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**Job-search Incentives From Labour Market  
Programs - an Empirical Analysis**

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# Job-search Incentives From Labour Market Programs - an Empirical Analysis

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## Abstract

In this paper we examine whether the prospect of compulsory programme participation motivates individuals to leave the unemployment insurance (UI) system prior to participation. We analyze data from the Danish labour market. Here a series of reforms have enforced program participation and gradually restricted the duration of unemployment before individuals must enroll into programmes. However, there is substantial heterogeneity in enrollment probabilities. If individuals want to avoid participation and observe the heterogeneity in participation, this will also affect their search behaviour. We estimate a model for anticipatory effects of participation, allowing for heterogeneity, on search behaviour and find large significant effects from anticipation of enrollment on the exit probability out of unemployment.

*Keywords:* Active Labour Market Measures, Hazard rates, unobserved heterogeneity.

JEL Classifications: C41, I21, J64

## 1 Introduction

In this paper we examine whether the prospect of compulsory labor market program (LMP) participation motivates individuals to leave the unemployment insurance (UI) system prior to participation.

As a response to the high and sustained unemployment in the end of the 1980s and beginning of the 1990s many countries invoked substantial labour market reforms in that period. Most countries expanded their use of

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LMPs considerably<sup>1</sup> (Gerfin and Lechner, 2002). Furthermore, some countries made UI benefit payments conditional on participation in any offered LMP. This principle of compulsory LMP participation after some pre-defined duration of unemployment was in Europe first introduced by Denmark in 1994 and followed by Great Britain, Switzerland and Sweden (Gerfin and Lechner, 2002). The same principle is also in use in countries such as the US and Australia (Black, 2003; Richardson, 2002).

The purpose of tying benefit payments to LMPs is twofold. First, participation in a LMP may improve individuals' qualifications and reintroduce them to the labor market. Second, the compulsory aspect may provide an new incentive for unemployed workers to look for and return to work (Jackman, 1994; Hansen and Tranæs, 1999). The second effect, which we will denote the "incentive effect", is the topic of this study.

Various empirical studies have found that the prospect of termination or reduction of benefits results in a significant increased incentive for work (Carling et al., 2001; Ham and Rea, 1987; Katz and Meyer, 1990; Meyer, 1990; Rogers, 1998). The prospect of compulsory program participation may result in a similar incentive effect without the side effect of an income drop for individuals who do not find employment. Such compulsory programs may also be a relevant alternative to Earned Income Tax Credits (EITC) programs as introduced in the US and the UK (Eissa and Liebman, 1996; Blundell et al., 2000).

A potential incentive effect from LMP's is highly dependent on the expected timing of enrollment into a LMP. In principle, the exact timing of program participation is dictated by law. However, in reality unemployed

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<sup>1</sup>By labor market programs, we refer to all sorts of programs with the intention of improving the labor market skills of unemployed individuals and reacquaint them with the labour market. Programs can be training programs or subsidized employment.

individuals may have very different risk of enrollment. There are various reasons why this might be the case. Case workers may assess that some individuals will gain less from program participation, or some types of programs may be in limited supply, thereby forcing case workers to select between individuals. Previous studies of the incentive effect have only looked at the timing of LMPs as dictated by law (Geerdsen, 2003; and Black et al., 2003).

In this paper we focus on individuals' actual risk of enrolment in a LMP. We do this by estimating individuals' probability of participating in a LMP as a function of demographics as well as time until LMP enrolment as dictated by law. We apply the predicted probability in a model describing individuals' hazard of leaving UI unemployment. Finally, we also allow for endogeneity in time until LMP enrolment as dictated by law as this depends on the previous employment history.

In order to identify the incentive effect we use Danish register data on individuals' unemployment history supplied by Statistics Denmark. Since 1994 the entitlement period, in which individuals can receive UI benefits without participating in a labor market program, has been shortened. This yields a quasi-experimental set up where the incentive effect of compulsory program participation can be identified without functional form assumptions.

Our results indicate that the compulsory aspect of the Danish LMPs motivates individuals to leave the UI system. The effect seems very strong and in size comparable to effects found in studies of UI systems where individuals are at risk of losing their right to benefits all together (Meyer, 1990; Rogers, 1998). According to the estimation results the hazard out of the UI system increases by up to 100 percent when compulsory program

participation approaches.

The remainder of the paper is organized as the following. Section 2 gives details on the labor market under study, section 3 present a model that account for the intertemporal dynamics of the incentive effect, section 4 presents the data for the study, section 5 introduces an econometric model for the incentive effect and section 6 gives the estimation results for this model and finally section 7 gives some concluding remarks.

## **2 Labor Market Programs and the Labor Market in Denmark**

The Danish UI system is a voluntary system where individuals can insure themselves against the consequences of involuntary unemployment. Approximately 80-90 percent of the Danish workforce are members of the UI system.<sup>2</sup> Individuals who do not have UI is referred to means tested social benefits which in most cases is well below the level of the UI benefits.

The Danish UI period is divided into two sub periods - a "passive" period and an "activation" period<sup>3</sup>. Unemployed individuals first enter the passive period. In this period they are generally left to their own job search. The passive period is followed by the activation period. In this period individuals have to participate in a LMP in order to receive benefits. Rejecting to participate in a LMP will in initially result in a quarantine from the UI system and eventually a dismissal all together.<sup>4</sup>

The passive period was initially set to 4 years and the activation period was set to 3 years. This meant that individuals could stay unemployed and

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<sup>2</sup>First time entitlement to enter the danish UI system requires 12 months of consecutive employment.

<sup>3</sup>This system was introduced in 1994. Before 1994, individuals who were eligible for UI benefits could, when unemployed, receive benefits for up to 9 years.

<sup>4</sup>Individuals who have been dismissed from the UI system have to regain the right to the system in the same way as other individuals without access to the UI system.

receive benefits for up to 7 years. The passive period has been shortened. From mid 1996, individuals who gained or regained the right to a fresh UI period were only entitled to a 2 year passive period. For all other individuals, the passive period was shortened to 3 years in mid 1996 and further to 2 years in 1998. The activation period has had an unchanged duration of 3 years since 1994.

The LMPs offered in the activation period consist of a wide variety of options. The programmes can be divided into the following categories:

- Subsidized employment in a private or public firm
- Labour market training
- Assistance with self-employment

Individuals in both public and private subsidized employment receive the minimum wage set by collective bargaining in the given sector. The working hours for individuals in public subsidized employment are restricted so that the wage income does not surpass the maximum benefit level. Individuals in private subsidized employment can have normal working hours and thereby have an income higher than maximum benefit level. Individuals in training programmes receive income equal to the benefits they received prior to starting in the labour market programme. Between 1994 and 1998 individuals could also receive economic support for self-employment. The support could not surpass the maximum benefit level.

Due to the long durations of the benefits period, individuals only rarely use up all of their benefit months. Most often individuals regain the right to a fresh UI period before they run out of benefits. The eligibility requirement was up to mid 1996 half a year of unsupported employment within a 3 year

period. After mid 1996, the requirement was changed to 1 year of unsupported employment within a 3 year period. If individuals have not regained the right to a fresh UI period between two unemployment spells, the previous spell is included in individuals' seniority in the UI period. This means that two individuals who begin an unemployment spell at the same time can very well have different seniority in the UI period and hence (by law) different risk of being enrolled in a LMP. In the following we will denote this as "passive period entitlement" (PPE) describing how many months individuals have left until entering the activation period when their unemployment spell commence.

### **3 A Model for Effects of Active Measures on Search**

In this section we propose a model for interpreting the effect of compulsory enrollment into LMPs. The model analyses the search behavior of unemployed possibly looking for employment and facing potential enrollment into a LMP. The purpose of the model is to characterize the situations in which we should expect an incentive effect from compulsory LMPs.

The model covers three time-periods. A pre-enrollment period, a period of potential participation in LMP, and a post enrollment period. In period one, the agent in the model is unemployed. In period two there are three possible states, continued unemployment, enrollment into LMP or employment. In period three there is only employment and unemployment. In period one and two the unemployed must decide on the amount of job-search. Job-search affects the probability of employment in the following period. Job-search is possible in all three states.

Finally, given the amount of job-search, there are state specific transition probabilities of moving between states in period two (employment, unem-

ployment and LMP) and period three (employment and unemployment). The agent has a state specific utility function, which also depends on the amount of job-search, except for period three where there is no job-search.

There are two immediate consequences of being in an LMP in the model. One is that the contemporaneous utility in period two might differ from that of being unemployed e.g. if the unemployed has a preference of doing the type of activity associated with active labour market measures or that it might be considered unpleasant to be forced to spend time in an mandatory measure compared to be unemployed. The other is, that transition probabilities of moving into employment in period three might differ between unemployment and LMP in period two because of some kind of stigmatization effect from being enrolled into active measures. Formerly our model is:

$$\begin{aligned} V^1(\alpha_1, \boldsymbol{\alpha}_2) &= u_u(\alpha_1) + \sum_{j=u,a,e} p_{uj}^{12}(\alpha_1) \left( u_j(\alpha_2^j) + \sum_{l=u,e} p_{jl}^{23}(\alpha_2^j) u_l \right) \\ &= u_u(\alpha_1) + \sum_{j=u,a,e} p_{uj}^{12}(\alpha_1) \tilde{V}_j(\alpha_2^j) \end{aligned}$$

where  $\tilde{V}_j(\alpha_2^j) = u_j(\alpha_2^j) + \sum_{l=u,e} p_{jl}^{23}(\alpha_2^j) u_l$  and  $\alpha_t, t = 1, 2$  is the level of job-search in period  $t$ ,  $u_j(\alpha), j = a, u, e$  is the utility of occupying state unemployment ( $u$ ), activation ( $a$ ) or employment ( $e$ ) respectively in period one and two. We assume utility in all states to be negatively related to the level of job-search in each state and also in a decreasing manner, i.e.  $u'_j(\alpha), u''_j(\alpha) < 0, u, j = a, u, e$ . We allow for the possibility of state specific search levels,  $\boldsymbol{\alpha}_2 = \alpha_2^e, \alpha_2^u, \alpha_2^a$ , in period two. As there is no job search in period three, the utility in period three,  $u_j, j = u, e$  does not depend on job-search.  $p_{jl}^{t,t+1}(\alpha), t = 1, 2$  are the transition probabilities from state  $j$  to  $l$  between period  $t$  and  $t + 1$ . The transition probability from unemployment and LMP to employment depends on job search activity by:  $p_{je} = p_j(\alpha), j =$



$u, a$ , with  $p'(\alpha) > 0, p''(\alpha) < 0$ .<sup>5</sup> Furthermore, given non-employment in period two, the probability of being enrolled into a LMP in this period is  $p_a$ . Hence, the probability of being unemployed in period two is the residual probability from not being enrolled in a LMP, conditional of being non-employed:  $p_{uu}^{12} = (1 - p_a)(1 - p(\alpha))$ .

The model is strictly recursive, with optimal decisions on search levels in period two,  $\hat{\alpha}_2 = \hat{\alpha}_2^e, \hat{\alpha}_2^u, \hat{\alpha}_2^a$ , which solves  $\tilde{V}'_j(\alpha_2^j) = 0, j = e, u, a$ , independent of optimal decisions in period one and  $p_a$ . Now differentiate the period one value function wrt search in period one given optimal search activity in period two:

$$\begin{aligned} \frac{\partial V^1(\alpha_1, \alpha_2)}{\partial \alpha_1} \Big|_{\alpha_2 = \hat{\alpha}_2} &= u'_u(\alpha_1) + \sum_{j=u,a,e} p_{uj}^{12}(\alpha_1) \tilde{V}_j(\alpha_2^j) \\ &= u'_u(\alpha_1) + p'(\alpha_1) \left[ \tilde{V}_e(\hat{\alpha}_2^e) + p_a \left( \tilde{V}_u(\hat{\alpha}_2^u) - \tilde{V}_a(\hat{\alpha}_2^a) \right) + \tilde{V}_u(\hat{\alpha}_2^u) \right] \end{aligned} \quad (1)$$

with  $p'_{uj}(2) = \partial p_{uj}(2) / \partial \alpha; j = e, a, u$ . On equating (1) to zero and solving for  $\alpha$ , we get the F.O.C. for the optimal search level as:

$$\frac{u'_u(\hat{\alpha}_1)}{p'(\hat{\alpha}_1)} = - \left[ \tilde{V}_e(\hat{\alpha}_2^e) + p_a \left( \tilde{V}_u(\hat{\alpha}_2^u) - \tilde{V}_a(\hat{\alpha}_2^a) \right) - \tilde{V}_u(\hat{\alpha}_2^u) \right] \quad (2)$$

When

$$\tilde{V}_e(\hat{\alpha}_2^e) > \tilde{V}_u(\hat{\alpha}_2^u) - p_a \left( \tilde{V}_u(\hat{\alpha}_2^u) - \tilde{V}_a(\hat{\alpha}_2^a) \right)$$

or when

$$-u''_u(\hat{\alpha}_1) > p''(\hat{\alpha}_1) \left[ \tilde{V}_e(\hat{\alpha}_2^e) + p_a \left( \tilde{V}_u(\hat{\alpha}_2^u) - \tilde{V}_a(\hat{\alpha}_2^a) \right) + \tilde{V}_u(\hat{\alpha}_2^u) \right]$$

$\hat{\alpha}_1$  defines an maximum and otherwise a minimum.

When  $\hat{\alpha}_1$  is a maximum, increasing values of  $p_a$  leads to increasing values of  $\hat{\alpha}_1$  (as the left hand side of (2) is decreasing in  $\alpha_1$ ) when ever

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<sup>5</sup>We could think of  $p_j(\alpha)$  being the probability of being offered a job from a degenerated wage distribution with wage equal to  $u_e$  adjusted for any perceived inconveniences from employment.

$\tilde{V}_u(\hat{\alpha}_2^u) > \tilde{V}_a(\hat{\alpha}_2^a)$ . Hence, whenever unemployment in period two is preferred to LMP, increasing enrollment in LMP will yield increased search behavior in period one. As mentioned above we may have  $\tilde{V}_u(\hat{\alpha}_2^u) > \tilde{V}_a(\hat{\alpha}_2^a)$  for several reasons. One is that  $u_u(\hat{\alpha}_2^u) > u_a(\hat{\alpha}_2^a)$ , disutility from LMP, given the optimal search levels in period two for the two states. Another reason is that  $p_{ue}^{23}(\hat{\alpha}_2^u) > p_{ae}^{23}(\hat{\alpha}_2^a)$ , together with  $u_e > u_u$ , stigmatization from LMP and employment is preferred in period three to unemployment.<sup>6</sup> The first reason (disutility from LMP participation) applies to both individuals whom, in period three, prefer to stay unemployed as well as employed, where as the second (stigmatization) only applies to those who prefer employment to unemployment in period three.

When  $\hat{\alpha}_1$  is a minimum it is equal to infinity and  $V^1(\alpha_1, \alpha_2)$  attains its maximum at the lower bound of the support of  $\alpha_1$  (no search in period one, voluntary unemployment). When no search is optimal it must be because the unemployed has optimal values of unemployment or LMP compared to employment in period two for all values of search. It is interesting to note that in this case, when  $\tilde{V}_u(\hat{\alpha}_2^u) > \tilde{V}_a(\hat{\alpha}_2^a)$ , increasing values of  $p_a$  might shift the characteristic of  $\hat{\alpha}_1$  from a minimum to a maximum, thus shifting optimal search from its lower bound to the new value of  $\hat{\alpha}_1$ .<sup>7</sup> This is because even though the agent prefer unemployment to employment, LMP might be so perceived so unpleasant, that the unemployed, facing high enrollment probability into LMP, might find search for employment to escape LMP to yield higher expected utility than the prospect of having a high risk of moving into LMP. Hence even in the case of voluntary unemployment, LMP

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<sup>6</sup>Note that disutility is given the optimal search level in period two. This means that disutility from LMP compared to unemployment might arise because optimal search is more costly within LMP than from unemployment, perhaps because employment is harder to reach from LMP than from unemployment.

<sup>7</sup>This is because  $\frac{\partial [\tilde{V}_e(\hat{\alpha}_2^e) + p_a(\tilde{V}_u(\hat{\alpha}_2^u) - \tilde{V}_a(\hat{\alpha}_2^a)) - \tilde{V}_u(\hat{\alpha}_2^u)]}{\partial p_a} < 0$  for  $\tilde{V}_u(\hat{\alpha}_2^u) > \tilde{V}_a(\hat{\alpha}_2^a)$  and for sufficiently large values of  $p_a$  this might chance the sign of the expression in the brackets.

might induce the unemployed to increase job search prior to moving into LMP.

The model illustrates the conditions under which we might expect unemployed to increase search activity and thereby having an increased unemployment to employment transition when facing increasing likelihood of enrollment into active measures. These are less contemporaneous utility from being in active measures compared to being unemployed and/or lower employment opportunities when being in active measures compares to being unemployed conditional on employment being preferred to unemployed. The first condition induce both voluntary as well as involuntary unemployed to increase job-search, while the latter only make involuntary unemployment to increase job-search.

## 4 Data

The data used in this analysis are collected by different public bodies and supplied by Statistics Denmark. Based entirely on registers, there is no non-response in our data.

In our analysis below we have used weekly observations on UI-benefits recipients collected by the UI system. We have also used demographic information, from different population registers supplied by Statistics Denmark. The analysis is performed on a balanced 10 percent sample of the population for the period 1995 to 1998. In order to obtain a homogenous sample of unemployed facing identical conditions on the labour market, we have further restricted the sample to male individuals who were between 25 and 47 years of age in 1994, who has full passive period entitlement (PPE), when they enter the sample (fresh spells) and who become unemployed during the sample period. See Geerdsen (2003) for details.

**Table 1. Descriptive Statistics.**

Variables	min	max	mean	st.dev.
Spouse=1			59.89	
University degree			14.62	
Age	26.00	51.00	36.69	6.79
Spell length	0.53	46.40	3.27	4.32
No. of spell per ind.	1.00	13.00	2.38	1.49
PPE when spell commence	-18.03	48.00	32.57	12.43

Note: Number of individuals=6,547. Number of spells=15,583. Number of fresh spells=8,575. Number of right censored spells=1,047.

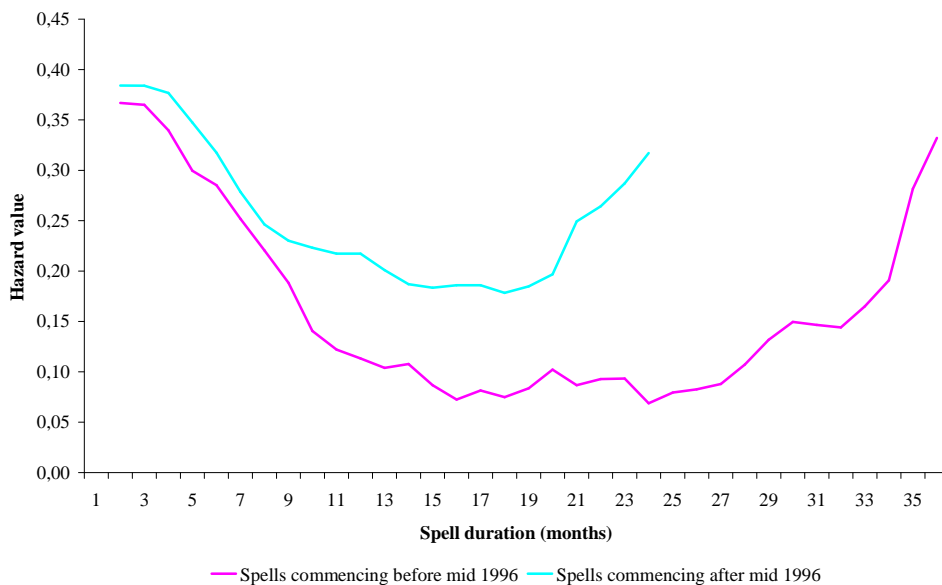
Our spell measure is monthly observations and in order to construct the UI spells for the analysis, we have assumed that a spell consists of minimum 2 weeks of unemployment within a month. A spell is broken if an individual is not receiving benefits for more than 2 weeks in a month.<sup>8</sup>

In Table 1, the sample is described. A total of 6,547 individuals appear in the sample. These individuals have a total of 15,583 UI spells between 1995 and 1998. A little more than half of these spells are “fresh” spells, meaning that the right to a new UI period has been gained or regained prior to unemployment. Individuals do on average have a little more than 2 unemployment spells in the sample period and the average duration of a spell is a little longer than 3 months. On average individuals commencing an unemployment spell have approximately 33 months of passive period entitlement (PPE) left before they enter the activation period.

If the prospect of compulsory LMPs indeed stimulate individuals to leave the UI system, this may be visible in standard Kaplan Meyer estimates. Furthermore, the shortening of the passive period, and hence advance of the activation period, in mid 1996 may also advance individuals’ reaction to the LMPs. In Figure 1 individuals’ hazard of leaving the UI system is displayed

<sup>8</sup>We do not have information on exit state of the individual. However, by restricting the analysis to males in the age group 25 to 47 years the overwhelming number of spells in the analysis ends in employment.

Figure 1: Kaplan Meyer estimates of the hazard out of UI unemployment



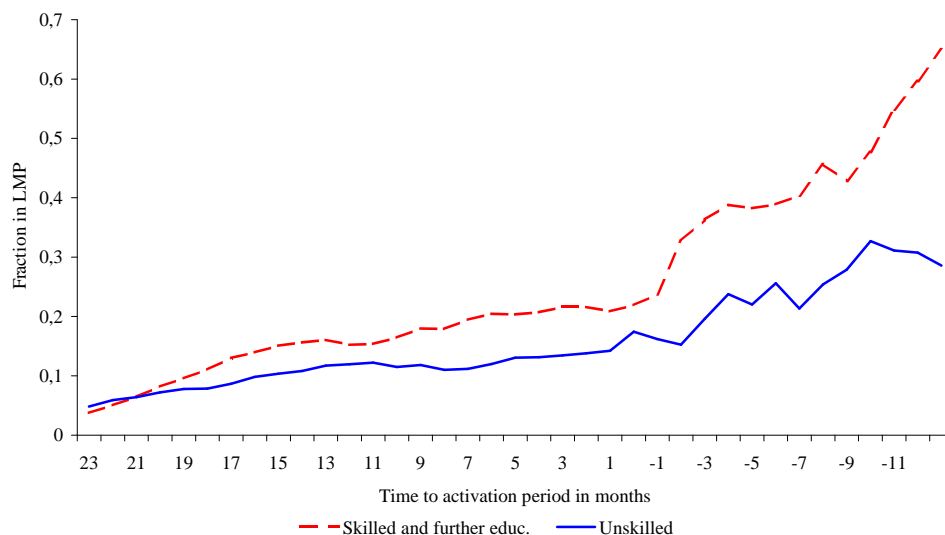
for spells commencing before and after mid 1996.

The Kaplan Meyer estimates give strong indications of a positive incentive effect. First of all, the hazard out of the UI system displays a steep increase which is located approximately when individuals at the latest enter the activation period. Second, this steep increase after a shorter duration for spells commencing after mid 1996. This may be a result of the advancement of the activation period.

Another question is whether individuals are actually enrolled a LMP when they enter the activation period. Figure 2 shows the fraction of unemployed individuals enrolled in LMPs as a function of their seniority in the UI period. The figure displays different educational groups of unemployed in our sample.

From the figure two important characteristics of the enrollment into LMPs becomes clear. First, there is by no means a deterministic relation-

Figure 2: Fraction of unemployed individuals in a LMP.



ship between entering the activation period and actually being enrolled in a LMP.<sup>9</sup> Second, the probability of enrollment is highly heterogenous between different groups of unemployed. 22 percent of unemployed individuals who are skilled or have a further education are in a LMP when the passive period runs out. For unskilled individuals the share is only 17 percent. Enrollment rises to 38 percent five month into the activation period for skilled unemployed or unemployed with further education compared to only 22 percent for unskilled at this point. If unemployed individuals know this, and use this to determine their search behavior, then time until the activation period is a very poor measure of the incentive effect of LMPs on search behavior prior to moving into such measures.

<sup>9</sup>The reason that some unemployed are in ALMP before entitlement is exhausted is that if unemployed did show no job-search activity at all, case managers at the unemployment agencies was entitled to offer ALMP to these individuals. Non-compliance in this case induced a 20 % reduction in benefits.

## 5 The Econometric Model

In this section we propose an econometric model of the incentive effect of LMPs on job-search. The model captures the characteristics of the model outlined in section 3, as well as the characteristics of the actual labor market under study.

As demonstrated above, the likelihood of moving into LMPs depends very much on individual characteristics. By accounting for individual characteristics as well as passive period entitlement (PPE),<sup>10</sup> we approximate the expected hazard rate of being enrolled in a LMP, as perceived by the unemployed. We then include this estimated hazard rate as an explanatory variable in the hazard rate into regular employment.

The model also takes into account the potential endogeneity of PPE. Those with long PPE's when entering a spell of unemployment might also have unobserved characteristics that indicate a high probability of entering employment. This is because a large PPE indicate more employment between unemployment spells compared to a shorter PPE. If we do not take this into account, we would infer that those with large PPEs have higher employment probabilities, and hence exercise more active job-search, than those with shorter entitlement. This is contrary to what a potential incentive effect from PPE's might indicate. Hence, if PPE enters as an exogenous variable in the enrollment hazard, it will have less predictive power on job-search than if treated properly as an endogenous variable.

Finally, the complete model also needs to take into account unobserved effects by allowing correlated random effects between the two hazard rate

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<sup>10</sup>Note that our sample is a random sample of individuals with maximum PPE. However, once individuals are sampled, they stay in the sample. Hence, when they have multiple spells of unemployment, consecutive spells do not necessarily have maximum PPE. If we only included individuals when they have regained maximum PPE, we would select individuals out of the sample according to a potential endogenous measure.

models and the model capturing PPE. Identification of the effect of the expected hazard rate into LMPs on the hazard rate into employment rest partly on the timing of events result in Abbring and van den Berg (2003), and traditional instrumental variables methods (the cut in PPE in 1996).

By including the 1996 advancement of the activation period in the model for PPE when spells commence, we obtain a non-parametric identification of the effect of entitlement on the hazard rate into a LMP. Note that the identification of the parameters of distribution of the random effects is also facilitated by the presence of multiple spells for most of the individuals in the sample, van den Berg (2002).

Formerly our model goes like this: First part of the simultaneous model describes PPE ( $y$ ) measured in months, at the start of an unemployment spell. Observed PPE has a maximum<sup>11</sup> that varies as policy changes through the sample period (the cut in mid 1996). We therefore suggest a tobit model for the observed entitlement according to:

$$y = y^*; y^* < c$$

$$y = c; y^* \geq c$$

where  $y^*$  is a latent PPE<sup>12</sup> if there were no ceiling on PPE and  $c$  is maximum PPE. The model for the latent PPE is:

$$y^* = \beta_y x_y + e_y + \varepsilon,$$

where  $x_y$  are characteristics of the unemployed when PPE began accumulating,  $e_y$  is a random effect capturing unobserved variables and  $\varepsilon$  is an idiosyncratic error term being normally distributed with zero mean and variance  $\sigma^2$ .

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<sup>11</sup>As mentioned in section 4, PPE is dependent on previous employment and unemployment. When maximum PPE is obtained, through a sufficiently amount of employment (12 months), employment over and above this does not contribute to the length of PPE.

<sup>12</sup>I.e. indicating employment over and above that required to obtain maximum PPE.



The next part of the model describes the probability of moving into a LMP during a spell of unemployment. In continuous time we propose a proportional hazard rate model of being enrolled into active measures during a spell of unemployment:

$$\theta(t, x_a(t), \epsilon_a) = \exp(Q_a(t)) \exp(\delta y + \beta_a x_a(t) + \epsilon_a)$$

where  $Q_a(t)$  capture the time-dependence of the unemployment spell on the hazard of moving into LMPs through a polynomial in elapsed unemployment duration.  $x_a(t)$  is a vector of, possibly time varying, characteristics of the unemployed and  $\epsilon_a$  is a random effect capturing the effect of unobserved characteristics of the unemployed. The corresponding discrete time probability (hazard) of leaving employment during an interval of length  $t_l - t_{l-1}$  (the unit of measurement, a month) is:

$$\begin{aligned} \lambda_a(t_l | x_a(t), y, \epsilon_a) &= \frac{S_a(t_{l-1}) - S_a(t_l)}{S_a(t_{l-1})} \\ &= 1 - \exp\left(-\int_{t_{l-1}}^{t_l} \theta(s, x_a(s), y, \epsilon_a) ds\right) \\ &= 1 - \exp\left(-\exp(\epsilon_a + \delta y) \int_{t_{l-1}}^{t_l} \exp(Q_a(s)) \exp(\beta_a x_a(s)) ds\right). \end{aligned}$$

By assuming that  $x_a(t)$  is constant within intervals we further get:

$$\begin{aligned} \lambda_a(t | x_a(t), \epsilon_a) &= 1 - \exp\left(-\exp(\epsilon_a + \delta y + \beta_a x_a(t_l)) \int_{t_{l-1}}^{t_l} \exp(Q_a(s)) ds\right) \\ &= 1 - \exp(-\exp(\Lambda_a(t_l) + \delta y + \beta_a x_a(t_l) + \epsilon_a)) \\ &= F(\Lambda_a(t_l, t_{l-1}) + \delta y + \beta_a x_a(t_l) + \epsilon_a) = F_a(t_l), \end{aligned} \quad (3)$$

where  $\Lambda_a(t_l, t_{l-1}) = \int_{t_{l-1}}^{t_l} \exp(Q_a(s)) ds$  and  $F(x) = 1 - \exp(-\exp(x))$ .

In similar manner we get the discrete time hazard rate of entering employment, capturing the incentive effect by conditioning this hazard rate on the probability of entering active measures in the next time interval:

$$\begin{aligned}
& \lambda_e(t_l|h_a(t_{l+1}), x_e(t_l), y_a(t_l), \epsilon_e) \\
&= F\left(\Lambda_e(t_l, t_{l-1}) + \gamma_1 y_{t_l}^a + \gamma_2(1 - y_{t_l}^a)\lambda_a(t_{l+1}) + \beta_e x_e(t_l) + \epsilon_e\right) \\
&= F_e(t_l, ).
\end{aligned} \tag{4}$$

where  $y_{t_l}^a$  is a binary indicator variable equal to one when in active measures in time interval  $t_l, t_{l-1}$ , and 0 otherwise.<sup>13</sup>  $x_e(t_l)$  and  $\epsilon_e$  are defined similar to the model for moving into a LMP. To construct the likelihood for  $n$  individuals each with  $\kappa_i, i = 1, \dots, n$ , spells of unemployment, we need to specify the joint distribution of unobserved heterogeneity from the three different parts of the model. We do this by assuming that they are all discrete with a finite number of points of support,  $e_{yj}, e_{aj}, e_{ej}, j = 1, \dots, J$  and that each point of support has a common probability,  $w_j$ , associated with it. This is a common assumption when allowing for random effects in duration model, see e.g. (van den Berg 2002). Similarly to  $y_{t_l}^a$  we define binary indicator of employment,  $y_{t_l}^e$ . From all this we get the following likelihood:

$$\begin{aligned}
\ln L &= \sum_i \ln \sum_j w_j \prod_{\kappa_i} \prod_{\tau_i(\kappa_i)} (1 - F_{aj}(t_l))^{1-y_{t_l}^a} F_{aj}(t_l)^{y_{t_l}^a} \\
&\quad \times (1 - F_{ej}(t_l))^{1-y_{t_l}^e} F_{ej}^j(t_l)^{y_{t_l}^e} \\
&\quad \times \left[1 - \Phi\left(\frac{c - \beta_y x_y + e_{yj}}{\sigma}\right)\right]^{\mathbf{1}(y \geq c)} \left(\frac{1}{\sigma} \phi_j\left(\frac{\varepsilon_j}{\sigma}\right)\right)^{\mathbf{1}(y < c)}.
\end{aligned} \tag{5}$$

where  $\phi(\cdot)$  denotes the standard normal density, superscript  $j$  of  $\varepsilon_j, F_{aj}(t_l)$  and  $F_{ej}(t_l)$  indicate conditioning of the actual value of the  $j$ 'th point of support for the distribution of the random effects. Maximization of  $\ln L$

<sup>13</sup>Individuals leave the data when they either move into employment or out of a LMP (right censored - if not employed).

yields the mle's of the parameters of the model:

$$\delta, \beta_a, \gamma_1, \gamma_2, \beta_e, \sigma, e_{yj}, e_{aj}, e_{ej}, w_j, j = 1, \dots, J$$

and the parameters of  $Q_e(t_l)$  and  $Q_a(t_l)$ . The parameter for the incentive effect of LMP on the job-hazard,  $\gamma_2$ , is our parameter of interest.

## 6 Results

The estimation result of the model described in section 5 is described in the following Tables. Table 2a shows results for the estimation of the passive period entitlement (PPE) when individuals unemployment spell commence. From Table 2a we find that older individuals and individuals living alone has the shortest PPE when entering an unemployment spell. Also, it appears that especially individuals with long further education has a significantly lower PPE than other unemployed individuals.

**Table 2a. Estimation results.  
Passive period entitlement when spell  
commence.**

Variable	Coefficient		Sd. error
Constant	53.758	*	0.380
Age	-0.033	*	0.009
Couple	1.192	*	0.125
Unskilled			
Up.Sec.	-0.034		0.408
Vocational	0.606	*	0.139
Short furth.	-0.082		0.338
Int. furth.	-0.211		0.336
Long furth.	-0.966	*	0.322
No educ. inf.	-0.811	*	0.258
1996	-1.820	*	0.233
1997	-3.173	*	0.310
1998	-12.317	*	0.312
June 1996	-20.916	*	0.247
$\sigma$	6.583	*	0.008

Note:  $\sigma$  is the estimated standard error of the error term.

\* denotes significance at a 5% level.

**Table 2b. Estimation results.  
Probability of being in a LMP.**

Variable	Coefficient		Std. error
Constant	-7.224	*	0.323
$t$	0.469	*	0.042
$t^2$	-0.015	*	0.005
$t^3$	$3.109E - 4$		$2.309E - 04$
$t^4$	$-2.76E - 06$		$3.23E - 06$
PPE	-0.026	*	0.004
Age	-0.015	*	0.005
Unskilled			
Up.Sec	0.670	*	0.140
Vocational	0.270	*	0.095
Short furth.	0.618	*	0.142
Int. furth.	0.780	*	0.160
Long furth.	-0.033	*	0.128
No educ. inf.	0.153	*	0.127
Couple	0.422	*	0.062
1996	-0.050	*	0.089
1997	-0.196	*	0.124
1998	0.306		0.155

\* is significant at 5% level.

This indicates that these individuals have less employment than other individuals, since PPE is a function on employment history. We also find that spells which start later, during the estimation period, have shorter PPE than those from earlier on. This could be a selection effect. During the economic upturn, those who have predominantly short unemployment spells (over and above that implied by time invariant random effects) are to lesser degree unemployed in the last part of the estimation period. Finally, we find, very much as expected, that PPE is very much shortened by the shortening of the passive period in mid 1996. In summary, we find that PPE is highly dependent on observed and unobserved (see Table 2d below) individual characteristics as well as formal rules for entitlement.

Results for estimating the transition into a LMP is shown in Table 2b.

From Table 2b we find that unemployed with spouses as well as younger individuals are more likely to be enrolled into a LMP. This also holds for individuals with vocational education as well as short and intermediate further education. So, those who has characteristics implying a high probability of enrollment into a LMP, appear also to be individuals with long expected PPE (Table 2a). But we also find that the shorter the PPE, the more likely one is to be in a LMP, indicated by the significant negative estimate of PPE. Furthermore, we find that in the later part of the estimation period, there is a higher probability of moving into a LMP over and above that implied by the PPE and changes in the PPE indicating a more strict enrollment policy from the unemployment agencies. Finally, we find a clear positive duration dependence on the probability of enrollment, implied by the parameters of the time polynomial.

Results for estimating the transition into employment are shown in Table 2c. From Table 2c we find that the transition rate into employment exhibits negative duration dependence. Furthermore younger individuals and individuals with a spouse are more likely to move out of unemployment. Hence it seems that those with the observed characteristics leading to the highest transition rate into employment also tend to be those with the highest probabilities of being in a LMP. When it comes to education, we find that especially individuals with a vocational education have a higher hazard out of unemployment than the reference group (the unskilled). As we saw above, individuals with a vocational education also have the lowest hazard of entering a LMP (apart from unskilled) and the largest PPE compared to all other educational groups.

**Table 2c. Estimation results.  
Hazard rate into employment.**

Variable	Coefficient		Sd. error
Constant	-0.249	*	0.063
$t$	-0.238	*	0.016
$t^2$	0.012	*	0.002
$t^3$	$3.201E - 4$	*	$1.183E - 4$
$t^4$	$3.65E - 6$	*	$1.75E - 6$
Age	-0.006	*	0.001
Unskilled	-		-
Up.Sec	-0.239	*	0.065
Vocational	0.085	*	0.023
Short furth.	-0.149	*	0.054
Int. furth.	-0.159	*	0.053
Long furth.	-0.246	*	0.053
No educ. inf.	-0.415	*	0.042
Couple	0.228	*	0.020
1996	-0.116	*	0.031
1997	-0.108	*	0.031
1998	0.016	*	0.032
$\gamma_1$	-0.053		0.114
$\gamma_2$	1.483	*	0.232

Note:  $\gamma_1$  is equal to 1 if the individual is in a LMP.

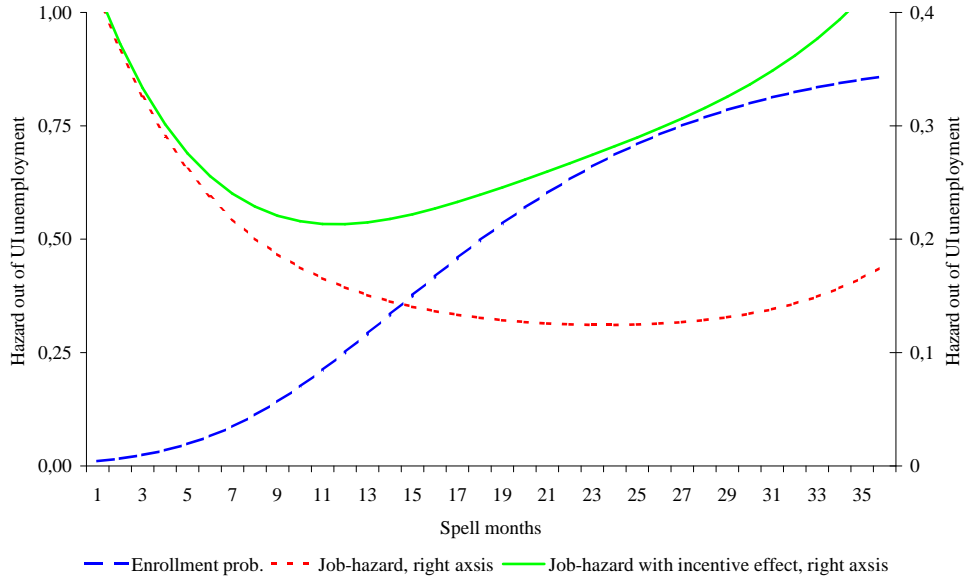
$\gamma_2$  is the probability of being in a LMP for individuals .  
who are not in a LMP. \* is significance at the  
5% level.

Finally, we find that being in a LMP ( $\gamma_1$ ) does not affect the transition rate out of unemployment significantly, but that the probability of being in a LMP, the incentive effect, ( $\gamma_2$ ) has substantial positive impact on the probability of moving out of unemployment. The magnitude of this effect is depicted in Figure 4. This figure also capture the duration dependence of the probability of being in a LMP.<sup>14</sup>

From the figure we see that during the spell of unemployment, the odds ratio of moving out of unemployment with incentive effect is increasing com-

<sup>14</sup>The enrollment probability and the job-hazard is calculated for an unskilled, living alone, of 35 years of age and with 12 months PPE when entering unemployment. Furthermore, we assume the person in the calculations to have average unobserved characteristics both in terms of enrollment as well as in terms of the job-hazard.

Figure 3: Predicted job-hazard rates and enrollment into ALMP.



pared to a situation with no incentive effect and after three years of unemployment the odds ratio is more than two. Hence, especially for long term unemployed, the incentive effect seems quite important.

In Table 2d we finally show results for the discrete distribution of random effects. From table 2d we see that individuals with a low component for the transition into employment ( $u_e$ ) is associated with a low probability of being in a LMP ( $u_a$ ) and less PPE at the outset of their unemployment spell ( $e$ ). This means that the adverse characteristics holds for the reference groups. Hence, it seems that unobserved characteristics associated with high probability of moving out of unemployment is associated with a relatively low probability of being in a LMP and relatively long entitlement.

**Table 2d. Estimation results.  
Distribution of random effects.**

Parameter	Estimate	Sd. error
$e_{y1}$	0	-
$e_{y2}$	-2.026	0.245
$u_{a1}$	0	-
$u_{a2}$	6.175	0.104
$u_{e1}$	0	-
$u_{e2}$	-1.015	0.104
$a_1$	0	-
$a_2$	-2.351	0.053

Note:  $e$  is individual error term for the PPE.

$u_a$  is individual error term for probability of LMP participation.  $u_e$  is individual error term for the hazard out of unemployment.

Therefore, according to the distribution of random effects, there are individuals which have a high transition rate into employment, yet has a very low probability of moving into a LMP, irrespective of their entitlement. Hence, this group do, apparently, not seem to behave as predicted by the incentive effect, because they have an extremely low enrollment probability. However, this is due to unobserved characteristics. Without the random effects included in the model, we would erroneously have estimated a lower incentive effect, because a large fraction of the sample would have a higher predicted incentive effect that they did not behave accordingly to.

## 7 Conclusion

The results of this paper clearly indicates that the prospect of compulsory LMP participation incite individuals to leave the UI system prior to participation. We find that this effect is very strong. When the risk of being enrolled in a LMP is at it highest, individuals respond with more than a 100 percent increase in the hazard of leaving UI unemployment. The size of this effect is comparable with the effect found in studies of individuals



reaction to the prospect of benefit exhaustion (Meyer, 1990; Rogers, 1998). This indicates that it is indeed possible to obtain the strong incentive effects which the loss of benefits will inflict, without a substantial income drop for individuals who cannot find employment.

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