeneity mass points in both the training and unemployment model. However, as Table 3 shows, the estimated heterogeneity components are not significantly different from zero in both models. Indeed, $\Pr(\varepsilon_1)$ is not significantly different from zero, and $\Pr(\varepsilon_2)$ is not significantly different from one.

[7] This transformation of the maximum log-likelihood forms the basis of the standard likelihood-ratio test. For the null hypothesis of no unobserved heterogeneity, the likelihood ratio statistic violates standard regularity conditions and its distribution is therefore not known (see, e.g., Gritz, 1993). AIC is defined as AIC = *LnLik* – *k*, where *k* is the number of parameters in the model. The decision rule is to take the model with the highest AIC (see, e.g., Greene 1997, p. 401).

Table 3—Estimates of the heterogeneity components for the outcome models with two mass–points

	training model		unemployment model	
	estimate	t–value	estimate	t–value
ε_1	–0.0005	–0.0901	–0.0008	0.0060
ε_2	0.0004	0.0016	0.0007	0.0000
$Pr(\varepsilon_1)$	0.4433	1.3683	0.4539	0.0109
$Pr(\varepsilon_2)=1-Pr(\varepsilon_1)$	0.5567	1.7186	0.5461	0.0131

Source: Estimated hazard rate models (see Tables A3 and A4 in the appendix).

These constellations for the ε-values and the $Pr(\varepsilon)$ estimates indicate that the unobserved heterogeneity component is superfluous, and the comparison of the likelihoods indeed showed only negligible differences in the parameter estimates between the models with and without unobserved heterogeneity. Based on these results, we decided to choose the models without unobserved heterogeneity. Furthermore, no unobserved heterogeneity could be detected in the participation model. Hence, in accordance with the discussion above, we assume that, after conditioning on the set of observable explanatory variables in the participation model, we do not face a severe selectivity selection problem in our estimations.

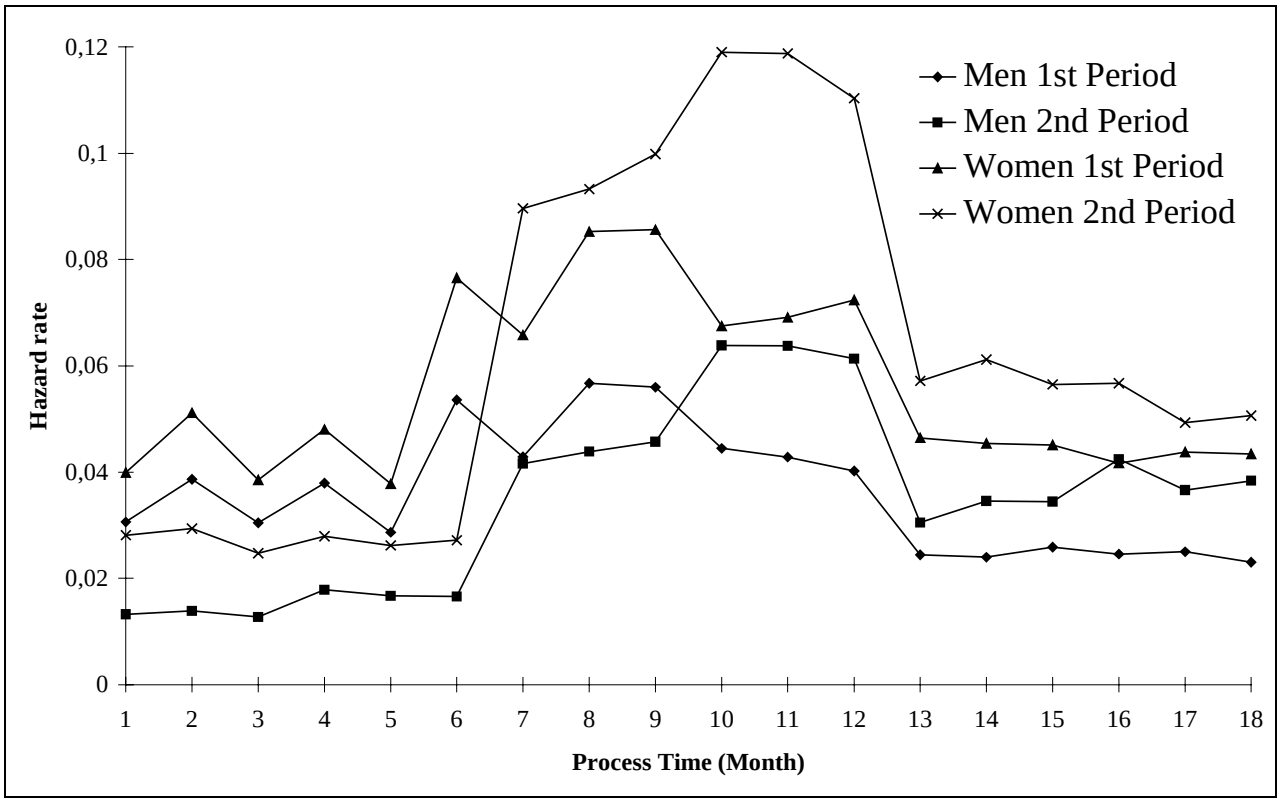
6.2 Participation in Training

For the sake of brevity, detailed estimation results from the participation equation are not reported in this paper but are available from the authors upon request. Here, we just summarize some of the most important estimation results. It is a general result that only few variables are significant in the participation estimation. This confirms the view that, given a few qualifications, the training programs did not have a very strong target group orientation in east Germany. People over 50 years of age have very low chances of receiving training, which makes sense for efficiency if not equity reasons. There are, however, slight differences between the first and the second period. In the first period, both men and women under 35, but especially those under 25, had higher chances of receiving training than people between 36 and 50. In the second period, there is no difference between these age groups. As to the impact of occupational qualification on training participation, there are differences between men and women. Whereas men with a university degree have better chances of getting into a public training program than men with lower occupational degrees, the occupational qualification plays hardly any role for women. An exception is that women without any qualification have low chances to get into training in the first period, but the coefficient becomes insignificant in the second period. A further interesting observation is that people with previous training spells have high chances to receive further training if they become

unemployed again. This is a common finding for countries where ALMPs are also used as a social policy instrument (OECD, 1997). This observation casts doubt on the efficient use of these programs.

As can be seen from Figure 2, most formerly unemployed participants of PFTP in east Germany are selected into the program between their sixth and twelfth month in unemployment. This suggests that training programs do have some targeting focus in east Germany, namely on the long–term unemployed. Alternatively, the increase in the transition rates after six, and to a lesser extent also after nine months, in the second period could be related to the exhaustion of unemployment benefits. Although the transition rates differ only slightly for men and women in the first period, women clearly are more likely to get into training in the second period. This is unsurprising, as the female share in unemployment increased and it was considered politically opportune to expand their share in PFTP accordingly.

Figure 2—Hazard rates from unemployment into PFTP



Source: Estimated hazard rate models; hazard rates are calculated at mean values of the explanatory variables for the respective sub-groups; see text.

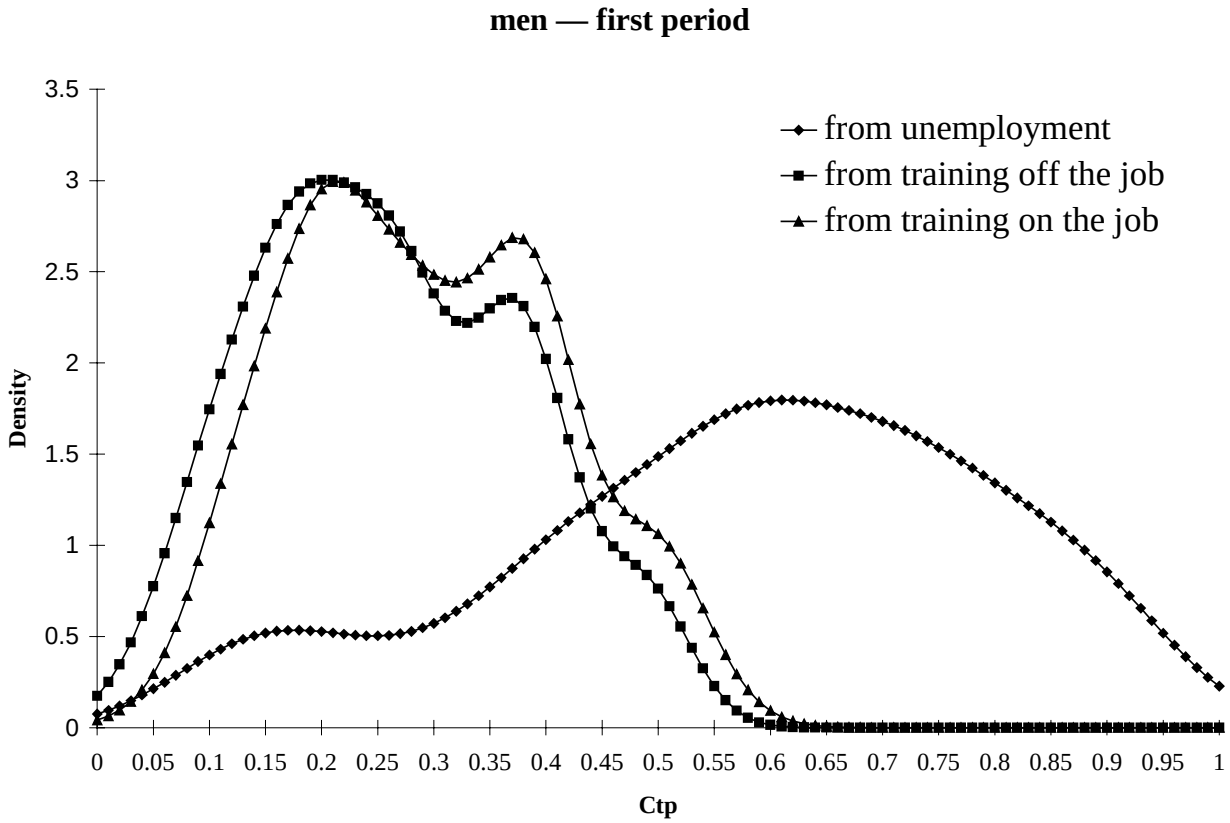
6.3 Employment Effects

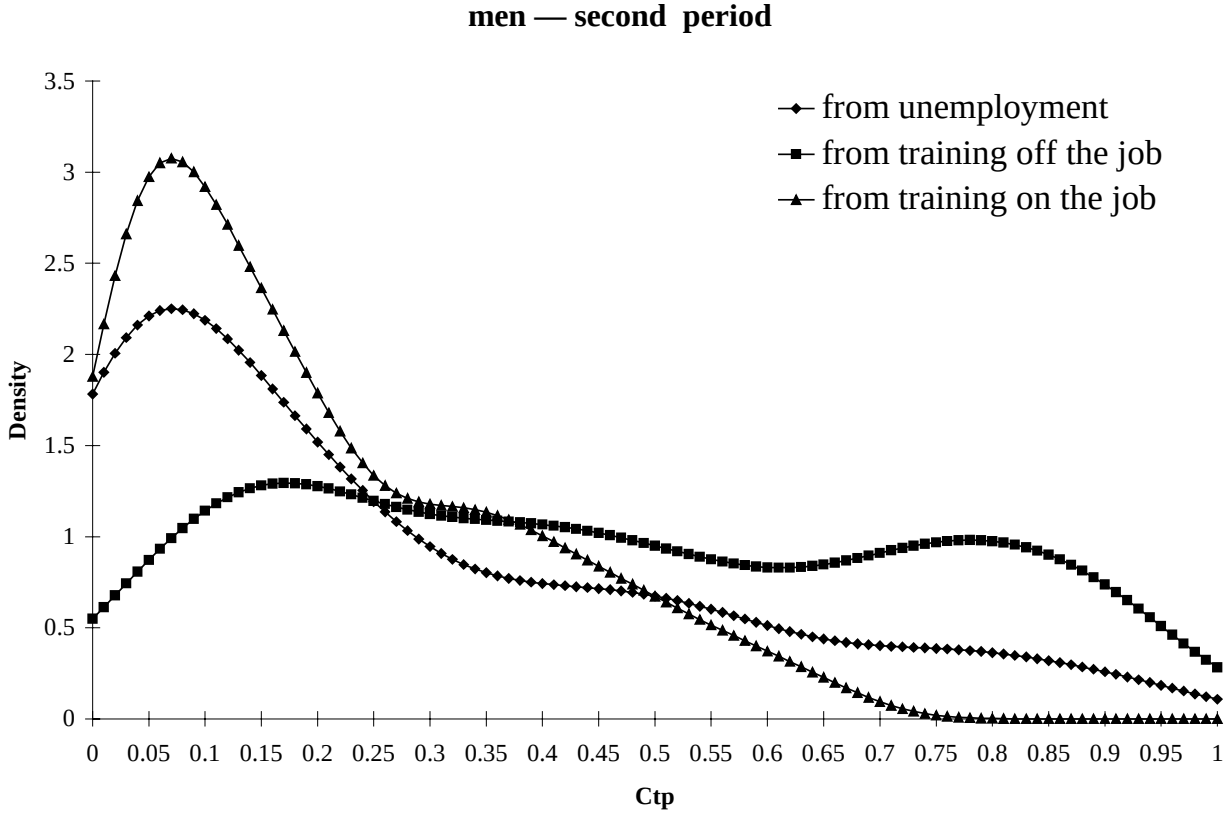
Estimation results for our hazard rate models are given in Tables A3 and A4 in the appendix. In order to improve on the efficiency of the estimation, we reduced the number of parameters by excluding all variables with associated t-values of less than 1.64 in a first–round estimation. The reported results are the second–round estimates. All explanatory variables are included as interactions with a dummy for gender and a time–period dummy, and there is no global constant in the model. In essence, this specification almost amounts to estimating the models separately for all four groups. We have, however, specified a common baseline hazard in the outcome models in order to keep the number of estimated coefficients at a reasonable level, given the number of available observations. In the following, we discuss the effects of training on the probabilities to find stable employment or to become non–employed subsequently to the training course. Because of the small number of observations on exits into unstable employment (*cf.* Table 1), we prefer not to interpret the results referring to this state.

As for the effects of training on the chances to regain stable employment, Figure 3 plots the distributions of the cumulated 12-months' transition probability (*ctp*) into stable employment for both men and women in both the first and the second period. All these cumulated transition probabilities were calculated on the basis of the group of formerly unemployed trainees, and are thus directly comparable (see our discussion in section 4.3).

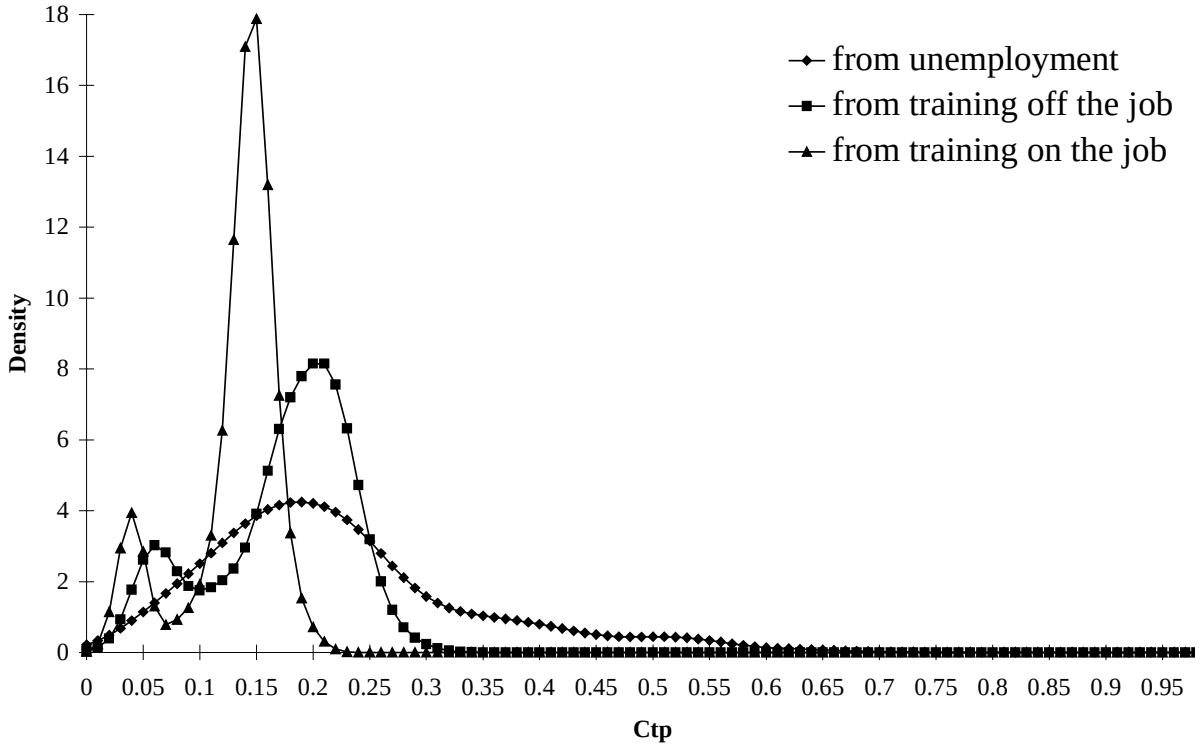
For the first period, the figure shows that both men and women were better off staying on the dole than participating in PFTP. This is especially true for men and holds irrespective of whether training occurred on-the-job or off-the-job. Hence, our estimation results confirm the widespread belief that PFTP were not very effective in their introduction period. Things changed in the second period, where in terms of re–employment opportunities both men and women were better off in training than in unemployment. However, men are only better off in training off-the-job, whereas both off–the–job and on–the–job training show positive employment effects for women.

Figure 3—Cumulated transition probability (*ctp*) into stable employment (Kernel density estimates)





women — first period



women — second period

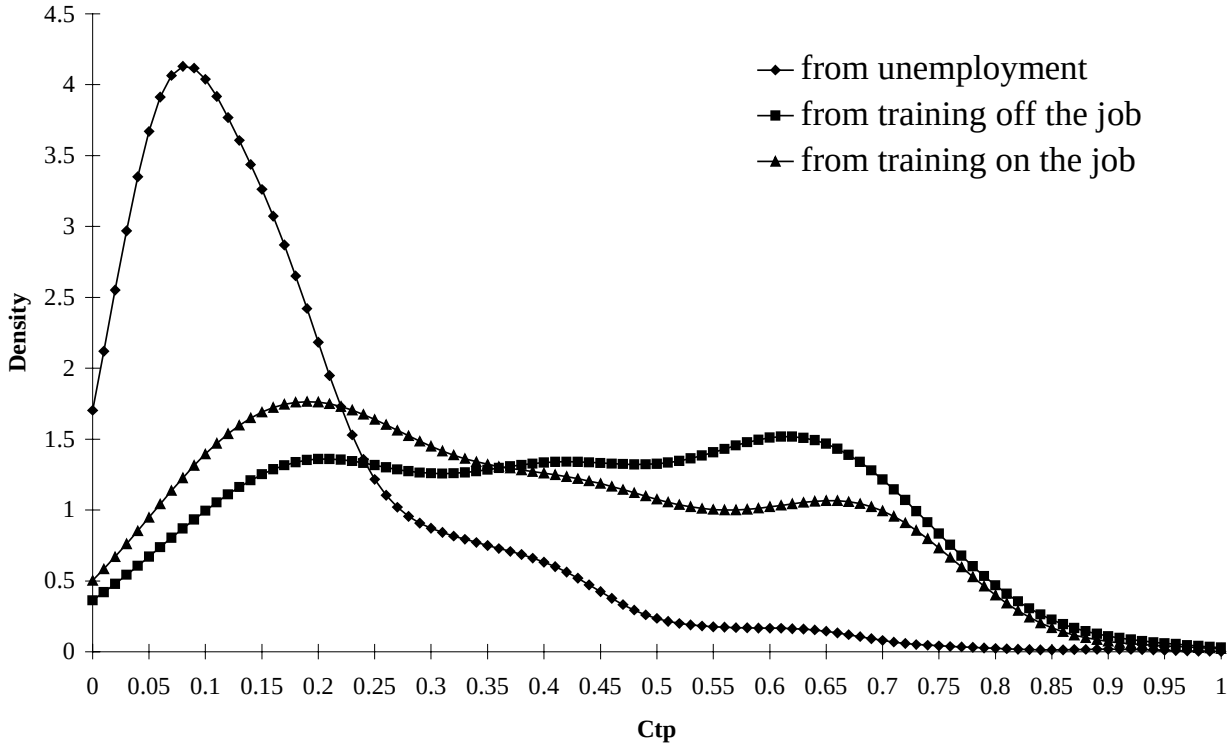
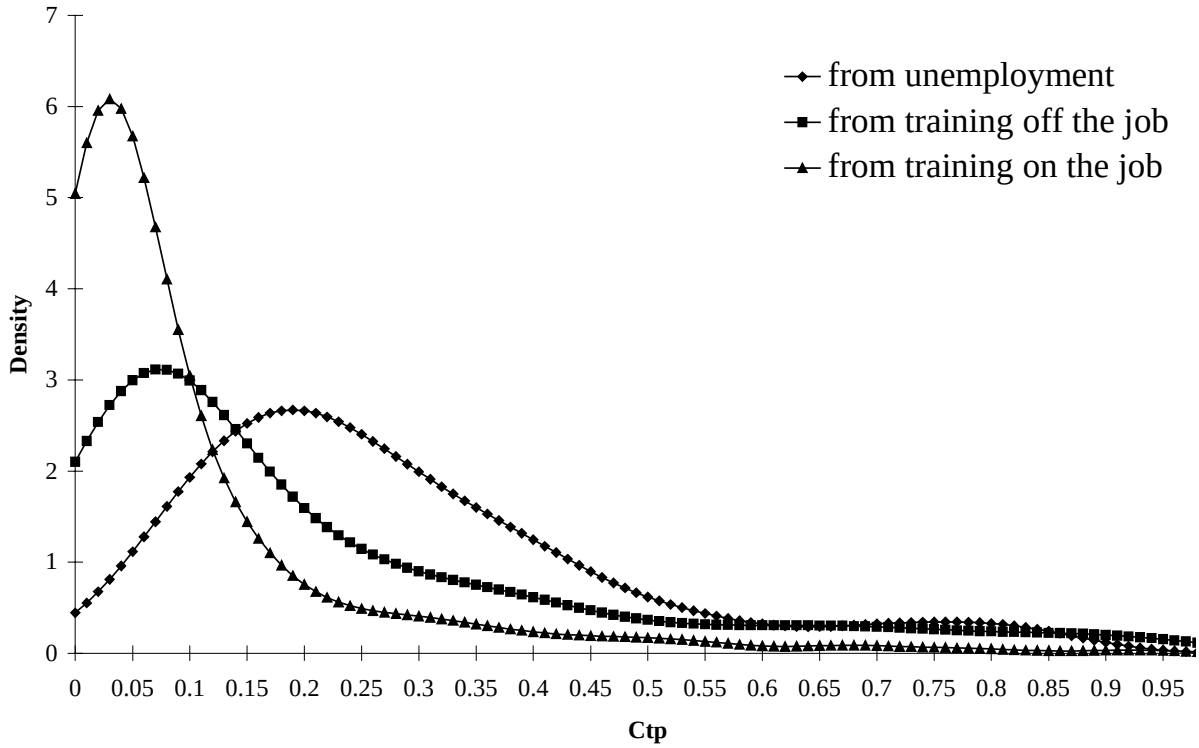
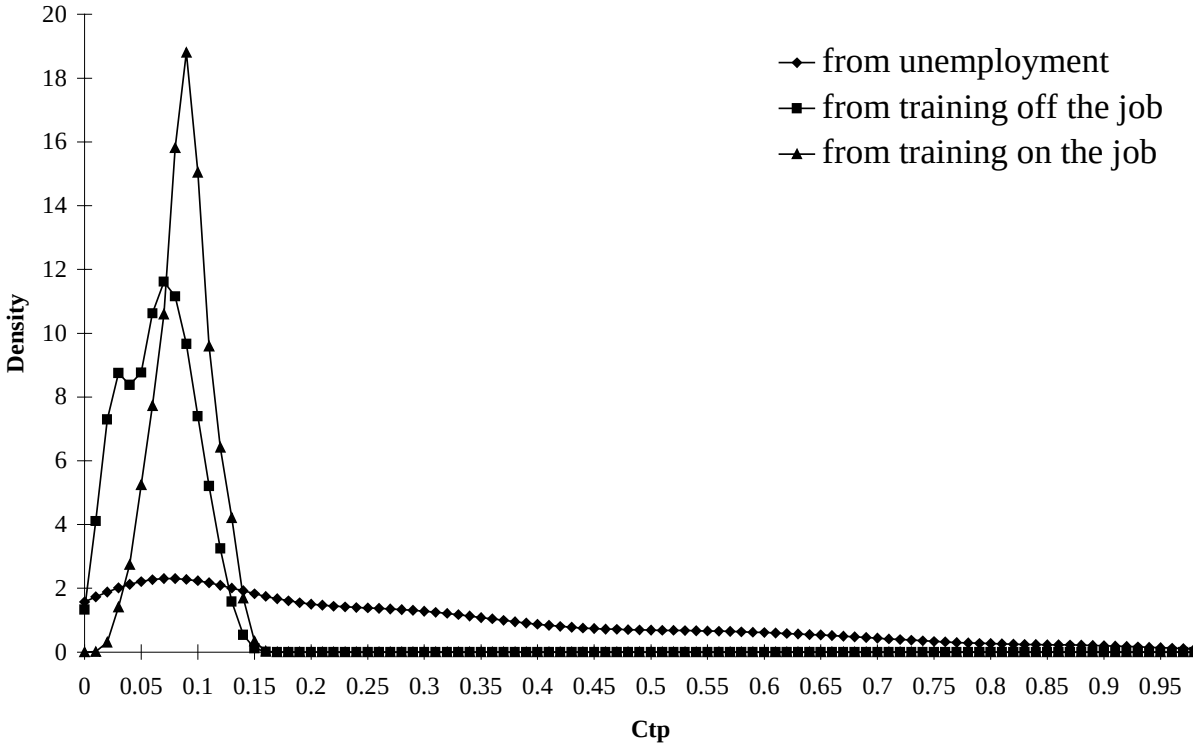


Figure 4—Cumulated transition probabilities (*ctp*) into non-employment (Kernel density estimates)

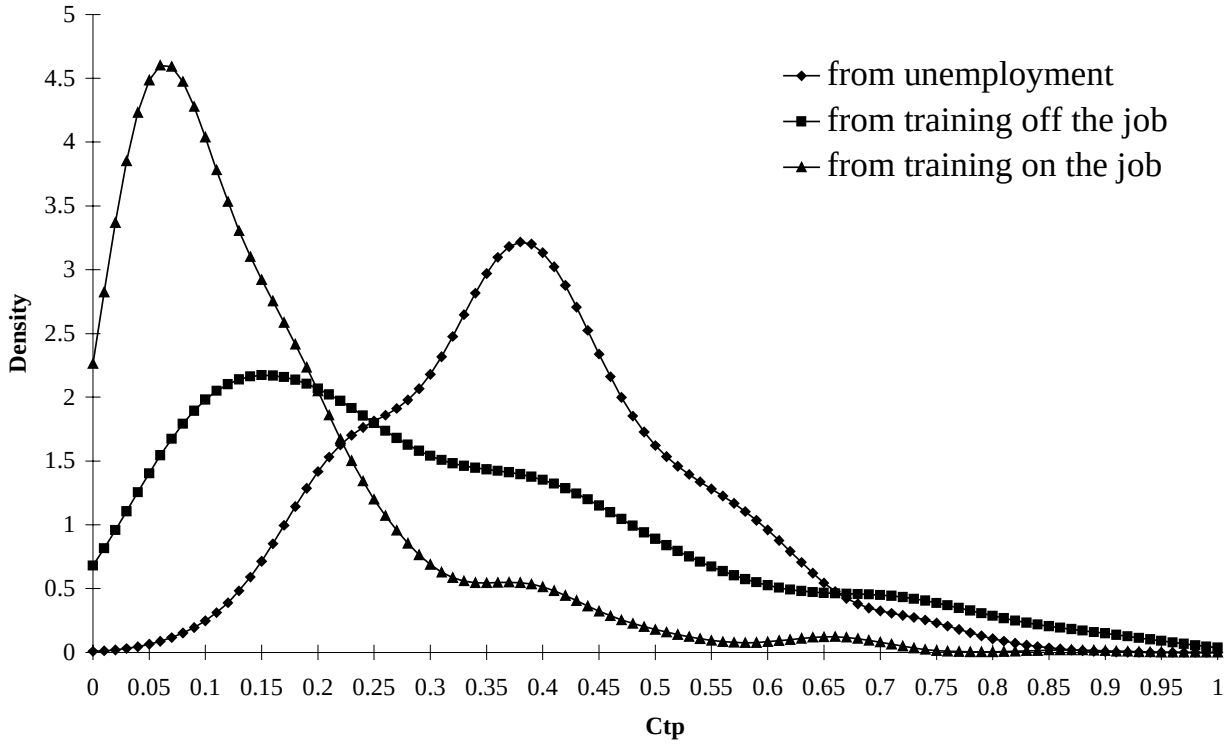
men – first period



men — second Period



women – first period



women — second period

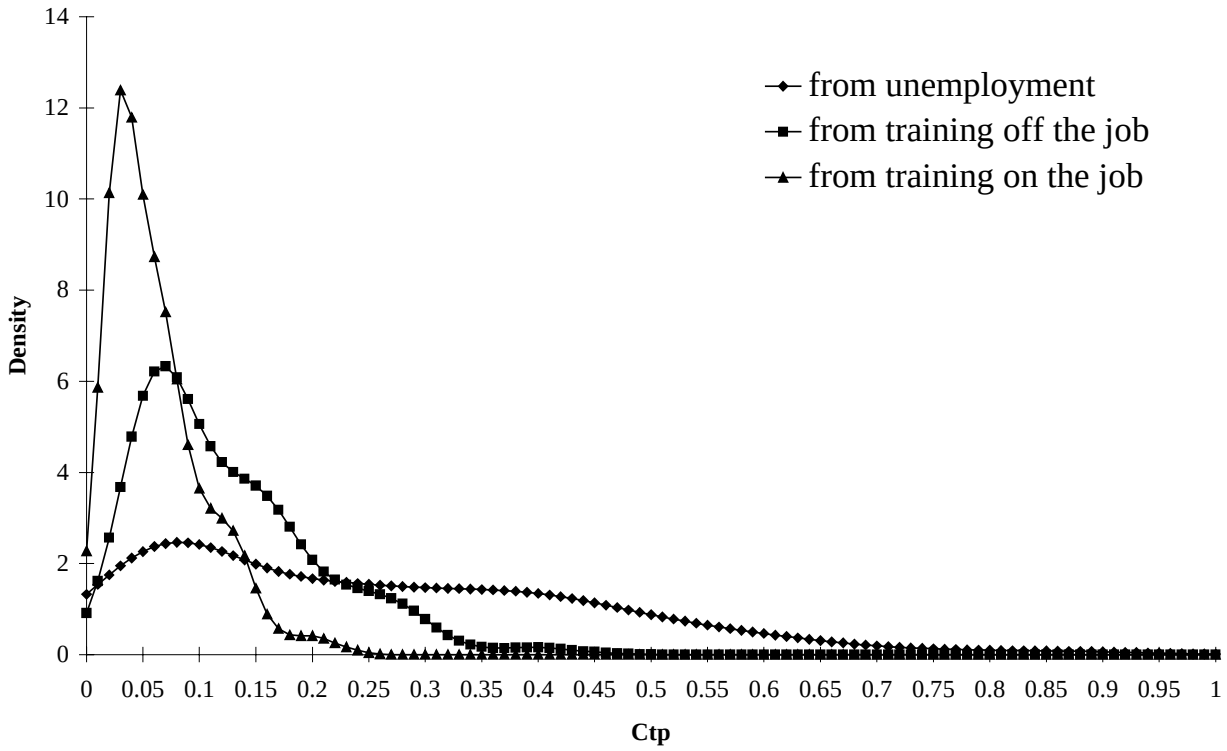
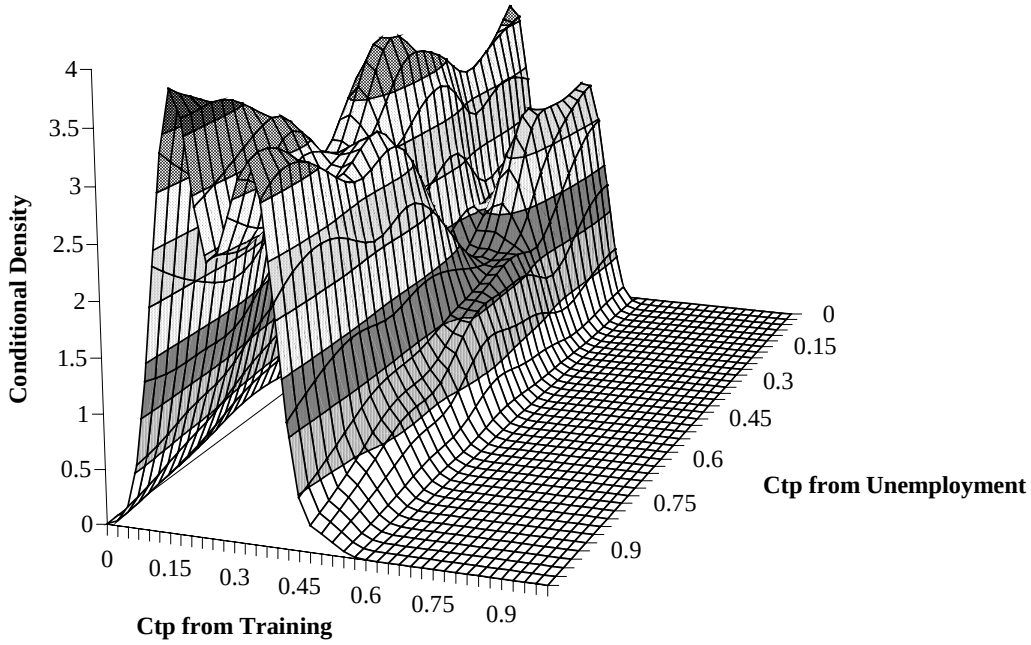
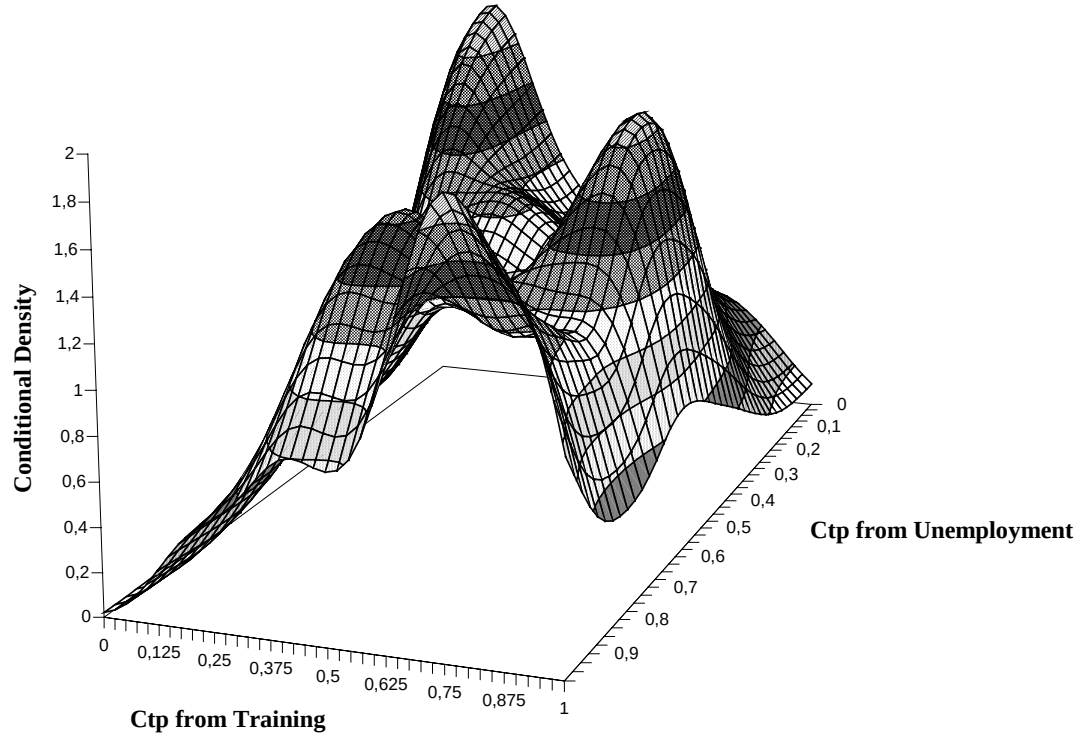


Figure 5—Distributions of cumulated transition probability (*ctp*) into stable employment from training conditional on ctp from unemployment (Kernel density estimates)

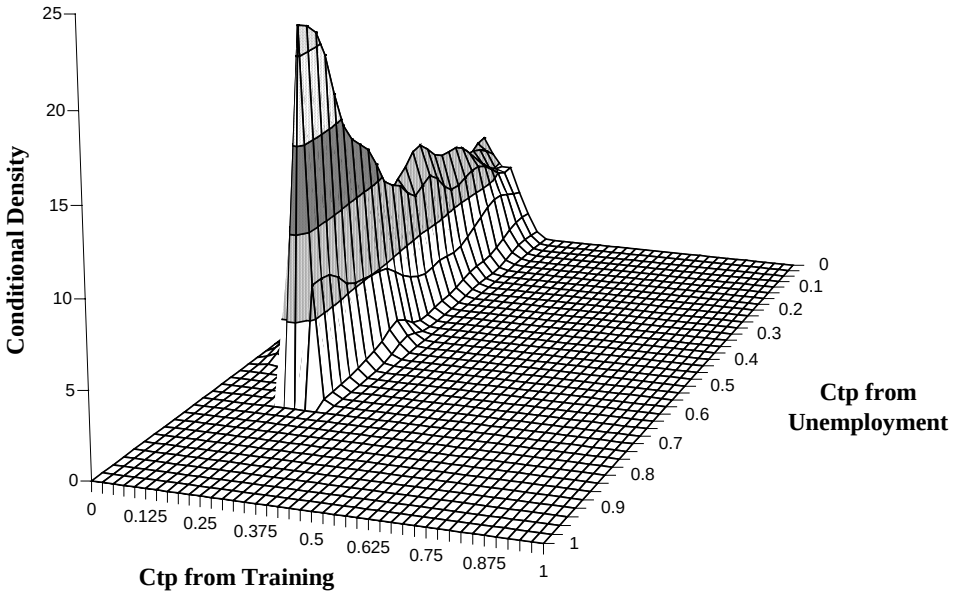
men – first period



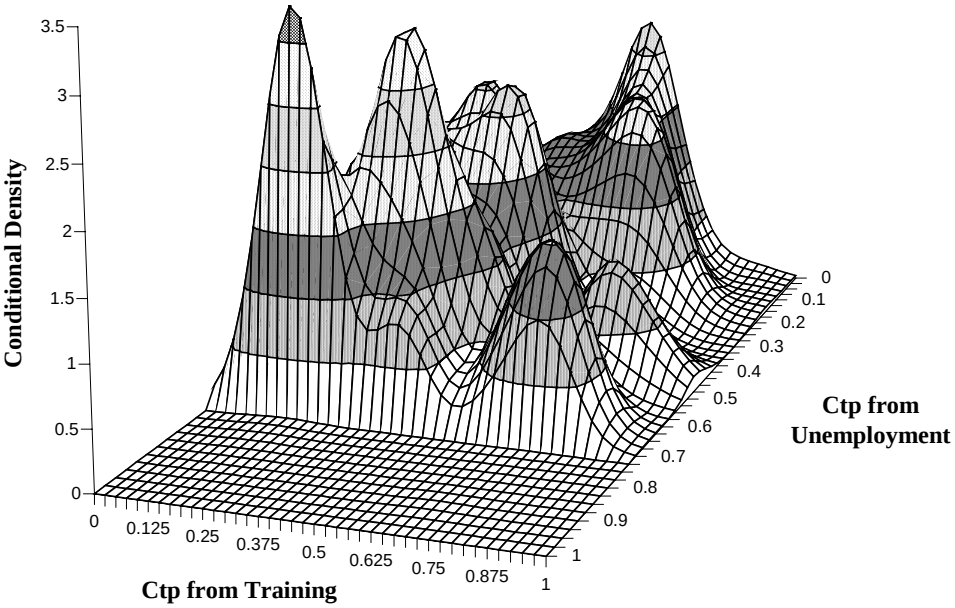
men – second period



women – first period



women – second period



Overall, the evidence on the effectiveness of PFTP to bring participants back into the first labor market is mixed for men, with clear signs of improvements in the second period for women. This conclusion is somewhat modified if the effect of training on the hazard rate into non-employment is also taken into account. Even if PFTP were ineffective in getting people directly back to work, they still may have positive effects if they keep participants searching for work and prevent them from dropping out-of-the-labor-force. As Figure 4 shows, this is clearly the case for both men and women in both periods as far as transitions into non-employment relate to transitions out-of-the-labor-force and not, say, into public works programs. One explanation for this finding is that a PFTP could renew the entitlement to unemployment benefits and thus create strong incentives to stay on the register longer than non-participants. Hence, it seems difficult to evaluate the efficiency of PFTP on the basis of the participants' lower hazard rate out–of–the–labor–force.

So far, we have compared the marginal distributions of the *ctps* of trainees with their counterfactual distribution had they stayed unemployed without training. The three–dimensional graphs of Figure 5 show the distribution of winners and losers from participating in PFTP, where the plots have to be interpreted in the following way. Take a point on the unemployment axis, say 0.2. If you slice the mountain at that point parallel to the training axis, you get the conditional distribution of the *ctps* into stable employment after training for the unemployed who would have had a *ctp* of 0.2 without training. Obviously, if the mountain were just a diagonal slice from the north–west to the south–east of the cube, then training would have no effect whatsoever.

For women in the first period, we see that irrespective of the *ctp* in unemployment, the great mass of *ctps* from training is concentrated around 0.2 to 0.3. Hence, in the first period training seems to have made female trainees more equal in terms of their employment prospects than they were before. As we have seen above, the overall employment effect was negative, though. In the case of men in the first period, the picture looks qualitatively similar, although the distribution of the *ctps* is more dispersed here. In the second period, the situation is more complicated. Overall, around 80 percent of all women lie right of the diagonal in the area where training has led to an improvement in employment prospects. For men, about 50 percent of all cases seem to be better off through training.

7 Summary and Conclusions

Previous research on the employment effects of publicly financed training and retraining programs (PFTP) in east Germany has yielded mixed results so far. To some extent, this can be related to the use of different data sources and methodological approaches. Following the microeconometric approach to the evaluation of the employment effects of these programs, we have estimated hazard rate models taking into account the exact timing of events and distinguished between stable and unstable employment subsequently to participation in a PFTP. The employment effects of PFTP are estimated separately for men and women and for two subperiods on the basis of the Labor Market Monitor covering the period 1990 to 1994. We have accounted for selection bias by controlling for a fairly large number of observable characteristics and also allowing for unobserved heterogeneity in both the outcome and participation equations. In all estimated equations, unobserved heterogeneity seems to be of little quantitative importance. Given this result, we show that the correlation between the error terms in the participation and outcome equations is rather small. This implies that, after controlling for a large number of observable characteristics in the outcome equations, selectivity–bias is likely to be negligible in our application.

In accordance with most previous research, we do find positive employment effects of PFTP in east Germany. However, these effects differ both by gender and between the first and second time period. For the first period, we find that staying unemployed increased the chances of finding stable employment relative to participating in PFTP. At that time, an infrastructure for effective training programs was not yet in place, and a large share of PFTP consisted of courses of very short duration offering only basic job counselling information. In the second period, when the institutional structure of the training programs was in place, both on–the–job and off–the–job training increased the probability of finding stable employment. For both men and women, there is also some evidence that PFTP have kept participants searching for work and prevented them dropping out-of-the-labor-force in both periods.

Although our results show at least for some groups positive employment effects, they do not imply that the unemployed population as a whole would have been worse off without this system of large–scale PFTP. It may well be that trainees have displaced other workers not offered training by the labor office. Furthermore, there are substantial net fiscal costs per trainee, which are financed through social security contributions, thus increasing labor costs and potentially reducing the demand for labor. Although potentially important for the overall evaluation of PFTP, such macro effects could not be taken into account in our evaluation of the microeconomic effects of these programs.

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Appendix

Deriviation of an Upper Bound for the Correlation of the Errors in the Participation and Outcome Equations

In section 4.2, we have specified the error terms in the outcome and participation equation as

$$u_{it} = \varepsilon_i + \eta_{it}$$

and

$$v_{it} = \mu_i + \xi_{it}$$

where the error terms are distributed as specified in the text. From this specification it follows that

$$\operatorname{cov}\left[u_{it}, u_{is}\right] = \operatorname{cov}\left[\varepsilon_i + \eta_{it}, \varepsilon_i + \eta_{is}\right] = E\left[\left(\varepsilon_i + \eta_{it}\right)\left(\varepsilon_i + \eta_{is}\right)\right] - E\left[\varepsilon_i + \eta_{it}\right]E\left[\varepsilon_i + \eta_{is}\right]$$

$$= E\left[\varepsilon_i\varepsilon_i + \varepsilon_i\eta_{it} + \varepsilon_i\eta_{is} + \eta_{it}\eta_{is}\right] - 0 = E\left[\varepsilon_i\varepsilon_i\right] = \sigma_\varepsilon^2 = \text{constant} \quad \forall t \neq s,$$

and, analogously,

$$\operatorname{cov}\left[v_{it}, v_{is}\right] = \sigma_\mu^2 = \text{constant} \qquad \forall t \neq s.$$

Imposing the restriction

$$\operatorname{cov}\left[u_{it}, v_{is}\right] = \operatorname{cov}_{u,v} = \text{constant} \quad \forall t, s,$$

we get the following correlation matrix of the residuals

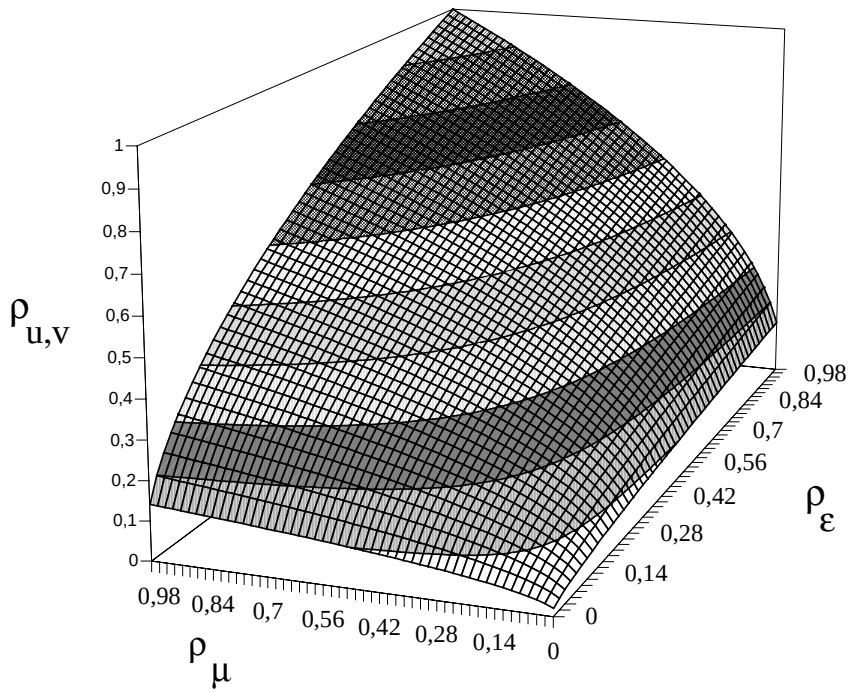
$$\mathbf{Corr}_{u,v} = \left[\begin{array}{cccc|cccc} 1 & \rho_\varepsilon & \cdots & \rho_\varepsilon & & & & \\ \rho_\varepsilon & 1 & & \rho_\varepsilon & & & \rho_{u,v} & \\ \vdots & & \ddots & \vdots & & & & \\ \rho_\varepsilon & \rho_\varepsilon & \cdots & 1 & & & & \\ \hline & & & & 1 & \rho_\mu & \cdots & \rho_\mu \\ & & & & \rho_\mu & 1 & & \rho_\mu \\ & \rho_{u,v} & & & \vdots & & \ddots & \vdots \\ & & & & \rho_\mu & \rho_\mu & \cdots & 1 \end{array}\right]$$

with $\rho_\varepsilon = \sigma_\varepsilon^2 / \sigma_u^2$, $\rho_\mu = \sigma_\mu^2 / \sigma_v^2$, and $\rho_{\mathrm{u,v}} = \operatorname{cov}_{u,v} / \left(\sigma_u \times \sigma_v\right)$.

For $\rho_\varepsilon = \rho_\mu = 0$, the eigenvalues of this matrix are 2(T–1) times 1, $+T\rho_{uv}$, and $-T\rho_{uv}$. Because this matrix has to be positive definite, all eigenvalues have to be positive. From $+T\rho_{uv} > 0$ and $-T\rho_{uv} > 0$, it follows that $(1+T\rho_{uv})(1-T\rho_{uv}) = 1-T^2\rho_{uv}^2 > 0$ implying $/T > |\rho_{uv}|$. Thus, in the case of no unobserved heterogeneity in both the participation and the outcome equation, $/T$ is the upper bound for ρ_{uv}. If there is unobserved heterogeneity in either equation, that upper bound for ρ_{uv} can be found numerically by increasing ρ_ε and ρ_μ in the correlation matrix until it is no longer positive definite.

The following graph shows the result of this calculation for the upper bound of ρ_{uv}. As the plot shows, for either ρ_ε or ρ_μ equal to zero the upper bound for the correlation between u and v becomes very small.

Figure A—Upper bound for the correlation between *u* and *v* for *T*=50



Source: own calculations.

Table A1—Descriptive satistics for the training model

Variable	Men 1st period	Men 2nd period	Women 1st period	Women 2nd period
age<= 25	0.21	0.11	0.14	0.11
25 < age <= 35	0.27	0.26	0.32	0.34
age > 50	0.10	0.15	0.12	0.13
married	0.67	0.70	0.72	0.72
with children	0.55	0.78	0.70	0.88
no vocational training	0.03	0.03	0.03	0.04
semi–skilled worker	0.03	0.02	0.02	0.01
master craftsman/ technician	0.09	0.10	0.04	0.04
vocational college	0.20	0.17	0.19	0.28
university degree	0.20	0.28	0.10	0.14
20 – 200 employees	0.05	0.11	0.04	0.12
200– 2000 employees	0.13	0.09	0.05	0.07
more than 2000 employees	0.04	0.03	0.06	0.02
primary sector	0.03	0.03	0.01	0.02
construction industry	0.04	0.03	0.01	0.01
tertiary sector	0.09	0.17	0.04	0.22
public employee	0.06	0.10	0.05	0.16
training off the job	0.72	0.72	0.83	0.74
Mecklenburg–Vorpommern	0.16	0.14	0.13	0.12
Brandenburg	0.13	0.14	0.11	0.16
Sachsen–Anhalt	0.14	0.18	0.19	0.15
Thüringen	0.17	0.14	0.22	0.15
Berlin (East)	0.09	0.07	0.07	0.09
previously in short–time work	0.32	0.08	0.26	0.06
previously in unemployment	0.25	0.17	0.48	0.34
previously out of the labor force	0.05	0.08	0.05	0.09
previous duration in short–time work	8.35	10.15	7.93	11.01
previous duration in employment	15.67	26.19	13.29	26.86
previous duration in unemployment	4.17	7.19	5.28	8.42
previous duration out of labor force	6.40	6.24	4.00	8.43

continued ./.

Table A1—Descriptive satistics for the training model (ctd.)

Variable	Men 1st period	Men 2nd period	Women 1st period	Women 2nd period
entry in the first quarter of a year	0.39	0.20	0.33	0.20
entry in the second quarter of a year	0.27	0.26	0.29	0.25
entry in the third quarter of a year	0.24	0.26	0.21	0.32
current quarter is the first of the year	0.20	0.18	0.18	0.18
current quarter is the second of the year	0.34	0.23	0.42	0.17
current quarter is the third of the year	0.26	0.14	0.22	0.18
current year is 1992	0.41	0.12	0.48	0.12
public income maintenance / expected earnings	0.66	0.71	0.66	0.77
public income maintenance	911.53	1197.28	635.69	913.27
unemployment rate	7.38	9.10	14.65	19.26
month in process time, first period				
month 3–6	0.39	0	0.39	0
month 7–9	0.19	0	0.16	0
month >=10	0.17	0	0.19	0
month in process time, second period				
month 2	0	0.10	0	0.07
month 3	0	0.07	0	0.05
month 4	0	0.05	0	0.05
month 5 –6	0	0.06	0	0.07
month 7	0	0.08	0	0.11
month 8 – 9	0	0.05	0	0.07
month 10 –12	0	0.06	0	0.07
month 13 –15	0	0.07	0	0.12
month >= 16	0	0.23	0	0.28
mean duration	5.82	9.27	5.87	11.53
(subsample size/sample size) × 100	24.23	12.84	35.55	27.39

Source: LMM, waves 1 – 8; own calculations

Table A2—Descriptive statistics for the unemployment model

Variable	Men 1st period	Men 2nd period	Women 1st period	Women 2nd period
age<= 25	0.15	0.11	0.13	0.08
25 < age <= 35	0.26	0.20	0.32	0.25
age > 50	0.27	0.29	0.21	0.28
married	0.62	0.61	0.74	0.75
with children	0.52	0.46	0.69	0.61
no vocational training	0.05	0.07	0.09	0.10
semi–skilled worker	0.09	0.06	0.05	0.06
master craftsman/ technician	0.11	0.12	0.03	0.04
vocational college	0.16	0.14	0.16	0.14
university degree	0.12	0.18	0.05	0.07
20 – 200 employees	0.20	0.29	0.20	0.24
200– 2000 employees	0.17	0.16	0.15	0.16
more than 2000 employees	0.06	0.04	0.05	0.04
primary sector	0.10	0.10	0.07	0.07
construction industry	0.07	0.10	0.02	0.02
tertiary sector	0.17	0.23	0.28	0.34
public employee	0.17	0.14	0.16	0.19
previously not in employment	0.47	0.34	0.49	0.39
Mecklenburg–Vorpommern	0.14	0.13	0.14	0.12
Brandenburg	0.18	0.16	0.14	0.16
Sachsen–Anhalt	0.18	0.16	0.16	0.17
Thüringen	0.17	0.17	0.18	0.16
Berlin (East)	0.06	0.11	0.08	0.05
previously in short–time work	0.18	0.10	0.18	0.15
previously in job creation measure	0.02	0.12	0.01	0.08
previously in retraining or further training	0.05	0.11	0.09	0.23
previously out of the labor force	0.06	0.09	0.15	0.10
previous duration in short–time work	10.32	11.37	10.20	13.30
previous duration in employment	12.12	17.29	12.73	18.66
previous duration in job creation measurement	6.08	12.08	7.44	139.89
previous duration in retraining or further training	4.54	124.18	4.89	120.89
previous duration out of the labor force	7.89	120.04	88.77	108.13

continued ./.

Table A2—Descriptive statistics for the unemployment model (ctd.)

Variable	Men 1st period	Men 2nd period	Women 1st period	Women 2nd period
entry in the first quarter of a year	0.25	0.14	0.26	0.15
entry in the second quarter of a year	0.18	0.25	0.22	0.31
entry in the third quarter of a year	0.33	0.33	0.30	0.29
current quarter is the first of the year	0.24	0.10	0.25	0.07
current quarter is the second of the year	0.17	0.19	0.20	0.18
current quarter is the third of the year	0.29	0.10	0.29	0.08
current year is 1992	0.22	0.28	0.33	0.22
unemployment benefits / expected earnings	0.39	0.60	0.44	0.64
unemployment benefits	466.68	718.00	411.87	599.06
unemployment rate	67.32	91.78	32.37	193.32
month in process time, first period				
month 2	0.13	0	0.12	0
month 3	0.16	0	0.11	0
month 4	0.09	0	0.09	0
month 5	0.10	0	0.10	0
month 6	0.08	0	0.08	0
month 7	0.04	0	0.07	0
month 8 – 9	0.07	0	0.09	0
month 10 – 12	0.07	0	0.08	0
month >= 13	0.05	0	0.08	0
month in process time, second period				
month 7 – 9	0	0.18	0	0.19
month 10 – 12	0	0.14	0	0.12
month 13 – 18	0	0.13	0	0.15
month >= 19	0	0.10	0	0.21
mean duration	4.55	8.67	5.54	11.70
(subsample size/sample size) × 100	24.23	12.84	35.55	27.39

Source: LMM, waves 1 – 8; own calculations

Table A3—Training model: exit into stable employment and into non-employment

	Exit into stable employment		Exit into non-employment	
	coeff.	t–value	coeff.	t–value
men, first period				
constant	–3.8910	–10.04	–5.5161	–4.24
age <= 25			–2.2000	–2.60
age > 50			1.2181	2.35
married	0.8506	2.67	–1.1640	–2.57
with children	–0.3673*	–1.82		
master craftsman / technician			1.4404	2.45
training off the job			1.2048	2.27
Mecklenburg–Vorpommern	–0.7429*	–1.81		
Thüringen	–0.6533*	–1.78		
previously in short–time work			2.2029	4.38
current year is 1992			–0.5008	–1.16
public income maintenance	0.3057	0.84	–0.0006	–0.92
unemployment rate			0.0911	0.91
men, second period				
constant	–0.8279*	–1.78	–5.3706	–8.47
married			–0.2764	–0.67
training off the job	1.2488	6.18		
Mecklenburg–Vorpommern	0.6937	2.69		
previously out of the labor force	–1.2196	–2.84		
previous duration in employment	0.0223	5.11		
previous duration in unemployment	–0.1518	–4.26		
current quarter is the first of the year	–0.6858	–3.68		
current quarter is the third of the year	–0.6348	–3.33	–0.9195	–1.55
current year is 1992	–0.7211	–3.22		
public income maintenance			–0.0005*	–1.93
income maintenance / expected earnings in employment	0.0479	0.19		
unemployment rate	–0.1592	–3.63		

continued ./.

Table A3—Training model: exit into stable employment and into non-employment (ctd.)

	Exit into stable employment		Exit into non-employment	
	coeff.	t–value	coeff.	t–value
women, first period				
constant	–4.4800	–8.61	–3.0135	–5.21
age <= 25	–0.4545	–3.12	–1.4669	–3.92
25 < age <=35			–0.7866	–3.40
age > 50			0.5853	2.15
master craftsman / technician			0.9247*	1.77
training out of the job	0.4798	1.46	1.0861	3.13
Berlin (East)			–0.6559	–1.62
previously in short–time working			1.0748	3.56
previously in unemployment	0.1356	0.49	0.3552	1.33
entry in the third quarter of a year			–1.0930	–4.10
public income maintenance	0.2871	0.58	–0.0017	–3.49
women, second period				
constant	–0.6721	–2.30	–4.3373	–6.43
age <= 25	–0.6309	–2.08*	–1.7244	–3.52
25< age <=35			–0.9154	–3.32
no vocational training			0.6315	1.45
tertiary sector	–0.6043	–2.33		
public employee	–0.7657	–2.63		
training out of the job			0.8771	2.10
previously in short–time working	1.5529	3.57		
previously out of the labor force	–1.2632	–3.23		
previous duration in unemployment				
previous duration in short–time working	–0.1498	–3.16		
previous duration in employment	0.0249	5.30		
previous duration in unemployment	–0.1703	–4.63	–0.0142	–0.76
entry in the first quarter of a year	–0.4199*	–1.89		
current quarter is the first of the year	–0.8725	–3.97	–1.2792	–3.07
current quarter is the second of the year	–0.6051	–2.88		
current quarter is the third of the year	–0.3822	–2.03	–0.4339	–1.50
current year is 1992	–0.9749	–4.21		
public income maintenance/expected earnings in employment	–0.5989	–2.23	–0.0019	–5.51

continued ./.

Table A3—Training model: exit into stable employment and into non-employment (ctd.)

	Exit into Stable Employment		Exit into No Employment	
	coeff.	t–value	coeff.	t–value
month in process time, first period				
month 7 – 9	0.3550*	1.70		
month in process time, second period				
month 2	–0.5978	–3.58*	1.7333	3.10
month 3	–1.0558	–4.98		
month 4	–1.1284	–4.74		
month 5 – 6	–1.4519	–6.97	1.2840	2.27
month 7	–0.7978	–3.35	2.0330	3.61
month 8 – 9	–1.3646	–5.80*	1.8114	3.42
month 10 – 12	–1.4767	–6.61	1.4851	2.70
month 13 – 15	–1.3528	–6.00	2.0004	3.84
month >= 16	–1.8560	–10.00	1.5606	3.08

Note: Shaded values indicate statistical significance at the 5%, a star at the 10% level.
Source: LMM, waves 1 – 8; own calculations

Table A4—Unemployment model: exit into stable and into non-employment

	Exit into Stable Employment		Exit into No Employment	
	coeff.	t–value	coeff.	t–value
men, first period				
constant	–3.0293	–7.02	–4.2624	–13.15
age > 50	–1.4998	–5.71	0.4823	2.66
married	0.6346	3.42	0.5473	2.79
with children			–0.4396	–3.04
no vocational training	–0.6838	–1.53		
semi–skilled worker	–0.4942	–1.45		
master craftsman / technician	0.3263	1.34	0.4100	2.02
university degree			0.2711	1.26
20 – 200 employees			0.7861	3.55
200 – 2000 employees			0.8748	3.89
more than 2000 employees			0.9836	2.84
previously not in employment	–0.5919	–2.91		
Mecklenburg–Vorpommern	–0.5571	–2.33		
Sachsen–Anhalt			0.3819*	1.92
previously in retraining or further training	1.0858	4.27		
previously out of the labor force	–1.0263*	–1.84	0.3182	1.05
previous duration out of the labor force	0.1189	3.91		
entry in the first quarter of a year	–0.4488	–2.05	–0.7952	–3.44
entry in the second quarter of a year	–0.8324	–3.00	–0.6837	–2.90
entry in the third quarter of a year	–0.4696	–2.16	–0.4734	–2.41
current quarter is the second of the year			–0.5936	–2.73
unemployment benefits /expected earnings	0.1635	0.49		
unemployment benefits			0.0000	–0.20
unemployment rate	0.0942	2.23	0.0914	2.38

continued ./.

Table A4—Unemployment model: exit into stable and into non-employment (ctd.)

	Exit into Stable Employment		Exit into No Employment	
	coeff.	t–value	coeff.	t–value
men, second period				
constant	–2.1978	–2.16	–5.8529	–10.55
25 < age <=35	0.4264	1.24		
age > 50	–2.1026	–3.94	0.6543	2.22
married	0.6974	2.05		
with children			–0.3315*	–1.75
no vocational training			0.3745	0.63
master craftsman / technician	1.4678	4.32		
vocational college			0.6081*	1.93
primary sector	–1.7042	–2.41		
tertiary sector	0.5936*	1.77		
previously not in employment	–1.6262	–3.99		
Mecklenburg–Vorpommern	1.3857	2.31		
Thüringen	0.8529	2.06		
previously in job creation measure			1.5434	2.17
previously out of the labor force			0.3198	0.70
previous duration in employment	–0.0369	–2.63		
previous duration in job creation measure	–0.0823	–2.15	–0.1807	–2.15
entry in the first quarter of a year	–1.5453	–3.06	–0.9413	–2.00
entry in the second quarter of a year	–1.6224	–3.30	–0.6065	–1.63
entry in the third quarter of a year	–1.1090	–2.68		
current quarter is the first of the year	1.8376	2.83		
current quarter is the second of the year	1.6099	2.45	1.5910	3.65
current quarter is the third of the year	1.0392	2.45		
current year is 1992	1.9371	3.82	2.6793	6.93
unemployment benefits /expected earnings in employment	0.6133	0.83		
unemployment benifits			0.0003	0.75
unemployment rate	–0.3138	–3.56		

continued ./.

Table A4—Unemployment model: exit into stable and into non-employment (ctd.)

	Exit into Stable Employment		Exit into No Employment	
	coeff.	t–value	coeff.	t–value
women, first period				
constant	–3.5176	–16.22	–4.5875	–19.96
age > 50	–1.2512	–4.54	0.3172	2.61
with children	–0.3209	–2.58		
no vocational training			–0.5208	–2.69
semi–skilled worker	–0.7464*	–1.94	–1.1948	–3.66
vocational college	0.4169	2.10		
university degree	1.0012	4.32		
more than 2000 employees			0.4028	1.62
tertiary sector	0.6773	3.88		
public employee	–0.2596	–1.19	–0.2514	–1.54
Mecklenburg–Vorpommern			–0.2511	–1.36
Thüringen			–0.3174*	–1.92
previously in retraining or further training			0.5962	3.33
entry in the second quarter of a year			–0.3960	–2.76
current quarter is the first of the year			0.6540	4.67
current quarter is the third of the year			0.6346	4.78
current year is 1992			–0.5502	–3.56
unemployment benefits /expected earnings in employment	0.0180	0.06		
unemployment benefits			0.0001	0.37
unemployment rate			0.0826	4.63

continued ./.

Table A4—Unemployment model: exit into stable and into non-employment (ctd.)

	Exit into Stable Employment		Exit into non-employment	
	coeff.	t–value	coeff.	t–value
women, second period				
constant	–4.1261	–10.29	–7.6350	–15.17
age <= 25			0.7704	2.10
age > 50	–1.2415	–3.33	0.4556*	1.77
with children			0.3301	3.08
no vocational training	0.7016*	1.88		
construction industry	1.3168	2.44		
previously not in employment	–0.5881	–1.97		
Thüringen			0.2495	0.97
previously in short–time working	1.6278	2.93	0.6274	2.27
previously in retraining or further training	1.7504	3.55*	1.6612	4.17
previously out of the labor force			1.2457	4.02
previous duration in short–time work	–0.0691*	–1.91		
previous duration in retraining or further retraining	–0.1066	–2.04	–0.1384	–2.85
entry in the first quarter of a year	–1.8874	–4.37		
entry in the second quarter of a year	–1.3153	–3.69		
entry in the third quarter of a year	–0.6736	–2.27	0.5874	2.80
current quarter is the second of the year			1.1572	4.10
current year is 1992	1.3128	4.92	2.1354	7.67
unemployment benefits /expected earnings	–0.4868	–1.40		
unemployment benefits			0.0015	3.83
month in process time, first period				
month 3			0.4310	2.85
month 4 – 6			0.5931	4.74
month >= 7			0.6562	5.19
month in process time, second period				
month >= 7	0.3599*	1.76	0.5640	3.25

Note: Shaded values indicate statistical significance at the 5%, a star at the 10% level.
Source: LMM, waves 1 – 8; own calculations