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Abstract

We analyze the effectiveness of public works programs (PWP, *Arbeitsbeschaffungs-maßnahmen*) in east Germany as measured by their effects on individual future re–employment probabilities in regular jobs. 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 PWP participation and in the outcome equations. In the latter, we differentiate between transitions into "stable" and "unstable" employment after the PWP. We find that these programs seem to have no special targeting focus on disadvantaged groups in the labor market and that participants are, on average, worse off concerning their re–employment prospects in regular jobs than unemployed people who do not join such a program. A possible explanation for this result is that PWP participants search less intensively for a regular job while on such a program than unemployed non-participants. Thus, our results cast serious doubts on both the effectiveness and the equity aspects of public works programs in east Germany.

Non–Technical Summary

There has been surprisingly little research on the employment effects of public works programs (PWP) which have been used extensively to cushion the repercussions of the restructuring process on the east German economy. Following the microeconometric approach to the evaluation of the employment effects of labor market programs, we estimate re–employment probabilities of PWP participants and unemployed non–participants in regular jobs, where we distinguish between stable and unstable employment. Stable employment is defined as obtaining regular employment within twelve months after the spell has ended and being still employed at the end of this period. The employment effects of these programs are estimated separately for men and women and for two subperiods on the basis of the east German Labor Market Monitor covering the period 1990 to 1994.

Our results on the effectiveness of public works in bringing people back into stable employment are not encouraging. We find that public works participants are, on average, worse off in terms of individual re–employment prospects than unemployed people who do not join a public works program. A possible explanation for this result is that PWP participants search less intensively for a regular job while on such a program than unemployed non-participants. However, we cannot find any evidence for the hypothesis that there are disincentive effects to take up regular jobs due to an allegedly high level of relative earnings in PWP. Furthermore, these programs seem to have no special targeting focus on disadvantaged groups in the labor market. Our results therefore cast serious doubts on both the effectiveness and the equity aspects of public works programs in east Germany. Given the scale of PWP in terms of participants and expenditures, policy makers may reconsider the role of public works programs as an active labor market policy tool. Since related research for east Germany has shown that training programs increase participants' re–employment prospects relative to unemployed job search, we conclude that a re–allocation of expenditures for "active" labor market policy rather than overall expenditure reductions could increase its effectiveness.

1 Introduction

The economic restructuring process in east Germany was accompanied by a dramatic rise in registered unemployment from virtually zero just before Monetary, Economic and Social Union on the 1st July, 1990 to a recent level of about 20 percent. But even this dramatic increase in unemployment only partially reflects the severe labor market problems in east Germany. Without the implementation of "active" labor market programs on a large scale, registered unemployment would have soared to about 30% (Sachverständigenrat, 1997, p. 150 ff). Hence, these programs are supposed to play an important role in smoothing the adjustment of the east German labor market during the transition process. Although the mix of these programs changed over the transition period, public works programs (PWP) started to play a prominent role early on. They reached an all–time high in 1992 when the average number of participants in PWP was about 400,000 people and public expenditures amounted to almost 9 billion Deutsche Marks. Since then, the size of these programs has been sharply reduced: in the year 1997 the average stock of PWP participants was reduced to about 200,000 persons with expenditures of about DEM 6.6 billions. This is a similar amount as is currently spent on publicly financed training programs in east Germany (*cf*. Kraus, Puhani, and Steiner, 1997).

Proponents of PWP claim that these programs are "self–financing" in the sense that their costs are compensated for by savings on unemployment benefits and social security contributions on the one hand, and higher tax receitps associated with a higher employment level on the other. However, according to some rough calculations, costs on these programs seem to exceed the sum of direct savings and additional income generated by any macroeconomic employment effects by a large margin (*cf*. Autorengemeinschaft, 1997; Sachverständigenrat, 1998, p. 153). Critics of PWP also claim that public works compete with private production and, due to the huge wage subsidies, displace jobs in the private sector of the economy. Furthermore, participants in these programs are said to be discouraged to search for a regular job because public works jobs have to offer contract wages which often exceed wages for comparable work in the private sector of the economy. Although these claims are often raised in policy debates on the usefulness of PWP in east Germany, there is hardly any empirical evidence supporting or disproving them.

There are various aims public works programs should achieve according to the criteria set out in the Work Support Act (*Arbeitsförderungsgesetz*) and related special regulations by the Federal Labor Office (*Bundesanstalt für Arbeit*), see Wolfinger and Brinkmann (1996) for a discussion. One important objective of PWP is to offer employment opportunities especially to those unemployed people who, because of personal characteristics such as disability, old age, or lack of qualification, have great problems finding employment in the market sector of the economy, and would therefore become long–term unemployed. This is the so–

called target–group objective (*Zielgruppenorientierung*) set out in the Work Support Act. Given the very high level of unemployment in east Germany, the authorities have not adhered to this criterion very strictly, though. Another important official objective of PWP is to re–integrate people into regular employment. It is the prevailing view of those concerned with the implementation of these programs that they should offer only temporary employment opportunities and thus act as a "bridge" to a regular job in the market sector of the economy (Buttler, 1992). Furthermore, according to the Work Support Act these jobs should also lead to "stable" employment.

This paper focuses on the effectiveness of public works programs in east Germany with respect to this latter objective. We view PWP as an alternative to the passive policy of just paying unemployment benefits and compare the re–employment prospects of PWP participants with the counterfactual outcome had the participants been unemployed during the period of the PWP. We extend previous work on the employment effects of PWP in east Germany by Steiner and Kraus (1995) who, on the basis of the east German Labor Market Monitor, only investigated the period 1990 to 1992 using a somewhat different methodological approach. In particular, they did not differentiate between stable and unstable employment and only focused on the short–term employment effects of PWP. These authors find that women have higher chances to become re–employed from unemployment than from public works. For men, the authors find hardly any difference in re–employment probabilities from public works and on the one hand and unemployment on the other hand. On the basis of more recent data from the Labor Market Monitor and using various econometric models, Hübler (1997a) reports negative employment effects of PWP for men, and insignificant effects for women.

In Germany, experimental data for the evaluation of labor market programs are not available. There are various approaches to the evaluation of the employment effects of public works and other labor market programs on the basis of non–experimental data (see, e.g., of Heckman and Robb, 1985, Heckman and Hotz, 1989, Heckman, Ichimura, and Todd, 1997). In this study, we apply the microeconometric approach to evaluate the employment effects of PWP. To this end, we estimate hazard rate models from public works or unemployment into stable employment on the basis of all eight waves of the east German labor market monitor which covers the period 1990 to 1994. We find that public works programs seem to have no special targeting focus on disadvantaged groups in the labor market and that participants are, on average, worse off in terms of individual re–employment prospects than unemployed people who do not join such a program. However, we do not find any evidence for the hypothesis that there are disincentive effects to take up regular jobs due to an allegedly high level of earnings in PWP.

The remainder of the paper is structured as follows. In the next section, we briefly describe the structure and development of public works programs in east Germany.

Our evaluation methodology and the data are described in section 3. In section 4 we present and discuss the estimation results focusing on the employment effects of public works programs, and section 5 concludes.

2 The Development and Structure of Public Works Programs in East Germany

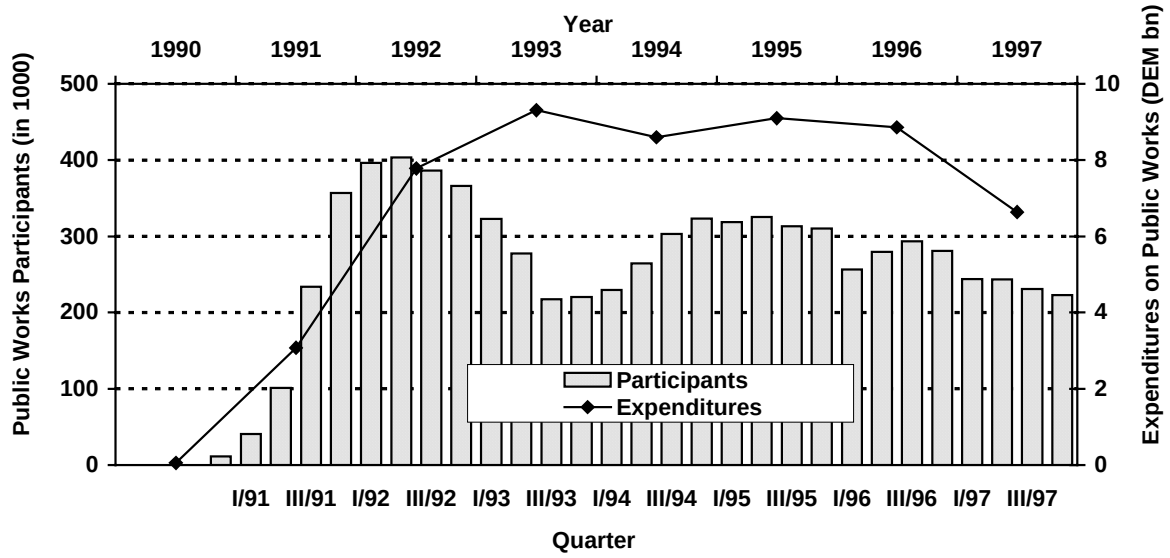
Public works programs (PWP) are considered an important part of "active" labor market policy by the German government and the Federal Labor Office. After unification, PWP have been extended tremendously to ease the east German transition process. In view of the dramatic employment decline in east Germany these programs have not only been used as a means to keep people off the dole and to avoid social hardship associated with long–term unemployment. They were also intended as investment in the east German industrial infrastructure, such as the cleaning–up of environmental damages and the closing–down of obsolete plants (see, *e.g*., Buttler and Emmerich, 1994). As stipulated by the Work Support Act (*Arbeitsförderungsgesetz*), activities undertaken under a PWP should be "useful" for society but, at the same time, must not compete with private production, *i.e*., there must not be a potential market supply even if there is demand for such goods. Obviously, both criteria are not easy to meet simultaneously.

To account for the special east German situation, public works programs were not restricted to non–profit organizations, wage subsidies could amount to 100% including social security contributions, and costs for machinery and material were also usually covered by the labor office. Although these special regulations were initially legislated to expire by the end of 1992, they were prolonged until 1995. Since then, a 100% wage subsidy is only paid if working–time is reduced by 20%. This allows earnings in public works jobs to be reduced without interferring with collective bargaining agreements, which effectively set a minimum wage for those firms covered by such agreements. At the same time, a special form of wage subsidy was introduced, known as "Productive Work Support East" (*Produktive Arbeitsförderung Ost*). Under this scheme, jobs can be subsidized up to the average amount of unemployment benefits and social security contributions. These special regulations were to expire by the end of 1997, but have recently been prolonged in view of the still desastrous labor market situation prevailing in east Germany. In the following, we aggregate these two types of programs because they have the same labor market objective, namely to get people off the dole and to integrate them into regular employment.

The scope of PWP in east Germany is unique in both the national and international context (see, *e.g*. Puhani and Steiner, 1996; OECD, 1997). As Figure 1 shows, the number of public works participants peaked in the first half of 1992 with over 400,000 people employed on such schemes. The following decline can be explained

by changes in institutional regulations rather than in improved labor market conditions. After an intermittent increase in the number of PWP participants, fiscal pressure and the increasing disenchantment of economic policy makers with PWP finally led to a downsizing of the number of participants to some 200,000 in the last quarter of 1997.

Figure 1—Expenditures on and participants in PWP



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

Except for the most recent severe expenditure cuts, the decline in the number of participants in public works after 1992 was not reflected in the development of public works expenditures (see Figure 1). The reason is that PWP became more cost–intensive when large–scale programs—so–called *Mega–PWP* and Societies for Employment Promotion and Structural Development (*ABS–Gesellschaften*)—were established. Mega–PWP have a funding of more than DEM 3 million and more than 150 people per program with a focus towards infrastructure and environmental re–development (Spitznagel, 1992). The task of the Societies for Employment Promotion and Structural Development is to employ and qualify people within the framework for public works programs set by the Federal Labor Office. At the beginning of 1995, they employed about 150,000 people in public works or financed by the special form of wage subsidy mentioned above (*cf.* Wolfinger and Brinkmann, 1996, p. 344).

According to calculations by the Research Insitute of the Federal Labor Office (Autorengemeinschaft, 1997), in the year 1996 the total costs for a PWP participant amounted to almost DEM 50,000 per year. These costs include the subsidies for labor costs and social security contributions as well as costs for material and machinery. To some extent, these costs are balanced by savings of unemployment

benefits and social security contributions. Additional savings are generated to the extent PWP induce increased production and employment elsewhere. Taking these indirect effects into account, the net yearly costs per participant in PWP reduce to about DEM 20,000, which exceeds the costs of paying unemployment benefits by about 50%. However, net costs of PWP would have to be reduced to the extent activities in public works produce value for society. Of course, in the absence of market prices it is not obvious how to make such a calculation.

Because PWP were, and still are, very much oriented towards structural policies, the targeting criteria as set out in the Work Support Act were loosened for east Germany. Whereas the main target group in west Germany are unemployed people with certain characteristics which substantially reduce their chances of getting a regular job, like disability, old age and, especially long–term unemployment, in east Germany these are not necessary requirements to get into a PWP. Instead, many people enter PWP directly from employment, *e.g.* in the case of mass redundancies. For the large–scale programs referred to above there seem to be no binding targeting criteria at all.

Information on the structure of public works participants, which gives some indication on the issue of the targeting focus of PWP, can be obtained from the LMM. These data show that the composition of PWP participants has markedly changed over time (see, e.g., Bielenski, Retzlaff, and von Rosenbladt, 1995, Bielenski and Margvas, 1997). Whereas in 1991 40% of public works participants were female, their share increased to about 68% by 1994, which roughly corresponds to the female share in unemployment. In 1994, 19% of all PWP participants were university graduates, compared to just 5% in 1991. The share of participants with a degree from polytechnical school is also rather high (16% in 1994), but has remained fairly stable over time. People with a higher occupational qualification were therefore supported by PWP far above their share in total unemployment. Old age, which is closely related to the incidence of long–term unemployment, is another important factor for PWP participation, and there are special regulations for long–term unemployed people above 50 years of age.

Participants in PWP earn, on average, considerably less than employees in regular jobs. Data from the Labor Market Monitor (LMM) of the Federal Labor Office show that average net monthly earnings in public works jobs amounted to about DEM 1,500 in November 1994 (the last wave of the LMM), while average net earnings in a regular job were about DEM 2,000 at that time (see also Spitznagel and Magnas, 1997). Substantial earnings differentials between public works and regular jobs also exist within economic sectors and qualification groups. Since information on working hours is not available in the LMM, we cannot tell to what extent these differentials also persist on an hourly basis.

Since employment in public works is limited to a fixed time period, normally 12 months, participants can be expected to search for a regular job during the duration of the program. In the period November 1990 to November 1992 (1994) about 40% (25%) of all PWP ended prematurely, where the drop in this share is probably related to the worsening of labor market conditions in east Germany (Spitznagel and Marvas, 1997). Of those PWP which expired in the observation period about 14% were hired by the public works firm and 25% ended with a transition into a regular job, while about half of all participants were left without a job (Spitznagel and Marvas, 1997, Table 96). We now turn to the question what these numbers tell us about the success of PWP.

3 Evaluation Methodology and Data

Our evaluation of the employment effects of PWP is based on a microeconometric model. To implement this model, we need to define an appropriate observable outcome variable, specify how PWP might affect this variable, and account for other observable and unobservable factors which may affect the outcome variable aside from having previously been on a PWP. Since an important criterion for the evaluation of a PWP in east Germany is its potential to increase the future re–employment probability of formerly unemployed people in regular jobs, we compare the re–employment probabilities of participants in such programs with the counterfactual outcome had they remained unemployed instead of entering a public works program. A particularly difficult problem arises from the potential selectivity of participation in PWP, i.e., its dependence on those factors which also determine the outcome variable.

3.1 Treatment of Potential Selection Bias

The essence of the sample selection problem is that participants in PWP 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 PWP. The standard econometric solution to this problem is to correct for potential selectivity bias in the outcome equation on the basis of a PWP participation equation estimated for the combined sample of participants and non–participants in PWP.

The outcome and participation equations are

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

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

where 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 PWP into labor force state *j*, i.e., the conditional probability to leave unemployment (PWP) for that state in time period *t*, given the individual has been unemployed (in PWP) until time *t*. The second equation refers to the selection into public works, where D_{it}^{*} is the latent index which determines the transition from unemployment into public works 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), or both.

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. To account for *selection on unobserables*, we assume the following error–components specification for the outcome and selection (PWP 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 the 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 PWP participation and the respective outcome equation has a rather small upper bound (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 PWP 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 PWP and control for selectivity by including the same observed variables as in the outcome equation in the participation equation.

3.2 Specification of the Outcome and Participation Equations

Since our data base contains information on the duration an individual has spent in unemployment or a PWP, we specify our outcome and participation equations as hazard rate models.[1] This has the great advantage that both the time spent in unemployment or in a PWP spell and the time between its completion and the beginning of a subsequent employment spell can be taken into account. Thus, both calendar–time effects and process–time effects ("duration dependence") can be allowed for in the comparison of future employment outcomes of PWP 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 (un–) employment duration is the outcome variable. Because the duration data are only observed in monthly intervals in the LMM we specify discrete hazard rate models.

The hazard rate for transitions from unemployment or a PWP into labor force state j in discrete process time t is the probability of exit into state j at time t conditional on the event that the person has remained in unemployment (in PWP) up to time $t - 1$. In our application, the j exit states from unemployment are public works programs, employment, and other labor force states in the PWP *participation model* and "stable" employment, "unstable" employment, and non–employment in the *outcome models*. The definition of the exit states differs between the participation and outcome models. In the participation model, we specify the hazard rate from unemployment into PWP with employment and other labor–force states as the remaining exit states. Other labor force states include short–time work, retirement, unemployment, training and re–training, and out–of–the–labor–force.

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

- *stable employment:* the person finds *regular* (i.e., not subsidized) employment and is still employed in the twelfth month after the end of the spell. Regular

[1] See Ridder (1986), Gritz (1993), Ham and LaLonde (1996), and Hujer, Maurer and Wellner (1997) for similar applications.

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 a spell spent unemployed or in PWP 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 active labor market programs is also included in this category.

If the person is still in public works 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 PWP (unemployment) spell. This is a very important condition for the comparability of the outcome variable between individuals, 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–months' 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 public works 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 coefficients 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 states.

For the 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 public works, 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 public works 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 PWP 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. Note that the standard assumption that spells are independent across individuals in the *sample*, need not hold in the population as a whole. In fact, for the latter this assumption is likely to be violated if subsidized employment in PWP resulted in the substitution of non–subsidized jobs.

We estimate a participation model for the transition from unemployment into public works and two outcome models. The first (second) outcome model refers to the transition of participants in PWP (unemployed non–participants) into stable employment and other labor force states, respectively. 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.[2]

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

Using standard numerical optimization procedures, the likelihoold function is maximized with respect to the coefficients on the baseline hazard, the coefficients on the explanatory variables and the mass–points together with the corresponding probabilities, $\hat{P}(\varepsilon^m)$, taking into account the restrictions on the individual effects given above.

3.3 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[3]. Nevertheless, the sample size shrunk down to 5,377 observations in wave 8 (November 1994).

The LMM contains information on socio–economic characteristics like age and education, participation in various active labor market policy measures, and an individual's employment status at the date of interview in each wave. From the first wave onwards the interviewees were asked when they participated in public works. 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 public works programs. The exit states in the PWP participation model refer to the employment state in the first month after the transition from the unemployment state. For the outcome models, the exit states are defined as described in section 3.2.

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

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

	participation model		unemployment model		public works model	
exit into	absolute	percent	absolute	percent	absolute	percent
stable employment	—	—	518	16.73	153	21.31
unstable employment	—	—	151	4.88	67	9.33
employment (full– or part–time)	818	23.35	—	—	—	—
public works	553	15.79	—	—	—	—
other labor force states	703	20.06	—	—	—	—
non–employment	—	—	724	23.39	107	14.9
right–censored	1,429	40.79	1,702	54.99	391	54.46
total	3,503	100	3,095	100	718	100

Source: LMM, waves 1 – 8; own calculations.

The same set of control variables is included in both the PWP 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. These are the income replacement ratio for transitions into regular employment and the real value of unemployment benefits or earnings in a PWP for transitions into non–employment. These variables are included in the outcome models to test for disincentive effects in individual (un–) employment behavior related to the allegedly high level of, respectively, unemployment benefits and earnings in public works relative to the expected earnings in regular employment.

As for the unemployment benefit variables, the unemployed usually give the amount of benefits they receive at the date of interview. In case an unemployment spell falls between two dates of an interview, we set the replacement ratio at the value of 63 percent, which is the institutionally determined replacement ratio for a person without children (see Steiner, 1997). For all other cases, the income replacement ratio in the unemployment model is estimated by dividing the amount of unemployment benefits by the expected net wage in regular employment. This latter variable is obtained from empirical wage equations. For transitions from PWP, the income replacement ratio is defined by the ratio of earnings in public works relative to expected earnings in regular employment. In about 10 percent of all cases the earnings information in public works was missing. In these cases, earnings were therefore imputed on the basis of empirical wage equations estimated on the sample of employees in regular jobs and in PWP. To save space, these and the estimates of an unemployed person's expected wage in regular employment are

not reported here, but are available from the authors upon request. All amounts are in 1990 Deutsche Marks.

We split the observation period into two subperiods, *viz.* January 1989 to August 1992, and September 1992 to November 1994, respectively. This is motivated by the institutional changes that took place during the observation period, i.e., the increasing importance of large scale works programs (*cf.* section 2). Futhermore, Kraus, Puhani and Steiner (1997) found that employment effects of publicly financed training problems in east Germany differed markedly between these two subperiods. Since PWP are to some extent probably substitutes for publicly financed training programs, it seems natural to split the observation period accordingly. Kraus, Puhani and Steiner (1997) also found important gender differences both with respect to the participation in and the employment effects of publicly financed training programs, and we therefore also differentiate between males and females in our estimations. For these two subperiods, means and definitions of the exogenous variables are given in the appendix in Table A1 for the public works model and in Table A2 for the unemployment model.

4 Estimation Results

4.1 Sample Selectivity

We test for potential selectivity bias due to the presence of unobserved heterogeneity by comparing the maximum likelihood values 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.[4]

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

unobserved	public works model		unemployment model		participation model	
heterogeneity	–2LnLik	AIC	–2LnLik	AIC	–2LnLik	AIC
0 mass points	3,055.44	–1,621.72	11,733.90	–6,015.95	15,187.27	–7,776.64

[4] 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).

2 mass points	3,011.48	–1,601.74	11,727.02	–6,014.51	15,184.88	–7,777.44
3 mass points	3,010.40	–1,603.20	11,727.02	–6,016.51	—	—

Source: Estimated hazard rate models (see Tables A3and A4 in the appendix).

According to the AIC, we have two heterogeneity mass points in both the public works and unemployment models. There is no significant heterogeneity component in the PWP participation model. As Table 3 shows, the estimated heterogeneity components are significantly different from zero in the public works model but not in the unemployment model. According to our discussion in section 3.1, this implies that the correlation between the error terms in the participation and outcome equations must be fairly small. As shown in the appendix, in the presence of unobserved heterogeneity in just one of the outcome equations the upper bound for the correlation between u and v is still below 0.15. In order to find out whether this order of correlation has an effect on the estimated coefficients in the outcome model, we carried out a small simulation study. The result was that the effect is negligible.[5] We, therefore, argue that we can, after conditioning on the set of observable explanatory variables in the participation model, ignore the bias due to the selection on unobservables in the outcome models.

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

	public works model		unemployment model	
	estimate	t–value	estimate	t–value
ε_1	1.3098	6.79	–0.0008	0.0060
ε_2	–3.1670	–7.34	0.0007	0.0000
$Pr(\varepsilon_1)$	0.7074	23.65	0.4539	0.0109
$Pr(\varepsilon_2)=1–Pr(\varepsilon_1)$	0.2926	9.78	0.5461	0.0131

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

4.2 Participation in Public Works

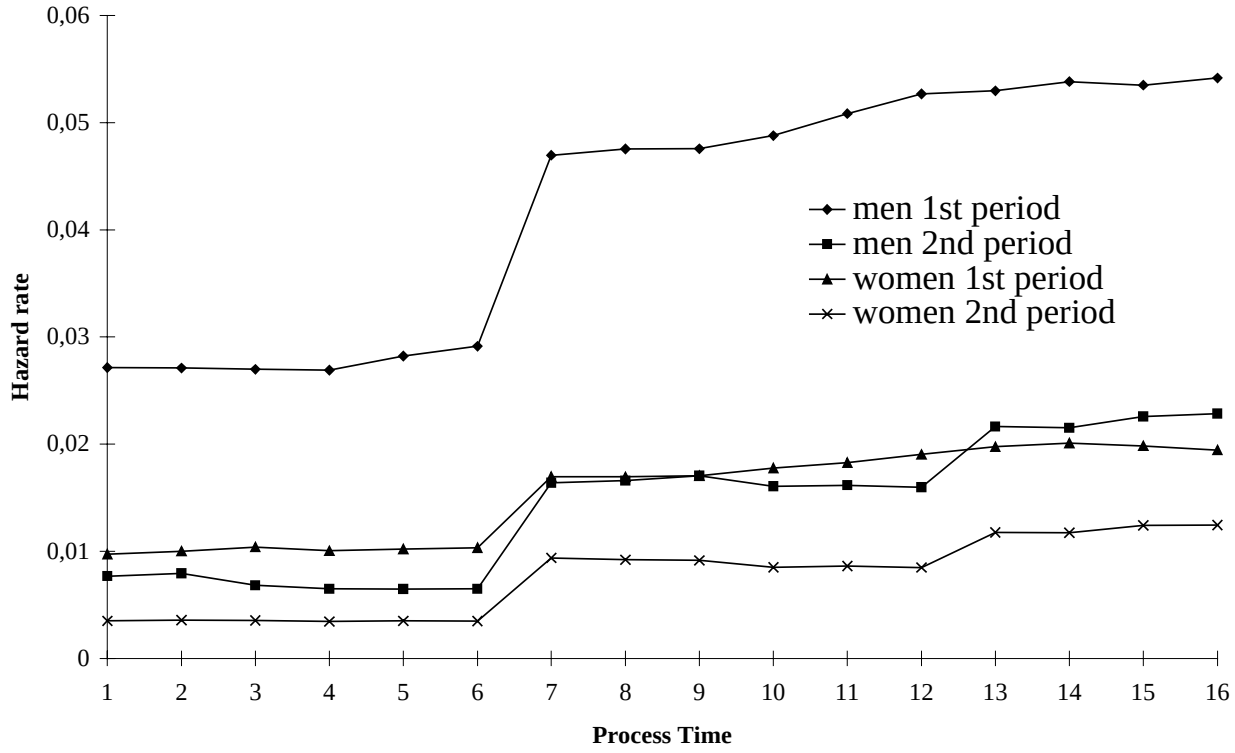
To save space, estimation results from the PWP participation equation are not reported in this paper but are available from the authors upon request. Here, we just summarize the most important estimation results. Regarding the selection of PWP participants according to age or occupational groups no general pattern emerges

[5] We simulated a multinomial logit model with only a constant and three exit states on the basis of 1000 observations and 100 replications. The results are available from the authors upon request.

from these estimates. Our results rather support the hypothesis that virtually all types of workers in east Germany were given equal access to PWP. This conclusion has to be modified slightly regarding highly skilled workers who, *ceteris paribus*, have better chances of getting into public works than people from other occupational groups (the effects were only significant at the 10 percent level, however). Except for men in the first period, people from east Berlin have higher chances of receiving a placement in a PWP than people from other states.

As can be seen from Figure 2, most unemployed people who are selected into a PWP in east Germany join the program after their sixth month in unemployment. Hence, these programs were targeted to some extent on the long–term unemployed, although this effect became less pronounced in the second subperiod. The figure also shows that, for both men and women, the average hazard rate is higher in the first period, which mainly reflects the subsequent overall increasing number of unemployed people. In the first period, men were far more likely to get into PWP than women. The political wish to support more women through public works, however, markedly reduced the gender difference in the hazard rate from unemployment into PWP in the second period. This resulted in women's participation in PWP being more in line with their high share in overall unemployment. Whether this has also resulted in improved re–employment chances in regular jobs for females will be investigated in the following section.

Figure 2—Hazard rates from unemployment into PWP



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

4.3 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. However, the income variables were always included because we are especially interested in the quantitative importance of the hypothesized disincentive effects of, respectively, the level of unemployment benefits and earnings in PWP relative to expected earnings in regular employment. 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 relative to the number of available observations.

Figure 3—Hazard rates from unemployment and PWP into stable employment

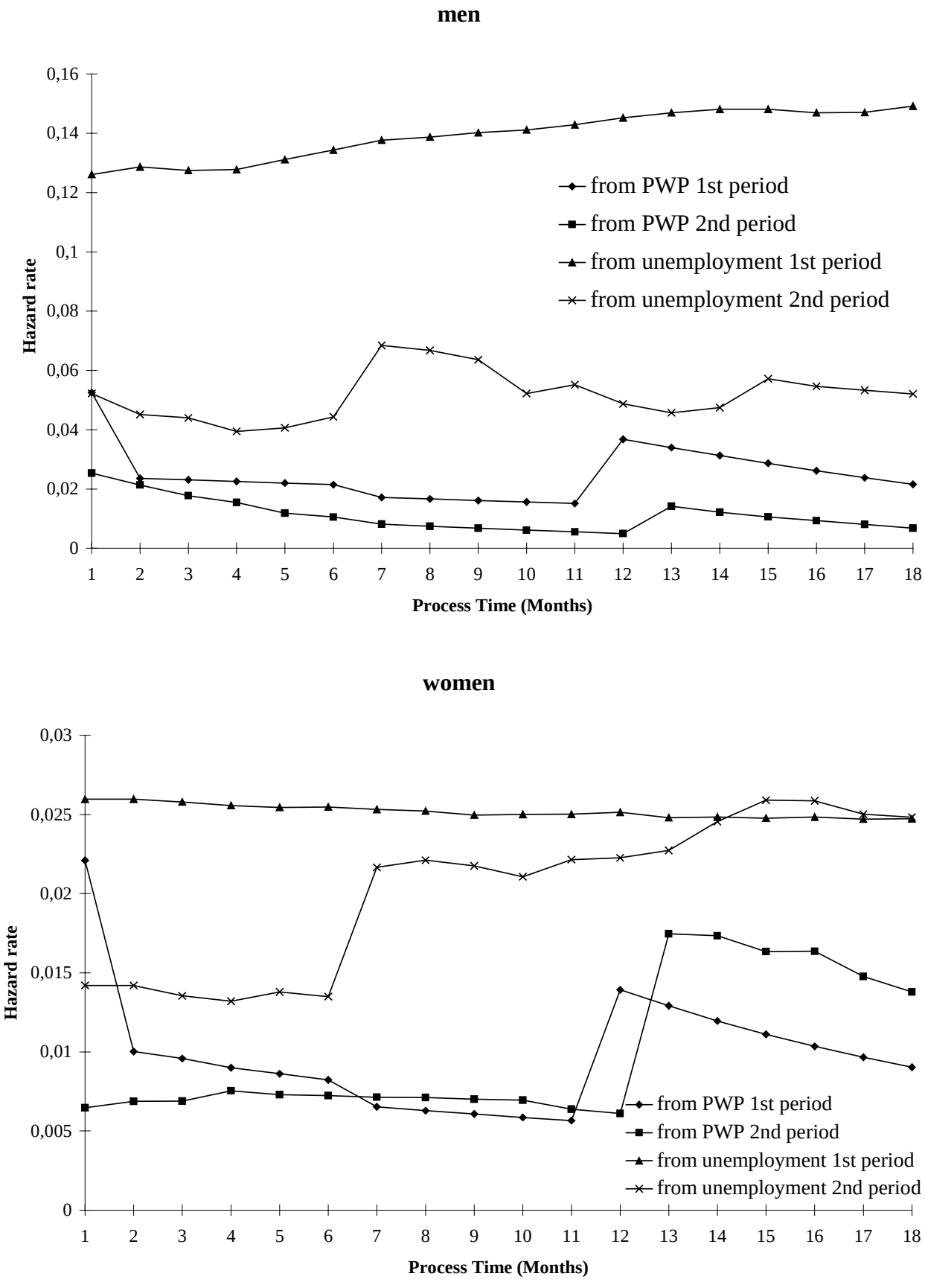
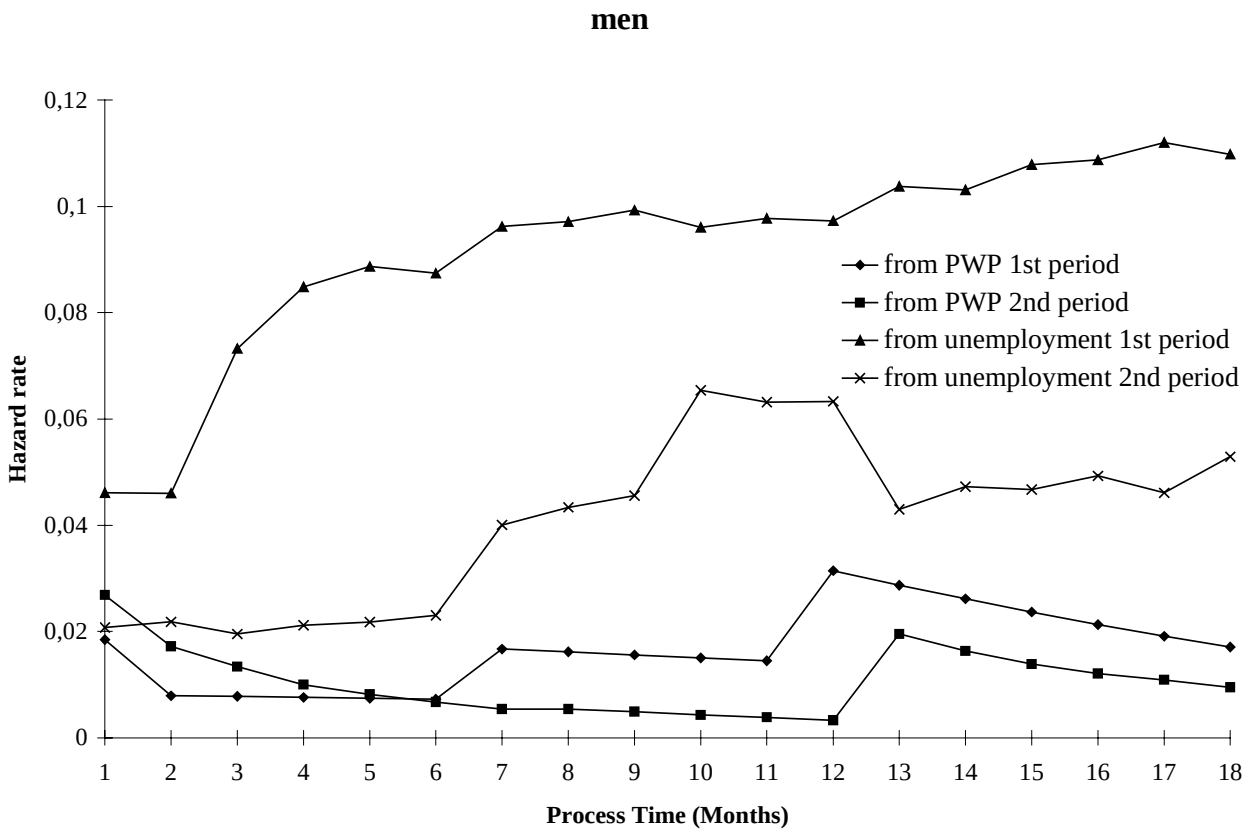
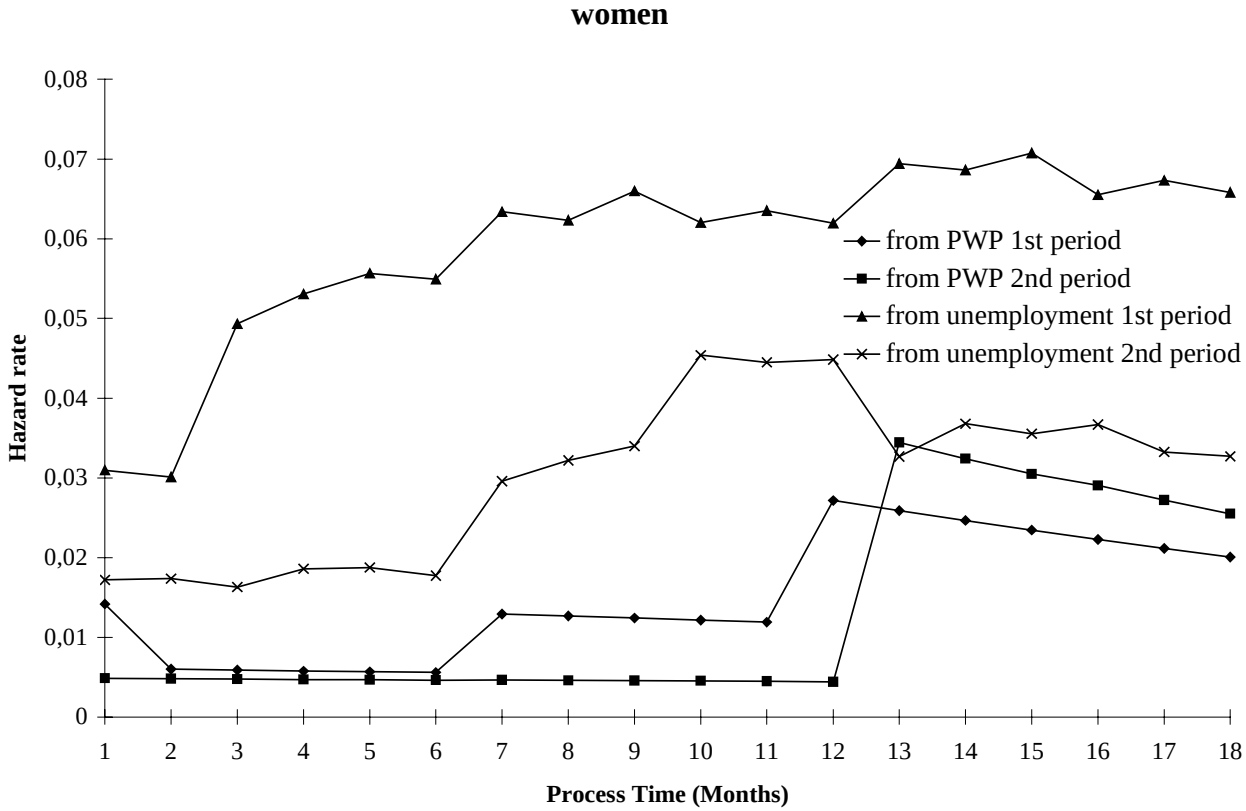


Figure 4—Hazard rates from unemployment and PWP into non–employment





In the following, we discuss the effects of participation in PWP on the probabilities to find stable employment or to become non–employed subsequently to the PWP. Because of the small number of observations of exits into unstable employment (*cf.* Table 1), we prefer not to interpret the results referring to this state. We first present results concerning the short–run employment effects of being placed in a PWP relative to remaining unemployed, before we look at the employment effects of public works from a somewhat different perspective on the basis of cumulated transition probabilities.

Short–Run Effects

Public works programs are typically offered for a period of up to 12 months. However, as mentioned in section 2, a large share of all public works spells end prematurely. This indicates that PWP participants are already searching for regular employment long before the expected end of the program looms. It, therefore, seems of interest to investigate whether a participant's re–employment prospects already improve during the expected duration of a PWP relative to those of an unemployed non–participant, i.e., to look at the short–run employment effects of PWP. Following Steiner and Kraus (1995), we interpret the difference in the hazard rates from public works and unemployment into regular employment as the short–run effect of PWP. However, in contrast to these authors we distinguish between stable and unstable employment as defined above. Given that our controls for observed and unobserved characteristics effectively remove all differences other than participation in PWP between the two groups, the difference in the hazard rates between the group of participants and the simulated hazard rate had this group stayed unemployed can be interpreted as the causal short–run employment effect of public works.

Hazard rates from unemployment and PWP into stable employment for males and females and for the two subperiods are plotted in Figure 3; these are evaluated at the respective subsample means. For men the plots show that the likelihood of finding a regular job is higher when unemployed than when participating in a public works program. This is true for both periods, but in the second subperiod the difference between the two hazard rates is much smaller than in the first period. This change is due to the dramatic drop in the hazard rate from unemployment between the first and second period, whereas the hazard rate from PWP changed little between the two periods. Hazard rates from unemployment exceed those from PWP throughout the duration of the respective spell, and there is only a very small increase in the PWP hazard after the 12th month when these programs normally expire.

Evaluated at sample means, female hazard rates are generally at a much lower level than those for males at their respective sample means. Unemployed women have a somewhat higher hazard rate into stable employment than those participating in a PWP. However, taking into account the generally low level of the estimated

hazards, this difference seems negligible for both periods. In relative terms, there is a marked increase in the female PWP hazard rate after the 12th month, but the quantitative effect of this change on the re–employment probability is small. Like for men, even for long durations the female PWP hazard rate never obtains the (low) level of the respective hazard rate from unemployment into regular employment.

These rather negative results regarding the effectiveness of PWP are somewhat modified if the effect of public works on the hazard rate into non–employment is taken into account. Even if PWP were ineffective in getting people directly back to regular employment, they still may have positive effects if they keep participants searching for work. As Figure 4 shows, participants in public works are indeed less likely to leave the labor force than people on the dole. Although this may give credence to the mentioned hypothesis, another plausible explanation for this observation is that participation in public works renews the entitlement to unemployment benefits and thus creates strong incentives to stay on the register longer than non–participants. Hence, it seems difficult to evaluate the efficiency of PWP on the basis of the participants' lower hazard rate into non–employment.

The hypothesis that the assumed high level of earnings in public works relative to expected earnings in a regular job create disincentive effects to take up such jobs is not supported by our estimation results. As Table A3 shows, the income replacement ratio is always insignificant, except for the estimates referring to women in the first period where it just obtains the 10% significance level. Although this may be related to the instrumenting of the expected earnings variable, the point coefficient estimates of the income replacement ratio also imply relatively small effects on the PWP hazard rates. Likewise, the income variables are never statistically significant in the unemployment hazard rate model. Hence, the hypothesis that the level of the income replacement ratio has a quantitiatively important impact on individual re–employment probabilities is not supported by our estimation results.

Cumulated Transition Probabilities

An alternative way to look at the effectiveness of PWP from a somewhat different perspective is to compare the cumulated transition probabilities into stable employment of participants in PWP and the comparison group of unemployed non–participants over a certain period. We choose a period of twelve months to take into account the fact that most PWP are initially expected to last no longer and that a large fraction of them ends prematurely. Hence, we define the employment effect of public works as the difference of the cumulated transition probabilities (*ctp*) from PWP and unemployment into stable employment within the first 12 months of the respective spell.

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

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

and

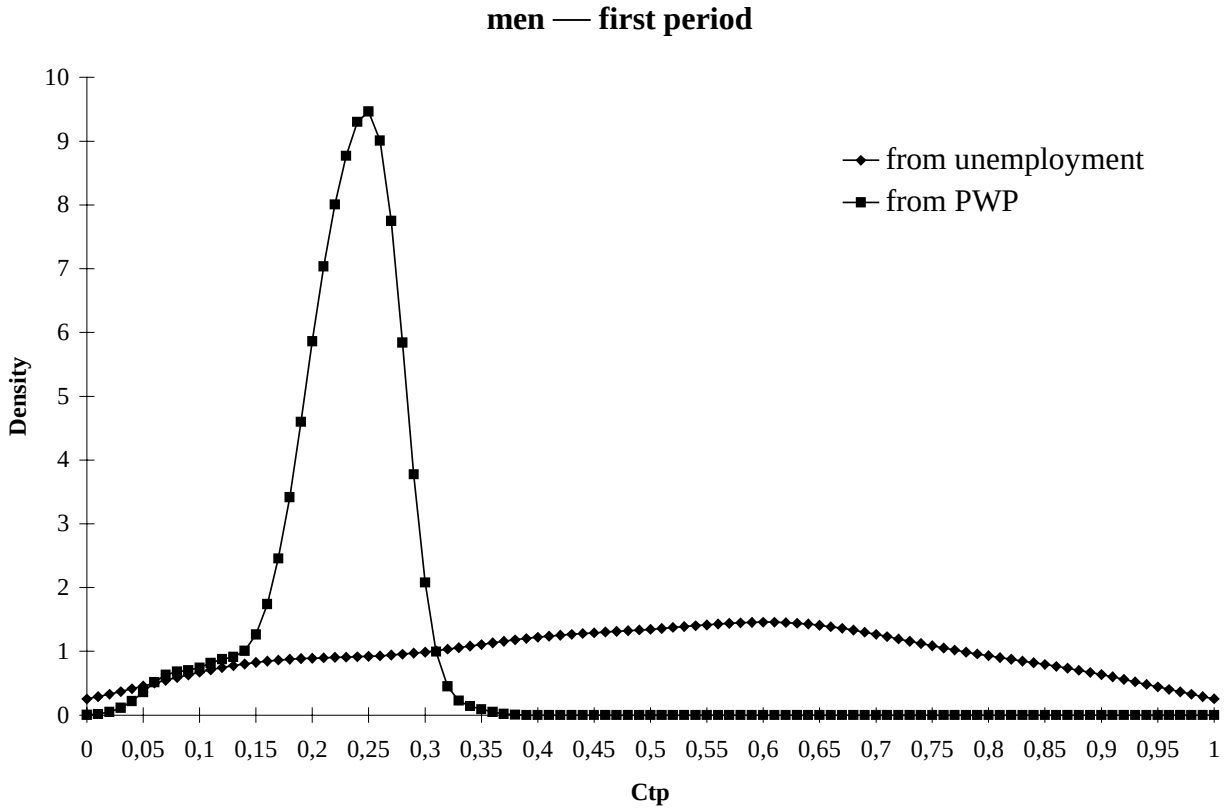
$$\lambda_{ij}\left(t\middle|x_i\left(t_i\right)\right) = \frac{\sum_{m=1}^{M}\Pr\left(\varepsilon_i^m\right)\times\lambda_{ij}\left(t_i\middle|x_i\left(t_i\right),\varepsilon_i^m\right)\times\prod_{\tau=1}^{t-1}\left(1-\lambda_i\left(\tau\middle|x_i(\tau),\varepsilon_i^m\right)\right)}{S_i\left(t-1\middle|x_i(1)\ldots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

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 unemployment (in PWP) 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 PWP or unemployment spell. The 12–months' *ctp* for the transition into unstable employment and non–employment have an analogous interpretation. 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 PWP participants into the outcome models for the two groups. This gives the 12–months' *ctp* for the PWP participants had they not been on such a program.

Cumulated transition probabilities into stable employment for men and women in the two subperiods are plotted in Figure 6. The graphs for the first period show that the mass of the distribution of the 12–months' *ctp* from PWP for men is concentrated on the support [0.15, 0.3], i.e., the probability of regaining a regular job within 12 months after entering public works lies between 15 and 30 percent for most participants. There are hardly any PWP participants whose cumulated re–employment probability exceeds 30 percent. In contrast, in this period re–employment probabilities for unemployed non–participants were distributed rather evenly over the whole support with some thinning–out at the lower and upper ends of the distribution. For women, the difference between the distribution of the 12–months' *ctp* from PWP and unemployment is less pronounced with the mass of the distribution being concentrated on the supports [0, 0.15] and [0, 0.35], respectively. In the second period, there is some convergence in the ctp from PWP and from unemployment for both men and women, i.e. the re–employment chances in regular jobs for the unemployed non–participants have deteriorated to a greater extent than for PWP participants. For men, the leftward–shift of the PWP *ctp* distribution is accompanied by a larger variance, whereas the dispersion in the female distribution, if anything, has become somewhat smaller.

So far we have seen that, on average, the public works participants would have been better off in terms of re–employment chances by not joining a public works program and just staying unemployed. In order to see whether there are certain subgroups who do benefit from public works programs, we plot the conditional distributions of the *ctps* of PWP participants given their *ctp* out of unemployment in the three–dimensional graphs of Figure 6. The graphs have the following interpretation. Take a point on the unemployment axis, say 0.2. If you slice the mountain at that point parallel to the public works axis, you get the distribution of the *ctp* into stable employment after public works for the unemployed who would have had a *ctp* of 0.2 without public works. If the mountain were a diagonal slice from the north–west to the south–east of the cube, then public works would have no effect whatsoever. As can be seen from all four graphs, most public works participants have a very low *ctp* irrespective of their *ctp* from unemployment. Except for men with a very low *ctp* from unemployment, there are hardly any people who benefit from public works. However, even for them the *ctp* from public works is still very low.

Figure 5—Cumulated transition probability (*ctp*) from unemployment and from PWP into stable employment (Kernel density estimates)



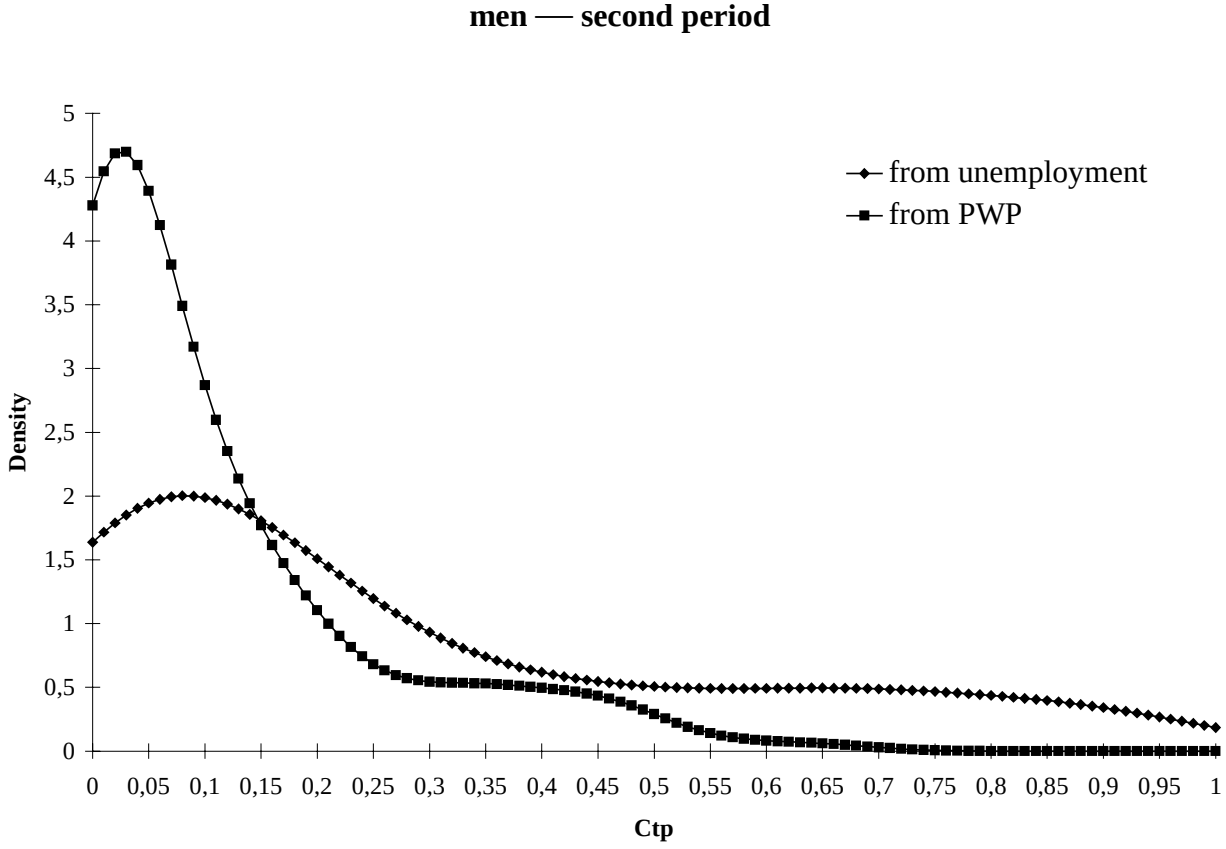
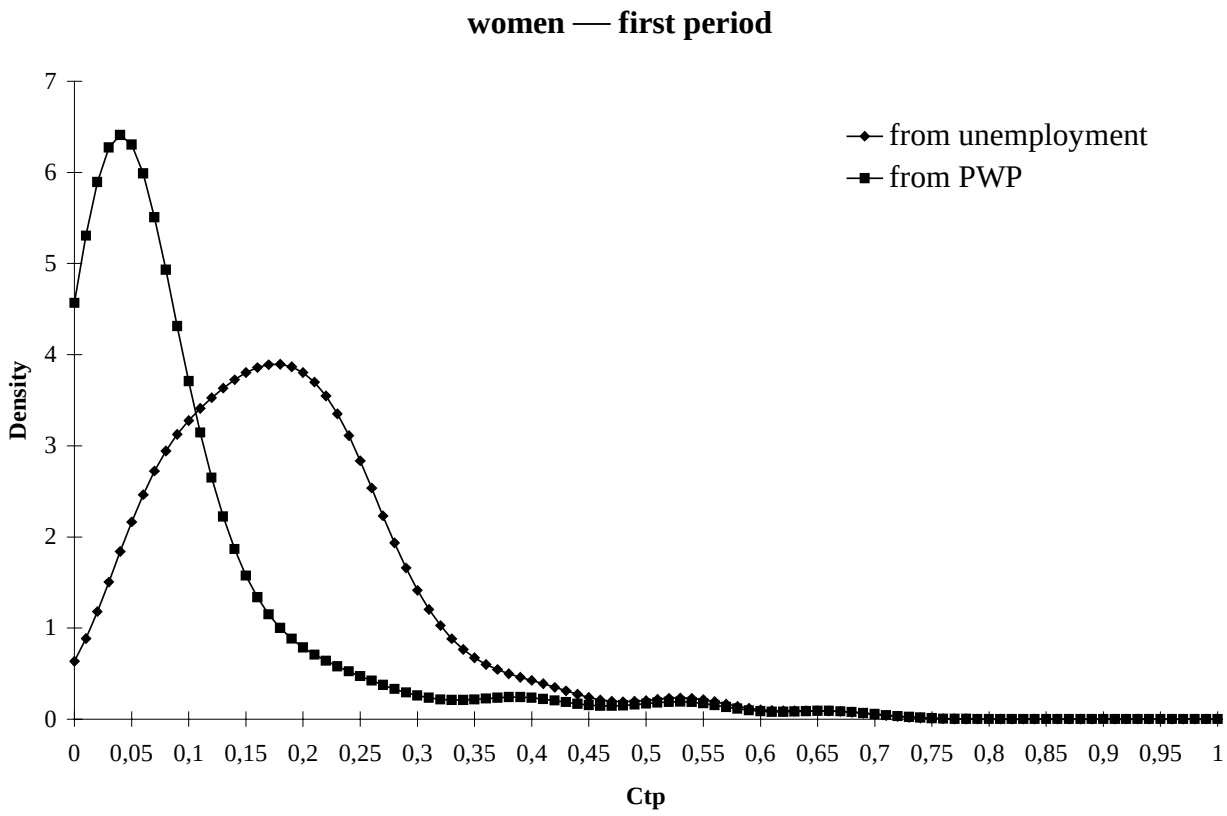


Figure 5 (cont.)



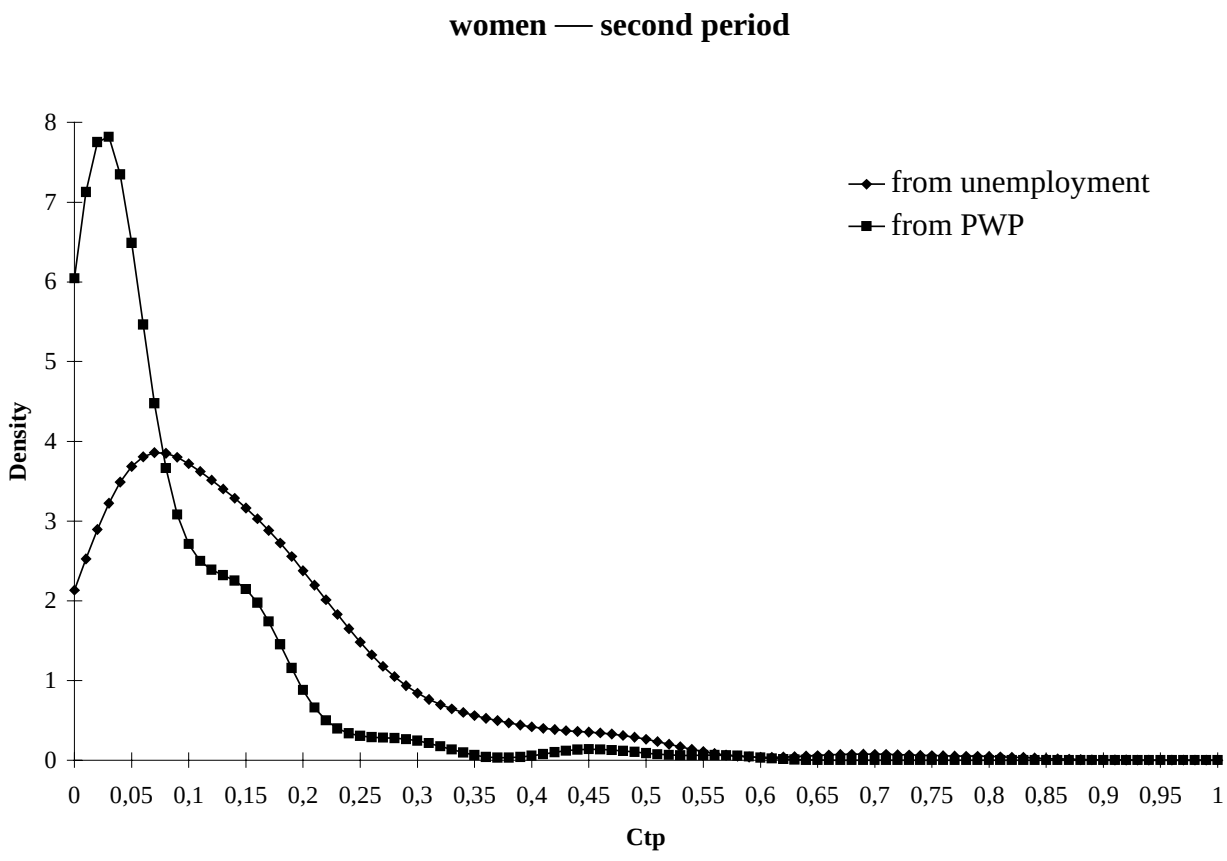
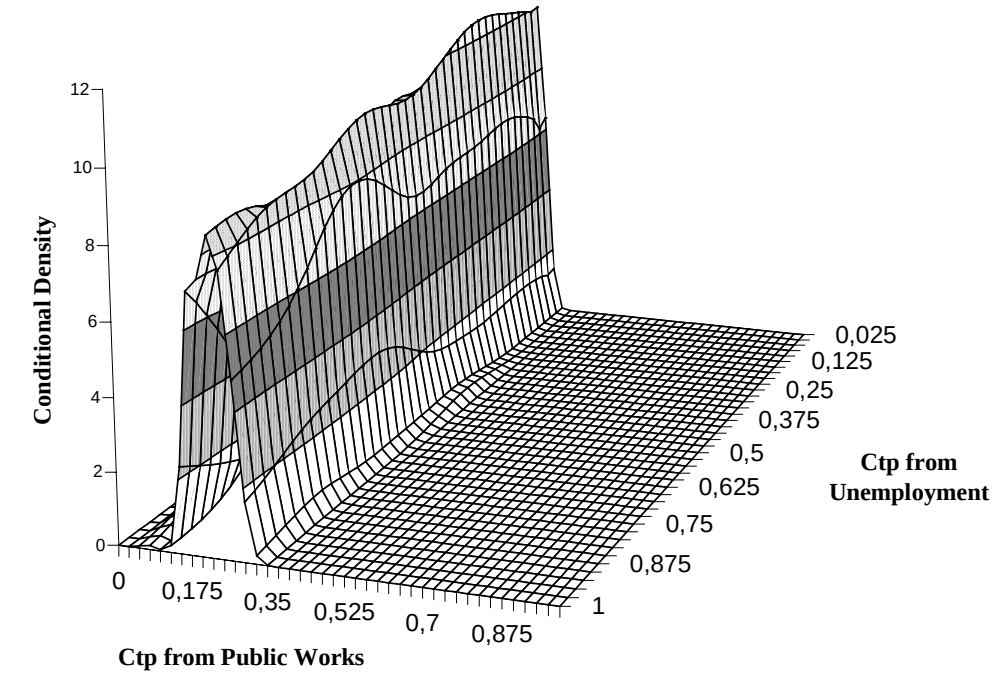


Figure 6—Distributions of the cumulated transition probability (*ctp*) into stable employment from PWP conditional on ctp from unemployment (Kernel density estimates)

men — first period



men — second period

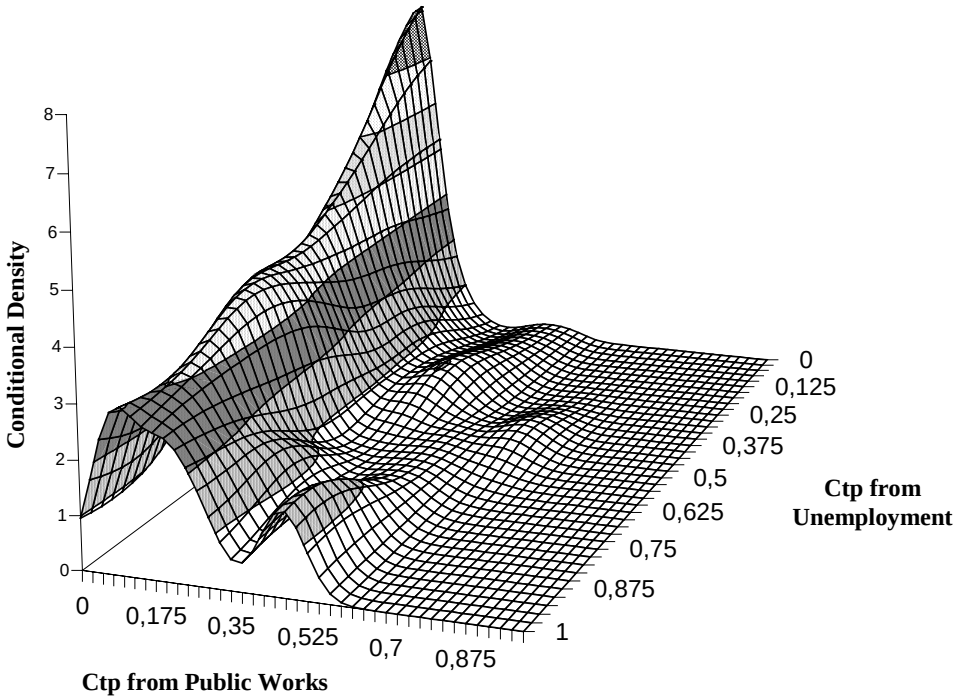
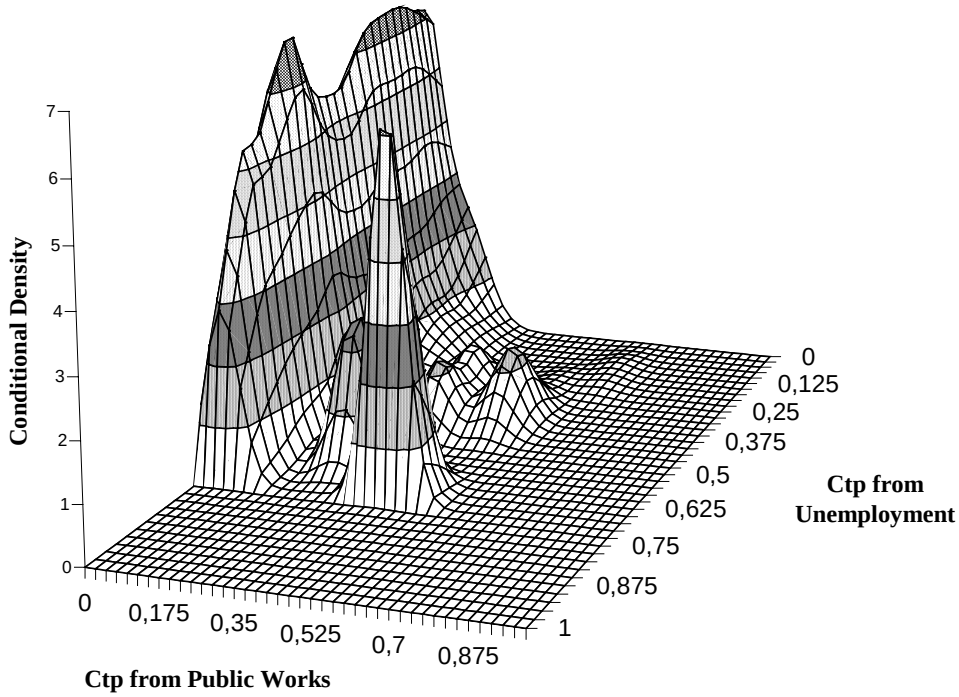
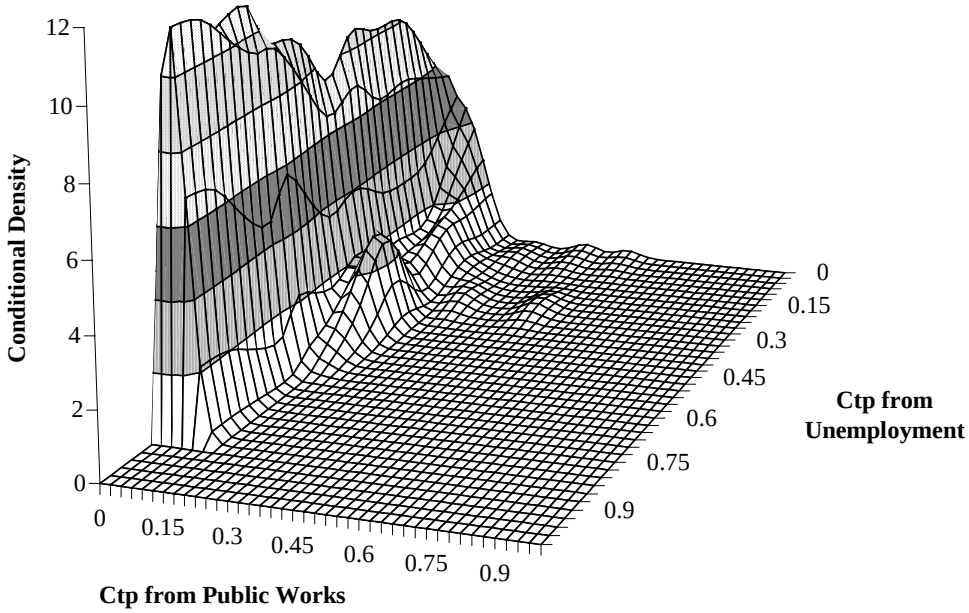


Figure 6 (cont.)

women — first period



women — second period



5 Summary and Conclusions

Following the microeconometric approach to the evaluation of the employment effects of labor market programs, we have estimated hazard rate models of re–employment probabilities where we distinguish between stable and unstable employment in regular jobs subsequent to participation in public work programs (PWP). The employment effects of these programs 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 allowed for unobserved heterogeneity in both the outcome and participation equations. Although unobserved heterogeneity in the outcome models may lead to some correlation between the error terms in the participation and outcome equations, we have shown that it will be of small order. 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.

Although we could not detect any significant disincentive effects to take up regular jobs due to an allegedly high level of relative earnings in public works, our results on the effectiveness of public works in bringing people back into stable employment are not encouraging. Indeed, we have found that public works participants are, on average, worse off than unemployed people who do not join a public works program, and this holds for both males and females and for the whole time period analyzed. A possible explanation for this result is that PWP participants search less intensively for a regular job while on such a program than unemployed non-participants. Furthermore, PWP also seem to have no special targeting focus on groups with special labor market problems. Our results rather support the hypothesis that, except for skilled workers and those living in east Berlin who had somewhat better chances of getting into public works, virtually all types of workers in east Germany were given equal access to these programs. This is clearly not compatible with the officially held view that PWP are aimed at disadvantaged groups in the labor market.

For proponents of public works programs these results are even more unpleasant than those obtained in previous studies by Steiner and Kraus (1995) and Hübler (1997a) who reached the conclusion that public works have no effect on individual re–employment probabilities in regular jobs. Thus, empirical research casts serious doubts on both the effectiveness and the equity aspects of public works programs in east Germany. Therefore, policy makers may rethink the role of public works programs as an active labor market policy tool. As recent empirical research for east Germany has shown (for a summary see Kraus, Puhani, and Steiner, 1997), training programs seem to increase participants' re–employment prospects relative to unemployed job search. Hence, taking into account the substantial net fiscal costs

per participant in public works, a re–allocation of expenditures for "active" labor market policy rather than overall reductions could increase its effectiveness.

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Appendix

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

In section 3.1, 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

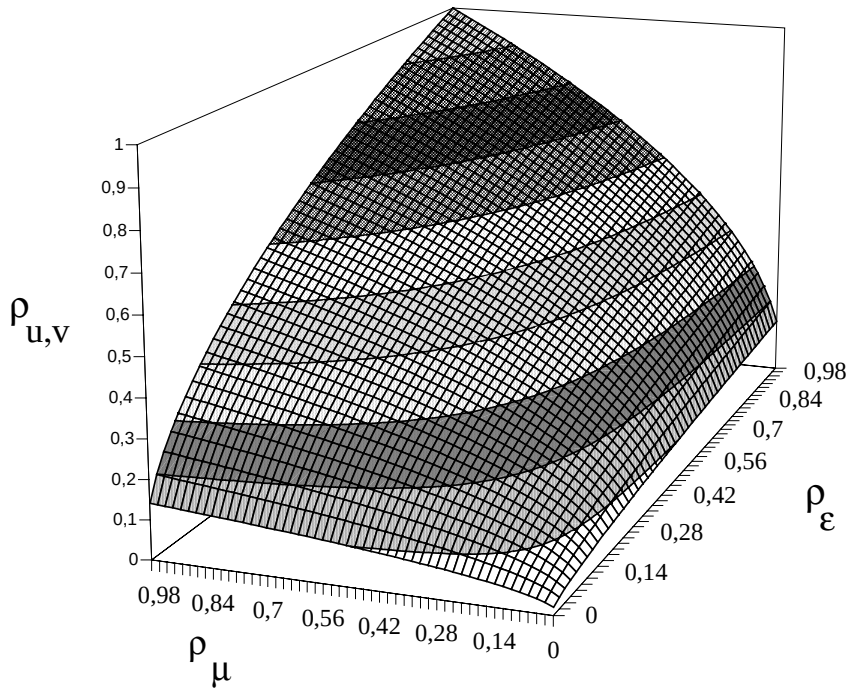
$$\mathbf{Corr}_{u,v} = \left[\begin{array}{cccc|cccc} 1 & \rho_\varepsilon & \cdots & \rho_\varepsilon & & & & \\ \rho_\varepsilon & 1 & & \rho_\varepsilon & & & \rho_{u,v} & \\ \vdots & & \ddots & \vdots & & & & \\ \rho_\varepsilon & \rho_\varepsilon & \cdots & 1 & & & & \\ \hline & & & & 1 & \rho_\mu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

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.

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



Source: own calculations.

Table A1—Descriptive statistics for the public works model

Variable	Men 1st Period	Men 2nd Period	Women 1st Period	Women 2nd Period
age<= 25	0.13	0.07	0.16	0.05
25 < age <= 35	0.23	0.17	0.28	0.29
age > 50	0.25	0.34	0.26	0.27
married	0.66	0.69	0.73	0.75
with children	0.56	0.41	0.59	0.72
no vocational training	0.06	0.05	0.08	0.13
semi–skilled worker	0.12	0.08	0.03	0.04
master craftsman / technician	0.09	0.11	0.05	0.05
vocational college	0.09	0.12	0.29	0.18
university degree	0.08	0.17	0.09	0.12
20 – 200 employees	0.39	0.41	0.37	0.33
200– 2000 employees	0.23	0.21	0.16	0.15
more than 2000 employees	0.05	0.05	0.06	0.03
primary sector	0.23	0.19	0.15	0.16
construction industry	0.15	0.15	0.01	0.02
tertiary sector	0.23	0.32	0.47	0.56
public employee	0.37	0.41	0.52	0.53
training out of the job	0.12	0.14	0.21	0.20
Mecklenburg – Vorpommern	0.15	0.10	0.13	0.13
Brandenburg	0.17	0.15	0.13	0.13
Sachsen – Anhalt	0.17	0.24	0.16	0.17
Thüringen	0.19	0.17	0.19	0.22
Berlin (East)	0.01	0.08	0.07	0.09
previously in short–time work	0.23	0.21	0.15	0.06
previously in unemployment	0.26	0.31	0.25	0.38
previously out of the labor force	0.02	0.14	0.15	0.21
previous duration in short–time work	8.19	9.25	8.37	10.36
previous duration in employment	13.52	13.14	16.15	13.03
previous duration in unemployment	4.17	7.61	5.22	10.66
previous duration out of labor force	5.51	5.69	8.71	7.52

continued ./.

Table A1—Descriptive statistics for the public works model (ctd.)

Variable	Men 1st Period	Men 2nd Period	Women 1st Period	Women 2nd Period
entry in the first quarter of a year	0.22	0.19	0.18	0.17
entry in the second quarter of a year	0.23	0.21	0.33	0.20
entry in the third quarter of a year	0.37	0.32	0.34	0.35
current quarter is the first of the year	0.19	0.09	0.22	0.06
current quarter is the second of the year	0.25	0.12	0.37	0.08
current quarter is the third of the year	0.18	0.22	0.20	0.17
current year is 1992	0.39	0.25	0.59	0.17
unemployment benefits / expected earnings in employment	1.04	0.95	1.00	0.95
net earnings in public works	1034.17	1209.86	1028.84	1120.09
unemployment rate	7.14	9.01	14.87	19.62
month in process time, first period				
month 2 – 6	0.45	0.00	0.24	0.00
month 7 – 11	0.18	0.00	0.28	0.00
month >= 12	0.18	0.00	0.25	0.00
month in progress time, second period				
month 13 – 18	0.00	0.26	0.00	0.24
month 19 – 23	0.00	0.11	0.00	0.14
month >= 24	0	0.14	0.00	0.14
mean duration	6.12	13.86	7.19	14.30
(subsample size / sample size) × 100	22.70	26.60	15.32	35.38

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 Lower Pommerania	0.14	0.13	0.14	0.12
Brandenburg	0.18	0.16	0.14	0.16
Anhalt Saxony	0.18	0.16	0.16	0.17
Thuringia	0.17	0.17	0.18	0.16
Berlin (East)	0.06	0.11	0.08	0.05
previously in short–time working	0.18	0.10	0.18	0.15
previously in public works	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 working	10.32	11.37	10.20	13.30
previous duration in employment	12.12	17.29	12.73	18.66
previous duration in public works	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 in employment	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/samplesize) × 100	24.23	12.84	35.55	27.39

Source: LMM, waves 1 – 8; own calculations.

Table A3—Public works model: exit into stable employment and into non–employment

	exit into stable employment		exit into non–employment	
Variable	coeff.	t–value	coeff.	t–value
men, first period				
constant	–2.9978	–5.01	–3.2522	–3.92
public employee			–1.1285	–2.61
missing values in firm–specific variables			1.4835	2.33
net earnings in public works			–0.0013*	–1.71
net earning in PWP / expected income in regular empl.	–0.7748	–1.44		
men, second period				
constant	–2.6061*	–1.81	–1.4374	–0.77
semi–skilled worker			2.2675	4.75
20 – 200 employees			–1.3172	–2.03
construction industry	2.7100	4.88		
tertiary sector	1.2644	2.22		
public employee	–1.4532	–2.99		
missing values in firm–specific variables			2.3207	4.05
Mecklenburg – Vorpommern			2.9793	2.47
Thüringen			2.0691	3.20
previously in short time work	2.9568	3.52	4.0732	4.11
previously in unemployment	2.3861	2.69		
previous duration in short–time work	–0.2357	–3.70	–0.3664	–4.34
previous duration in unemployment	–0.415*	–1.80		
current quarter is the first of the year	–0.5171	–1.38		
net earnings in PWP			–0.0017	–1.47
net earning in PWP / expected income in regular empl.	0.2979	0.45		
unemployment rate	–0.3581	–2.92	–0.4146	–2.34

continued ./.

Table A3—Public works model: exit into stable employment and non–employment (ctd.)

	exit into stable employment		exit into non–employment	
Variable	coeff.	t–value	coeff.	t–value
women, first period				
constant	–5.8654	–5.71	–5.5199	–6.38
20 – 200 employees	1.027	2.24		
missing values in the firm–specific variables	3.3045	4.72	3.7552	5.01
Brandenburg	0.6115	1.06		
previously in short–time work	1.2923*	1.96		
previously in unemployment			–2.0554	–2.29
previous duration in employment	0.0922	4.57		
previous duration in unemployment			0.1103	1.45
previous duration out of the labor force	0.141	2.45	0.1077	2.86
entry in the second quarter of a year	1.0865	2.24	1.1475*	1.72
entry in the third quarter of a year			0.9157	1.42
income / expected income	–1.1824*	–1.67		
income			–0.0005	–0.81
women, second period				
constant	–8.1386	–7.97	–7.0502	–7.94
age > 50			1.4235	2.52
married	1.4989	2.83	0.8861*	1.90
with children	0.4001	2.45	0.6244	2.85
vocational college	1.1485	2.90		
Brandenburg	1.9258	3.57		
entry in the first quarter of a year	1.5561	3.15		
current quarter is the first of the year	–0.5171	–1.38		
income / expected income	–0.2554	–0.29		
income			–0.0007	–1.04
month in process time, first period				
month 2 – 6	–0.82	–3.29	–0.8706	–2.64
month 7 – 11	–1.0109	–2.98		
month > 11			0.9071	2.31
month in process time, second period				
month 13 – 18	1.2879	3.26	2.1752	4.97
month 19 – 24	1.5976	4.48	2.1171	4.39
month >24	3.8986	6.26	3.7337	4.26

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 employment and into non–employment

	exit into stable employment		exit into non–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 in employment	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 employment and non–employment (ctd.)

	exit into stable employment		exit into non–employment	
Variable	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 public works			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 public works	–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 benefits			0.0003	0.75
unemployment rate	–0.3138	–3.56		

continued ./.

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

	exit into stable employment		exit into non–employment	
Variable	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 employment and non–employment (ctd.)

	exit into stable employment		exit into non–employment	
Variable	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 work	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 in employment	–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.