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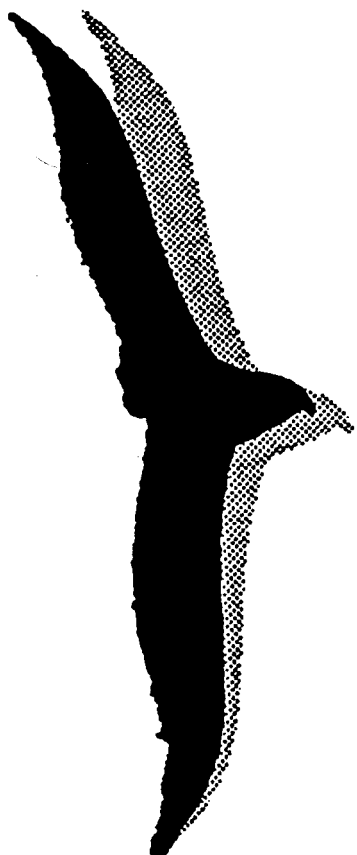
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A MODEL OF COMPETITION BETWEEN EMPLOYED, SHORT-TERM
AND LONG-TERM UNEMPLOYED JOB **SEARCHERS**

by

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ABSTRACT

This paper presents a model in which not only employed job search is endogenized, but also the phenomenon that long-term unemployed may become discouraged and stop searching for a job. When this model is applied to Dutch flow data, we find that this discouragement particularly took place in the early 1980's. We also find that a mere stimulus to **labour** participation is not enough to solve the problem of the high long-term unemployment in The Netherlands.

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AUTHOR'S NOTE

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1. INTRODUCTION

Since the search theory has gained momentum, more attention has been paid to flows into and out of unemployment, instead of concentrating on the stock of unemployed. The matching model is one of the most popular models to analyze the unemployment outflow. In this approach, the unemployment outflow into employment is related to the number of unemployed and the number of vacancies via a matching function. For an empirical analysis of the matching function, see Pissarides (1986), Layard et al (1991), Blanchard and Diamond (1989,1990) and van Ours (1991). A shortcoming of this standard matching approach is that no account is being taken of employed job searchers. The group of employed job searchers can be quite large and therefore exert a substantial effect on the unemployment outflow rate. Recently, Burgess (1993) has developed a model of competition between employed and unemployed job searchers in order to take account of this effect. This competition has had considerable impact on unemployment outflow, not only in Britain, but also in The Netherlands. Cf. Broersma (1994).

In this paper, the model of competition is extended in order to take account of yet another phenomenon, which has frequently been used to explain differences in job opportunities between short-term and long-term unemployed, namely discouragement. Here, we touch upon the notion that the duration of unemployment affects the motivation and morale of the unemployed and also the extent to which they are stigmatized by employers. Cf. Layard et al (1991). In our view discouragement implies that the situation on the **labour** market is that bad, that long-term unemployed give up hope of finding a job and hence stop searching. This phenomenon is particularly assumed to have happened in the early **80's**, when unemployment increased rapidly. We will present a model that not only endogenizes competition between unemployed and employed, but also endogenizes discouragement of long-term unemployed in the matching approach.

Section 2 provides a theoretical framework with which the issues can be understood. Section 3 presents some stylized facts on short-term and **long-term** unemployment flows, while section 4 gives the empirical results. Finally section 5 summarizes the main conclusions.

2. A MODEL OF LONG-TERM UNEMPLOYMENT OUTFLOW

Burgess' (1993) model of competition serves as starting point. There are two issues at stake here. First, employed job search, which is related to the decision to search or not, when employed. This depends on the reservation wage; a worker earning less will engage in search. Second, discouragement among long-term unemployed, which is related to the labour market conditions. In grim conditions, long-term unemployed, for which we take the unemployed with an unemployment duration of more than one year, may give up hope of finding work and become discouraged. Short-term unemployed, i.e., with a duration of less than one year, are assumed not to become discouraged.

It can be shown that the reservation wage, w_r , say, depends on all parameters of the search problem and in particular on the arrival rate of job offers, θ . If a worker is more likely to receive a job offer, search will be more profitable. In other words, the reservation wage rises with increasing θ , $w_r = w(\theta, \mathbf{W})$, where \mathbf{W} is a vector of all other influences on the reservation wage. Let ϕ_N be the proportion of the employed engaging in search, hence the proportion earning less than w_r . Then

$$\phi_N = \phi_N(\theta, \mathbf{W}), \tag{1}$$

with ϕ_N increasing in its first argument.

Labour market conditions can be represented by the job offer arrival rate θ . When **labour** market conditions are bad, much less job offers will arrive for long-term unemployed than in good times. In bad times, layoffs increase implying an increase in short-term unemployed, U_s , say. Hence, in bad times, the long-term unemployed, U_l , will not only face competition from employed job searchers, but also from an increasing number of short-term unemployed. Of course, also in this case the number of discouraged long-term unemployed searchers depends on the offer arrival rate θ and on the variables \mathbf{W} as well. The more likely a long-term unemployed will receive an offer, the less likely will he be discouraged. Let ϕ_L be the proportion of discouraged long-term unemployed

$$\phi_L = \phi_L(\theta, \mathbf{W}). \tag{2}$$

Here, ϕ_L is decreasing in the first argument: an increase in job offers, θ , means that **labour** market conditions are favourable, so less long-term unemployed become discouraged or ϕ_L falls. We assume throughout that ϕ_N and ϕ_L do not affect each other.

Clearly, θ is an important variable in our model. It is given by

$$e = M/J, \quad (3)$$

where M is the number of job matches and J is the number of job searchers, which consists of the fraction of employed job searchers, $\phi_N N$, the short-term unemployed and the fraction of long-term unemployed not being discouraged. Hence, all short-term unemployed are engaged in search, so J is defined as $J = \phi_N N + U_s + (1 - \phi_L)U_l$ or dividing through the labour force L

$$j = u_s + u_l + (1 - u_s - u_l)\phi_N - \phi_L u_l. \quad (4)$$

If there were no employed job search and discouragement, i.e. $\phi_N = 0$ and $\phi_L = 0$, j would simply equal $u_s + u_l$ and we would be back at the standard matching model, where only unemployed search for a job. Equation (4) shows that the movement in ϕ_N and ϕ_L are important in determining j and hence θ . But from (1) and (2), we found that θ is also important for determining ϕ_N and ϕ_L . In fact, (1) through (4) jointly determine θ , ϕ_N and ϕ_L .

Following Burgess (1993), we assume that individuals know the unemployment rate at the beginning of the period, they form an expectation about the matching or hiring rate $m = M/L$, and know that all other individuals make a similar decision. In equilibrium, when expectations are fulfilled, we then have

$$\theta = \theta(m, u_s, u_l, W), \quad \phi_N = \phi_N(m, u_s, u_l, W), \quad \phi_L = \phi_L(m, u_s, u_l, W). \quad (5)$$

The properties of θ are important for all three groups of job searchers.

We can next show that

$$\eta_{\theta,m} = \frac{1}{1+\pi_N\eta_{\phi_N\theta}-\pi_L\eta_{\phi_L\theta}} < 1, \quad (6)$$

$$\eta_{\theta,u_s} = \frac{-(1-\phi_N)(u_s/j)}{1+\pi_N\eta_{\phi_N\theta}-\pi_L\eta_{\phi_L\theta}} > -1, \quad (7)$$

$$\eta_{\theta,u_l} = \frac{-(1-\phi_N-\phi_L)(u_l/j)}{1+\pi_N\eta_{\phi_N\theta}-\pi_L\eta_{\phi_L\theta}} > -1, \quad (8)$$

where $\eta_{a,b}$ is the elasticity of a with respect to b , π_N is the proportion of employed job searchers $\pi_N = (1 - u_s - u_l)\phi_N/j$ and π_L is the fraction of discouraged long-term unemployed $\pi_L = u_l\phi_L/j$.

The elasticity $\eta_{\theta,m}$ in (6) states that an increase in the number of matches m increases the offer rate θ by less than one-for-one. The extent to which $\eta_{\theta,m}$ lies below one depends on the importance of employed job searchers (π_N) and discouraged long-term unemployed (π_L) and the responsiveness of employed and long-term unemployed to changes in the job offer rate ($\eta_{\phi_N\theta}$ and $\eta_{\phi_L\theta}$, respectively). Comparison between this situation and the one without discouragement ($\pi_L = 0$ and $\eta_{\phi_L\theta} = 0$), as studied in Burgess (1993), implies that (6) yields an even lower value for $\eta_{\theta,m}$ than Burgess (1993), since $\eta_{\phi_L\theta} < 0$. An increase in the matching rate, m , stimulates employed job search, i.e., raises ϕ_N , and lowers long-term unemployed discouragement, i.e., reduces ϕ_L , thereby pushing $\eta_{\theta,m}$ considerably below unity. In a situation of absence of both discouragement and competition ($\pi_L = \pi_N = 0$ and $\eta_{\phi_L\theta} = \eta_{\phi_N\theta} = 0$), $\eta_{\theta,m} = 1$, which is the standard result.

The elasticity η_{θ,u_s} in (7) indicates that the offer arrival rate θ also responds to changes in the number of short-term unemployed. Since η_{θ,u_s} is bounded between -1 and 0, this implies that an increase in u_s lowers the arrival rate. This reflects the notion that there is not only competition between employed and unemployed job searchers, but also between short-term and long-term unemployed. This phenomenon describes the crowding out of long-term unemployed by short-term unemployed. Since we have argued that discouragement is connected to the situation on the labour market represented by the number of layoffs, i.e. the short-term unemployed, η_{θ,u_s} gives an indication of the extent of discouragement in the outflow of long-term

unemployed.

Next, η_{θ, u_l} reflects the responsiveness of the offer arrival rate to the number of long-term unemployed. Only when both the share of employed job searchers and the share of discouraged long-term unemployed are large, will an increase in the long-term unemployed lead to an increase in the offer arrival rate. In all other cases, $-1 < \eta_{\theta, u_l} < 0$, so an increase in the long-term unemployment rate lowers the job offer arrival rate. The three elasticities (6)-(8) also relates the outflow rate of long-term unemployed, x_l , to m , u_s and u_l , respectively, since this outflow rate depends on the offer arrival rate θ in a positive way. We will return to this issue shortly.

Finally, we must examine whether employed, short-term and long-term unemployed face the same offer arrival rates. There are two contradictory opinions. Blau and Robbins (1990) argue that employed generate more offers per search. It is also argued that long-term unemployed search less efficient compared to short-term unemployed. However, there is no apparent evidence for that, although long-term unemployed are less likely to be called for an interview. Cf. Layard et al. (1991). On the other hand, Mortensen (1986) argues that unemployed search more intensively than employed. Therefore, we assume the long-term unemployed to receive a proportion of offers given by

$$X_l/M = \lambda_l(U_l/J), \quad 0 \leq \lambda_l \leq J/U_l, \quad (9)$$

where X_l is the outflow from long-term unemployment. So long-term unemployed receive more (less) than the 'fair' share of offers if $\lambda_l > 1$ ($\lambda_l < 1$).

The outflow rate from long-term unemployment, x_l , is the product of the job offer arrival rate, θ , and the proportion of offers accepted by the long-term unemployed, ρ_l , times the share of offers the long-term unemployed receive, hence

$$x_l = \lambda_l \theta(\theta, u_s, u_l, W) \rho_l. \quad (10)$$

In this way the model can be developed in the same way as the model without discouragement of long-term unemployed was derived. The difference is that now not only employed, but also short-term unemployed exert influence on the outflow rate from long-term unemployment.

3. A MODEL OF SHORT-TERM UNEMPLOYMENT OUTFLOW

The model of the outflow rate for short-term unemployed is developed in the same way as the model of competition between employed and unemployed job searchers, as in Burgess (1993). We assume that short-term unemployed do not become discouraged. Long-term unemployment does of course exert influence on the outflow rate of short-term unemployed. The higher long-term unemployment, the more job opportunities for short-term unemployed and hence the higher the outflow rate. In that sense, discouragement of long-term unemployed favours short-term unemployed. They only have to face competition from employed job searchers. The outflow rate for short-term unemployed is then given by

$$x_s = \lambda_s \theta(\theta, u_s, u_l, W) \rho_s. \quad (11)$$

where λ_s is the share of job offers received by short-term unemployed and ρ_s is the offer acceptance rate of short-term unemployed.

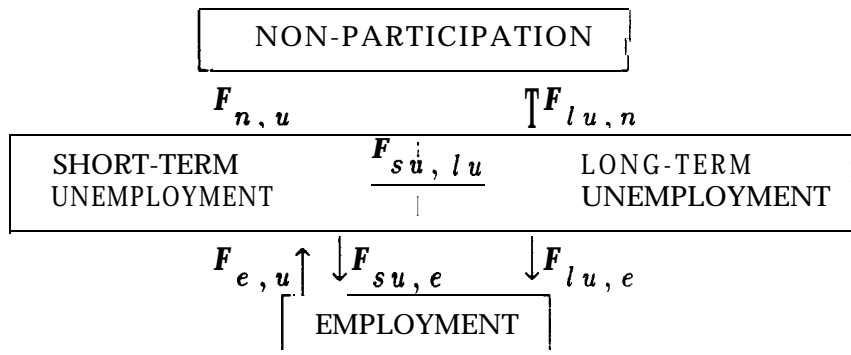
4. DATA

This section briefly discusses some of the data used. Details are presented in the Data Appendix. Inflow from short-term to long-term unemployment in a particular year t , is determined by the probability to stay unemployed in the previous year $t - 1$, times the inflow in unemployment in $t - 1$. Outflow of long-term unemployed is the difference of this inflow and the net change in the stock of long-term unemployment. This outflow is normalized by the number of long-term unemployed in the beginning of period t to yield the outflow rate $x_{l,t}$. We present the main characteristics of the long-term unemployment stock and inflow and outflow in table 1. Figure 1 presents an outline of the relevant flows. In figure 2, the actual long-term unemployment stock and flow series are graphed.

Table 1. Characteristics of long-term unemployment stock and flows, 1965-1991

	Mean	Standard deviation	Maximum	Minimum
Long-term unemployment	141,600	150,300	416,400	6,400
Inflow	118,700	78,000	258,500	23,600
outflow	107,800	73,600	262,700	23,900

Figure 1. Flows into and out of unemployment.



We will pay specific attention to the flows out of long-term and short-term unemployment, $F_{lu,e}$ and $F_{su,e}$, respectively. We have information on the inflow into unemployment from employment and from non-participation and abstract from the outflow of long-term unemployed to non-participation, i.e. $F_{lu,n}$ is set to zero. The discouraged long-term unemployed may be considered as being non-participant, since they no longer search for a job. We assume that there is no flow from short-term unemployment into non-participation.

The inflow into (short-term) unemployment just consists of the flows into unemployment from employment and from non-participation, $F_{e,u}$ and $F_{n,u}$, respectively. The first flow is the number of layoffs, the second consists of school-leavers and re-entrants on the labour market searching for a job. We can, however, say something about the outflow from short-term unemployment, $F_{su,e}$, which is determined by the difference between total and long-term unemployment outflow. Over the sample period, short-term unemployment outflow

is larger than long-term unemployment outflow. See figure 3.

Figure 2 reveals that until the 1980's the inflow and outflow of long-term unemployed moved close together, with an exception of 1975-76, when the outflow fell. In the early 80's, there was a dramatic increase in the inflow of long-term unemployed, while at the same time the outflow decreased. This led to a steep rise in the number of long-term unemployed from 1981-84. After 1982, outflow rose again and after 1984 it was larger than inflow so long-term unemployment slowly started decreasing. Especially in the period 1987-88, the outflow was large, so a considerable number of the long-term unemployed found a job in that period.

Figure 3 also reveals some interesting features. The relatively mild recessions of 1967 and 1972, were characterized by the fact that inflow rose steeper than short-term outflow. If inflow into unemployment is a measure of job destruction and (short-term) outflow is a measure of job creation, then, in those years, jobs were destroyed at an increasing rate and jobs were being created at an slightly less increasing rate. The more severe recessions of 1974-75 and 1980-82 were characterized by a sharp fall in short-term outflow. Since job-to-job movement was minimal in those periods, we can say that there has been a sharp fall in the creation of new jobs, combined with a large rise in the number of jobs being destroyed. The outflow increased again from 1982 onwards. The period 1986-87 is characterized by large increases in both inflow and outflow. This implies that large structural changes took place in The Netherlands in that period. Cf. Broersma (1995).

The explanatory variables we use in the empirical modelling exercise are described in detail in the Appendix. The hiring rate, m , is composed of the number of workers moving from one job to another and the number of new hires. In equation (10), λ_l represents movements in the relative share of offers and hence depends on search intensity and suitability of applicants, for which we assume the replacement ratio's, based on the benefits of short-term and long-term unemployed to be important. Also the number of short-term and long-term unemployed will affect λ_l : more short-term unemployed imply a declining share of job offers for long-term unemployed. Another factor which might influence λ_l is mismatch: unemployed offering 'wrong' skills in 'wrong' places. The variables in W that affect the job offer arrival rate θ might be the replacement ratio and demographic effects, like the proportion of young

workers, aged 16-24, and the proportion of old workers, aged over 55. Young workers are assumed to change jobs more often than older workers and hence compete more with unemployed job searchers. We allow for non-linearity in θ by including $(\log u_s)^2$, $(\log u_l)^2$, $(\log m \cdot \log u_s)$ and $(\log m \cdot \log u_l)$. The job offer acceptance rate ρ depends on the relevant replacement ratio.

5. EMPIRICAL RESULTS

As in the analysis of Burgess (1993), we assume that the actual matching or hiring rate, \bar{m} , differs from its expected value by a zero mean random shock, ζ , so $\bar{m} = m(1 + \zeta)$ or $\log \bar{m} = \log m + \varepsilon$. Since the expected hiring rate m affects j , the actual arrival rate is $\log \theta(m, u_s, u_l, W) + \varepsilon$. The expected matches m are assumed to be determined by lagged matches. Starting with the outflow rate out of long-term unemployment, we log-linearize (10) and incorporate the random element in θ to yield

$$\log x_i = \log \lambda_i + \log \theta(m, u_s, u_l, W) + \log \rho_i + \varepsilon, \quad (12)$$

where $i = s$ for the outflow rate of short-term unemployed and $i = l$ for the outflow rate of long-term unemployed. We start with the model for the outflow rate of long-term unemployed.

As a first stage we apply a unit root test to determine the degree of integration of the series. The test suggests that all important series are $I(1)$. Next, we test the presence of cointegration. A static regression of the $I(1)$ variables yields a Durbin-Watson statistic of 2.212, implying that the presence of a long-run equilibrium relation cannot be rejected and that only limited additional dynamics is needed to yield a model with no significant residual autocorrelation. Model (12) can be rewritten in error-correction form to give

$$\Delta \log x_{i,t} = \sum_{k=1}^r \alpha_k \Delta \log Z_{k,t} + \gamma \log x_{i,t-1} + \sum_{k=1}^r \beta_k \log Z_{k,t-1} + \varepsilon_t, \quad (13)$$

where Z_k , $k=1, \dots, r$ is the set of explanatory variables and $i = s, l$. We do not allow for lags in the integrated variables, due to the limited data set. Our

modelling approach is to move from general to specific and test whether our model satisfies a number of important statistical properties, like absence of autocorrelation, absence of non-normality and absence of heteroskedasticity.

The estimation results of (13) applied to long-term unemployment outflow, after simplification, are presented in table 2. There is indeed little additional dynamics required to yield a model free from residual autocorrelation. The dynamic part of the model is confined to the change in the square of the log of the long-term unemployment rate. This latter variable is significant only at a 10 percent level and has a negative impact on the outflow rate of long-term unemployed. Apparently, an increase in the number of long-term unemployed job searchers only affects the outflow in the short run. In fact, the outflow rate, x_t , tends to decrease when long-term unemployment increases. This negative value corresponds to the negative elasticity of equation (8).

The long-run equilibrium part is, however, the more interesting part of the model. Here we find the evidence of competition with employed job searchers and with short-term unemployed. Both the adjustment parameter and the parameters of $\log m$, $(\log m \cdot \log u_s)$ and $(\log u_s)^2$ are highly significant. There is also some slight influence of regional mismatch: the outflow rate is negatively influenced by the fact that vacancies are offered in one place and unemployed search for a job in another place.

The diagnostic tests point towards possible misspecification, as the ARCH and RESET test statistics are rather high. This indicates that the functional form is suspect. If we eliminated both the quadratic growth rate of long-term unemployment and the regional mismatch indicator, which both have a parameter value insignificantly different from zero at 5 percent, we get the model of table 2, column 2.

In our model of the outflow rate of long-term unemployed, only the error-correction part is important. This model cannot be rejected by any of the diagnostic tests, so we find a stable long run relation between the outflow rate of long-term unemployed, the matching rate and the short-term unemployment rate. There is no significant effect of the level of long-term unemployed on the outflow rate of long-term unemployed.

This outflow simply depends on the intensity with which employed and short-term unemployed compete for a job, represented by the variables $\log n$,

$(\log m \cdot \log u_s)$ and $(\log u_s)^2$. Because of these non-linear effects, we have non-constant elasticities. They are graphed in figures 4 and 5. Figure 4 corresponds to elasticity (6) and reflects the amount of competition between employed job searchers and the long-term unemployed. In the first half of the period, the hiring rate has had a negative effect on long-term unemployment outflow. During that period, job-to-job movement was still considerable, so long-term unemployed suffered a great deal of competition from employed job searchers. In the first part of the 80's, the industrialized world plunged into recession and there was a dramatic decline in job-to-job movement. This implied that there was less competition for the long-term unemployed, thereby increasing their chances of finding employment and hence raising the outflow. In the second half of the 80's, labour market conditions improved, job-to-job movement increased, and the outflow of the long-term unemployed fell, leaving the elasticity at a value near minus one.

Figure 5 corresponds to elasticity (7) and reflects the level of discouragement of the long-term unemployed. In periods of economic distress, represented by the number of layoffs, i.e. short-term unemployed, competition with employed job searchers may fall, as job-to-job movement is low in these circumstances. However, there is then increased competition from short-term unemployed, looking for the few jobs that are being offered. Employers are likely to prefer a short-term unemployed over a long-term unemployed to fill a vacancy. This is a situation in which we assume that a long-term unemployed may give up hope of finding a job and hence become discouraged. We find that from the early 1970's, there has been some discouragement among long-term unemployed. Things worsened dramatically in the beginning of the 1980's, when huge amounts of workers were laid-off. When conditions on the labour market improved in the second half of the 80's, more long-term unemployed were able to find work and hence discouragement fell, and remained at a similar level as the second part of the 70's.

Note that the pattern in the elasticities of both figures moves in opposite directions. Clearly, the elasticity of the outflow rate with respect to short-term unemployment dominates. Therefore, the 'discouragement' effect has been much higher over the reference period than the 'hiring' effect.

Table 3 contains the estimation and test results for the short-term unemployment outflow, as specified by (13). A static regression of the I(1)

variables yields a statistic of 1.695, implying that also in this case the presence of a long-run equilibrium relation cannot be rejected and that little additional dynamics is needed to yield an adequate model. After some experimentation, (13) was simplified to the specification in the first column of table 3. The adjustment parameter has a value of almost -1 . An F-test on parameter restrictions gives $F(2,20)=1.245$, so our simplified model is presented in the final column of table 3. As opposed to the long-term outflow model, which had an adjustment parameter significantly different from -1 , this short-term outflow model can be restricted to one where $\log x_t$ is the dependent variable. Diagnostic tests indicate that the ultimate specification cannot be rejected at any reasonable significance level.

Also in this model the non-linear terms appear to be very important. These variables are related to the intensity with which all three categories of job searchers compete for the available jobs. Like the previous model, we have non-constant elasticities in this model as well. Their patterns are plotted in figures 6-8. The hiring rate elasticity in figure 6 shows a value of around 1 until the early 1980's. After that it drops to about 0.5. The explanation is again relatively straightforward. In the 1960's and early **1970's**, opportunities of finding a job for short-term unemployed were good, despite competition with employed job searchers. In the second part of the 1970's and early **1980's**, chances of finding a job were less, because of the economic downturn. However, since job-to-job movement is procyclical, this meant less competition with employed job searchers. During the same period, long-term unemployment sky-rocketed and discouragement surged. This also meant less competition for short-term unemployed. In the late 1980's, however, the Dutch economy was booming, which raised job-to-job movement, thus increasing competition with employed job searchers. Discouragement fell, see figure 5. This means that there was considerable competition for **short-term** unemployed. This competition appeared to be particularly fierce from the part of the non-participants searching for a job. A majority of the increase in employment in The Netherlands in the period 1985-1990 consisted of non-participants and not unemployed. Cf. Ministry of Social Affairs (1993). In figure 6, this is reflected by a permanently lower elasticity after 1984.

Figure 7 presents the outflow elasticity with respect to short-term unemployment. This value is relatively constant and negative throughout, with

a value around -0.9. The increase in layoffs due to the recession of 1981-2, lowered the chances for short-term unemployed of finding a job. These chances increased, however, during the subsequent upsurge. Note that this negative value means that the outflow rate is negative, but not necessarily that the outflow *in* persons is negative as well. In fact, in persons the elasticity with respect to short-term unemployment is slightly positive.

Figure 8 shows the response of short-term unemployment outflow to the long-term unemployment rate. This value is insignificantly different from zero almost the entire reference period. There was a slight negative impact throughout the 1970's, whereas in the early 1980's it was positive. The recession of that period caused a steep rise in long-term unemployment and discouragement. In its turn, this implied better opportunities of finding a job for short-term unemployed, which explains the positive value. After that, its value turns negative again, influenced by the economic upsurge.

6. COMPARISON WITH STANDARD MODELS

The final part of this paper is about a comparison between our models of the previous section and the 'standard' matching model for long-term and short-term unemployed job searchers. In these standard models, the number of matches are determined by the stock of vacancies and the pool of unemployed. This standard model typically has the form $x_i = f(v, u_i)$, $i = s, l$, where v is the vacancy rate. In essence, our model of competition and discouragement (12) boils down to $x_i = \theta(m, u_s, u_l)$, $i = s, l$. It is easy to show that this model can also be expressed in terms of vacancies and unemployment.

Assume a matching function m equivalent to the standard form, given by a Cobb-Douglas specification with constant returns to scale, $m = j^\alpha v^{1-\alpha}$. In our setting of competition and discouragement, this means that

$$x_i = e = \frac{m}{j} = \left(\frac{v}{j}\right)^{1-\alpha} \quad (14)$$

From the specification of the matching function, m , we can derive

$$\frac{v}{z} = \frac{m}{v_1}^{-\frac{1}{\alpha}} \quad (15)$$

Substituting (15) into (14) then yields, using the matching function m ,

$$x_i = \left(\frac{m}{v}\right)^{\frac{(1-\alpha)}{\alpha}} = \left(\frac{u_s + u_l + (1-u_s-u_l)\phi_N - \phi_L u_l}{v}\right)^{-(1-\alpha)} \quad (16)$$

In (16) the outflow rate for both short-term and long-term unemployed can be written as a function of ratio of unemployment and vacancies and the ratio of long-term unemployment and vacancies, or

$$x_i = \left(\frac{u_s + u_l}{v} - \frac{(1-u_s-u_l)\phi_N}{v} - \frac{\phi_L u_l}{v}\right)^{-(1-\alpha)} = \left(\frac{u}{v} + \frac{(1-u)\phi_N}{v} - \frac{\phi_L u_l}{v}\right)^{-(1-\alpha)} \text{ or}$$

$$x_i = \omega(v, u, u_l), = \omega(v, u_s, u_l), \quad i = s, l. \quad (17)$$

Here, w is the reduced form model for the outflow rate of both short-term and long-term unemployed that is derived from the simultaneous matching, competition and discouragement processes.

The matching model (17) for the outflow of long-term unemployed ($i = l$) differs from the standard model in that not only the stocks of vacancies and long-term unemployed determine the outflow of long-term unemployed, but also the stock of short-term unemployed. An increase in this latter variable decreases x_l . Both $x_l = \omega(v, u_s, u_l)$ and $x_l = \theta(m, u_s, u_l)$ are correct specifications of the competition-cum-discouragement model. In essence, we find the same reduced form model for the outflow rate of short-term unemployed ($i = s$). Also in this case, both $x_s = \theta(m, u_s, u_l)$ and $x_s = \omega(v, u_s, u_l)$ are correct specifications of the same process.

Since competition with employed job searchers and discouragement are important features in the job search process for unemployed, we must compare our results of tables 2 and 3 with the conventional approach. Hence, we first have to specify and estimate these standard matching models. Table 4, presents the estimation and test results of the standard models of short-term and long-term unemployment outflow rates, based on (17). For both models, we

have assumed a specification with constant returns to scale, which follows from numerous matching function studies. See, Blanchard and Diamond (1989), van Ours (1991), Layard et al. (1991) and Burda and Wyplosz (1994).

The model for the outflow rate of long-term unemployed based on (17) is presented in table 4, column 2. We find that the ratio of vacancies and short-term unemployment (V/U_s -ratio) has no effect on the outflow rate. However, the ratio of vacancies and long-term unemployment (V/U_l -ratio) does. In fact, this model boils down to the standard matching model for long-term unemployed, where the outflow of long-term unemployed is related to the stock of long-term unemployed and the stock of vacancies. The elasticity of the outflow rate with respect to long-term unemployment is -0.38. Note that in combination with the fact that the dependent variable is the outflow **rate**, i.e., X_l/U_l , the elasticity with respect to the outflow in **persons**, X_l , is positive, with a value of 0.62, whereas in the model of table 2 its value was insignificantly different from zero. This model did show a distinct effect of short-term unemployment on the outflow of long-term unemployed, representing the discouragement. In the standard model, we cannot find any influence.

The outflow rate of short-term unemployed to employment is affected by both the V/U_s and the V/U_l -ratio. An increase in long-term unemployed implies a decrease in the outflow rate of short-term unemployed. This represents competition with long-term unemployed. On the other hand, an increase in short-term unemployed rises the outflow rate of the short-term unemployed, as could be expected from standard matching models. Also the replacement rate influences the outflow of short-term unemployed. An increase in the replacement rate means the reservation wage of unemployed increases, so they have less incentive to accept a job offer as it arrives, which means that the outflow rate falls. In this model, the elasticity of short-term unemployment with respect to the outflow rate of equals -0.21, whereas in the model of table 3 we found a non-constant elasticity of about -0.9. The outflow **in persons**, X_s , is positive with a value of 0.8 for the model of table 4 and 0.1 for the model of table 3. The elasticity of the long-term unemployment with respect to the outflow rate is -0.22, whereas for the model of table 3 we found a non-constant elasticity of about -0.1. This implies that even though models (12) and (17) represent the same phenomenon, the elasticities are different.

The question is which of the models best fits to the data, our preferred specifications in tables 2 and 3, or the equally suitable models of table 4. To answer this question, we apply a number of encompassing tests to assess whether our preferred models encompass the rival models. For more details on the encompassing principle, we refer to Mizon and Richard (1986). Basically, the encompassing principle boils down to the fact that when model 1 does not encompass model 2, there is specific data information contained in model 2 not captured by model 1.

Table 5 presents the results of a number of encompassing tests. All tests point towards the conclusion that the competition-cum-discouragement model for the outflow rate of long-term unemployed job searchers encompasses the 'standard' model of long-term unemployment outflow of table 4. The encompassing tests for the short-term unemployment outflow model of table 3, which incorporates competition with employed and long-term unemployed job searchers, and the model of table 4, points towards the fact that the model of table 3 encompasses the model of table 4. This evidence is, however, not very strong. On the other hand, the results of these tests do emphasize the importance of the job competition and discouragement variables in search theory and matching functions.

Finally, we conduct a simulation experiment with our preferred model specifications and the models based on (17) in order to infer the differences in outflow into employment to an increase in labour supply. The outcome may have policy relevance for The Netherlands. One of the major labour market problems in The Netherlands is the low participation rate. In essence, there are two possible ways to increase labour participation, depending on the assumption one makes on the cause of this low participation. It may be caused by the fact that labour supply is too low. The cure is then to stimulate unemployed to search more actively. On the other hand, labour demand may also **fall** short. In that case stimulating labour supply would not solve the problem.

Table 6 presents the change in outflow, in number of persons, caused by an increase in labour supply, i.e., short-term or long-term unemployment; which ever is relevant. We assume that an increase in either category leaves the other category unaffected. The results of table 6 corroborate our earlier analysis, namely that the models based of (12) and (17) are both correct

representations of the same phenomenon. We find that the response of an increase in short-term unemployment is about the same in the models based on (12) and (17). In the model based on (12) this response is slightly lower. An increase in long-term unemployment has virtually no effect on the outflow of short-term unemployed in both models.

As far as discouragement is concerned, the table indicates that an increase in short-term unemployment, representing an economic downturn, leads to a fall in the outflow of long-term unemployed. Note that in the current situation on the Dutch **labour** market, this effect is twice as large as in an equilibrium situation. The model specification based on (12) does not yield a significant effect of long-term unemployment on the outflow of long-term unemployed, whereas the model based on (17) does. Thus, for the outflow model of long-term unemployed the simulation results of the two models cannot be compared. Our preferred model specification, based on the encompassing tests, does, however, represent the concept of discouragement, where an increase in short-term unemployment leads to a decrease in the outflow of long-term unemployed job searchers.

7. CONCLUDING **REMARKS**

In this paper, we have presented a model which not only includes competition between employed job searchers and unemployed, but also the phenomenon of discouragement of long-term unemployed persons. Long-term unemployed become discouraged when **labour** market conditions are bad, thus the number of layoffs increases, and they not only face competition of employed job searchers, but also of an increasing number of short-term unemployed looking for the few jobs being offered. In such a situation long-term unemployed give up hope of finding a job and hence become discouraged.

Applying this model to annual data for The Netherlands over the period 1965-1991, yields that long-term unemployment outflow rate has been negatively affected by employed job search, with a possible exception of the early **80's**, when job-to-job movement was low. Also short-term unemployment outflow is affected by employed job search, but much less. Particularly, the second half of the **1980's**, when on the job search was high, meant competition

for the short-term unemployed. From other sources we know that not only employed looked for another job, but that a lot of the newly offered jobs were filled by non-participants. This implies another source of competition, which is beyond the scope of this paper.

More importantly, this model enables us to visualize the level of discouragement of long-term unemployed. Discouragement started playing a significant role in long-term unemployment outflow in the second half of the 70's. Its effect increased dramatically in the early 80's; from 1987 onwards it is at approximately the same level as the second part of the 70's. Another important feature of this approach is that we find that a rise in the participation rate, via increased job search through unemployment, does not necessarily increase the unemployment outflow rate, especially of long-term unemployed.

Finally, some policy recommendations may follow from our models. **First**, in the short-term outflow model, the replacement ratio is an important variable. A lower replacement rate increases the outflow out of unemployment. A lower replacement ratio cannot only be achieved by lowering unemployment benefits, but also by increasing the net wage rate. The latter amounts to lowering the wedge. Both measures have already been proposed from a numerous number of theoretical point of view. Hence, also the flow approach to labour markets makes the same stance.

Second, discouragement of the long-term unemployed appears to play an important role in The Netherlands, particularly in the first half of the 80's when unemployment rose. So, measures to stimulate the job offer arrival rate to this group may reduce discouragement and hence increase the outflow of long-term unemployed to employment. There have already been made proposals in The Netherlands to provide favourable conditions for employers, like tax cuts, when a long-term unemployed is hired.

Third, low participation rates and a high level of unemployment, especially of long-term unemployed, are the major labour market problems in The Netherlands. Our model shows that a policy to stimulate participation through more incentives to search as an unemployed, e.g., by making it more difficult for employees to enter the disability provisions, not necessarily leads to more outflow of long-term unemployed to employment.

Table 2. Estimation and test results of long-term unemployment outflow, based on equation (12).

Dependent variable:	$\Delta \log x_{i,t}$	$\Delta \log x_{i,t}$
constant	1.232 [1.427]	1.232 [1.427]
$\Delta(\log u_t)^2$	-0.045 [-1.6381]	
$\log x_{i,t-1}$	-0.645 [-5.1551]	-0.481 [-4.8691]
$\log m_{t-1}$	4.075 [3.608]	3.605 [3.234]
$(\log m \cdot \log u_s)_{t-1}$	1.351 [3.572]	1.299 [3.341]
$(\log u_s)^2_{t-1}$	-0.236 [-2.688]	-0.230 [-2.731]
$\log mm1_{t-1}$	-0.194 [-1.5831]	
R^2	0.666	0.564
σ	0.234	0.254
AR $F(1, 18)$	1.109	0.036
AR $\chi^2(5)$	5.530	3.240
Normality $\chi^2(2)$	1.935	0.833
ARCH $F(1, 25)$	2.580	0.325
RESET $F(1, 18)$	2.616	2.554
CHOW $F(4, 15)$	1.163	0.688

The t-values are between square brackets, below the parameter values. AR stands for testing absence of autocorrelated disturbances; it consists of the F-version of the Lagrange Multiplier test due to Godfrey (1979) and the χ^2 -distributed Ljung-Box test. Normality is tested by means of the Jarque and Bera (1980) test. ARCH is tested with Engle's (1982) test. Finally, we also apply the familiar RESET test on functional form and omitted variables and the Chow test on predictive performance of the model. The test statistics indicate the null distribution and the degrees of freedom are presented in **parentheses** with these statistics. \tilde{R}^2 is the correlation coefficient, σ is the residual standard error.

Table 3. Estimation and test results of short-term unemployment outflow, based on equation (12).

Dependent variable:	$\Delta \log x_{s,t}$	$\log x_{s,t}$
constant	-2.467 [-1.841]	-1.316 [-2.3271]
$\Delta \log m_t$	1.120 [2.965]	
$\log x_{s,t-1}$	-1.003 [-5.0851]	
$\log m_{t-1}$	0.274 [0.322]	
$(\log m \cdot \log u_s)_{t-1}$	0.458 [5.946]	0.492 [8.649]
$(\log m \cdot \log u_t)_{t-1}$	-0.521 [-2.4791]	-0.336 [-3.935]
$\log u_{s,t-1}$	-1.037 [-2.5821]	-0.672 [-4.8591]
$\log m_t$		0.958 [3.567]
R^2	0.799	0.968
σ	0.154	0.150
AR $F(1,18)$	0.270	0.267
AR $\chi^2(5)$	1.910	4.760
Normality $\chi^2(2)$	0.231	1.710
ARCH $F(1,25)$	0.250	1.551
RESET $F(1,18)$	0.326	0.700
CHOW $F(4,15)$	0.885	0.559

Table 4. Estimation and test results of ‘standard’ matching models for short- and long-term unemployment outflow rates, based on equation (17).

Dependent variable:	$\log x_{s,t}$	$\Delta \log x_{l,t}$
constant	0.199 [1.372]	0.080 [1.143]
$\log(v/u_s)_t$	0.208 [3.540]	
$\log rr_{t-1}$		
$\log x_{l,t-1}$		-0.533 [-4.3591]
$\log(v/u_l)_{t-1}$	0.216 [6.709]	0.202 [3.857]
R²	0.960	0.453
σ	0.165	0.272
AR $F(1,22)$	0.191	0.163
AR $\chi^2(5)$	2.560	3.090
Normality $\chi^2(2)$	1.259	1.960
ARCH $F(1,25)$	1.781	0.399
RESET $F(1,22)$	0.035	2.005
CHOW $F(4,19)$	0.938	0.759

Table 5. Encompassing tests.

A. The model of long-term unemployment outflow, due to (12), versus the same model, due to (17).

The model of table 2 column 3 is called model 1

The model of table 4 column 2 is called model 2

model 1 vs. model2	Form	Test	Form	model 2 vs. model 1
-0.462	$N(0,1)$	cox	$N(0,1)$	-3.117 *
0.405	$N(0,1)$	Ericsson IV	$N(0,1)$	2.501 *
0.158	$\chi^2(1)$	Sargan	$\chi^2(3)$	4.830
0.152	$F(1,20)$	Joint Model	$F(3,20)$	1.772

B. The model of short-term unemployment outflow, due to (12), versus the same model, due to (17).

The model of table 3 column 1 is model 2

The model of table 4 column 1 is model 2

model 1 vs. model2	Form	Test	Form	model 2 vs. model 1
-2.317 *	$N(0,1)$	cox	$N(0,1)$	-3.875 *
1.736	$N(0,1)$	Ericsson IV	$N(0,1)$	2.619 *
3.059	$\chi^2(3)$	Sargan	$\chi^2(4)$	7.065
1.023	$F(3,18)$	Joint Model	$F(4,18)$	2.129 **

* indicates significance at a 5 percent and ** at a 10 percent level.

Table 6. Simulation results. The change in the outflow (in 1000 persons) from the two unemployment duration classes due to a 1 percentage point increase in the short- and long-term unemployment rates for two baseline projections').

		Baseline 1 ²⁾			Baseline 2 ³⁾		
		Effect of a shock in			Effect of a shock in		
		U_i :	U_s	U_l	U_i :	U_s	U_l
on the outflow of							
U_s	model (12)		57	0		23	0
	model (17)		60	-1		25	-1
U_l	model (12) ⁴⁾		-2			-1	
	model (17)			39		-	21

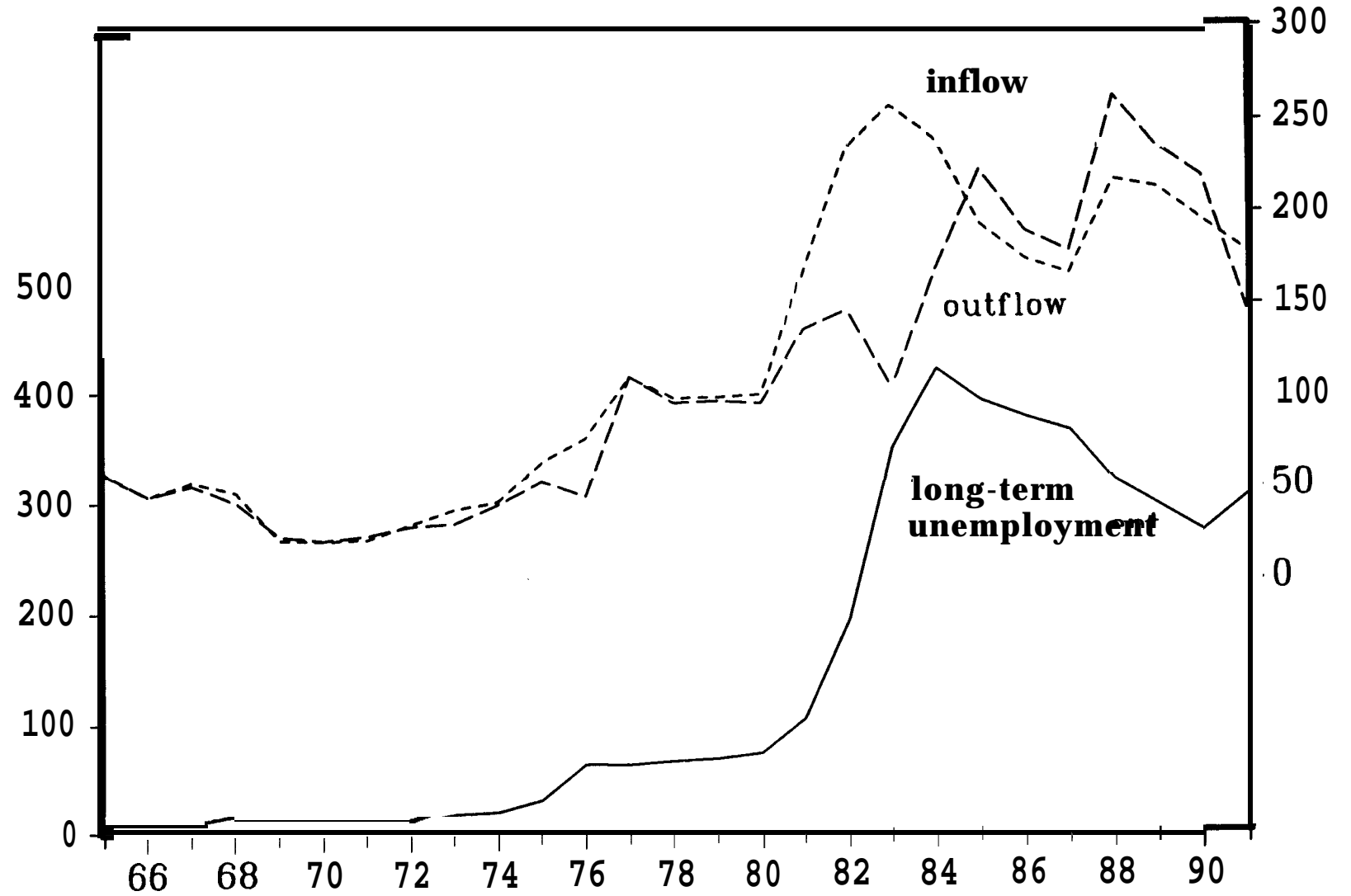
1) The - indicates that, there is a theoretical effect, but that it is insignificantly different from zero.

2) In baseline 1, which is related to the Current Dutch situation, we have set $N = 5000$, $U = 600$, $U_s = 300$, $U_l = 300$, $X = 500$, $X_s = 300$, $X_l = 200$.

3) In baseline 2, which is a more or less equilibrium situation derived from the situation in the early 1970's, we have set $N = 4000$, $U = 400$, $U_s = 330$, $U_l = 70$, $X = 240$, $X_s = 180$, $X_l = 80$.

4) The response of this model to a shock in short-term unemployment is a measure of discouragement of long-term unemployed job searchers.

Figure 2. Long-term unemployment: stock and flows in The Netherlands 1965-1991 (stock: left scale, flows: right scale).



- 25 -

- L T U U - - - - LTUI3 - - - - LTU03

Figure 3. Unemployment inflow and outflow from short-term and long-term unemployment in The Netherlands, 1965-1991.

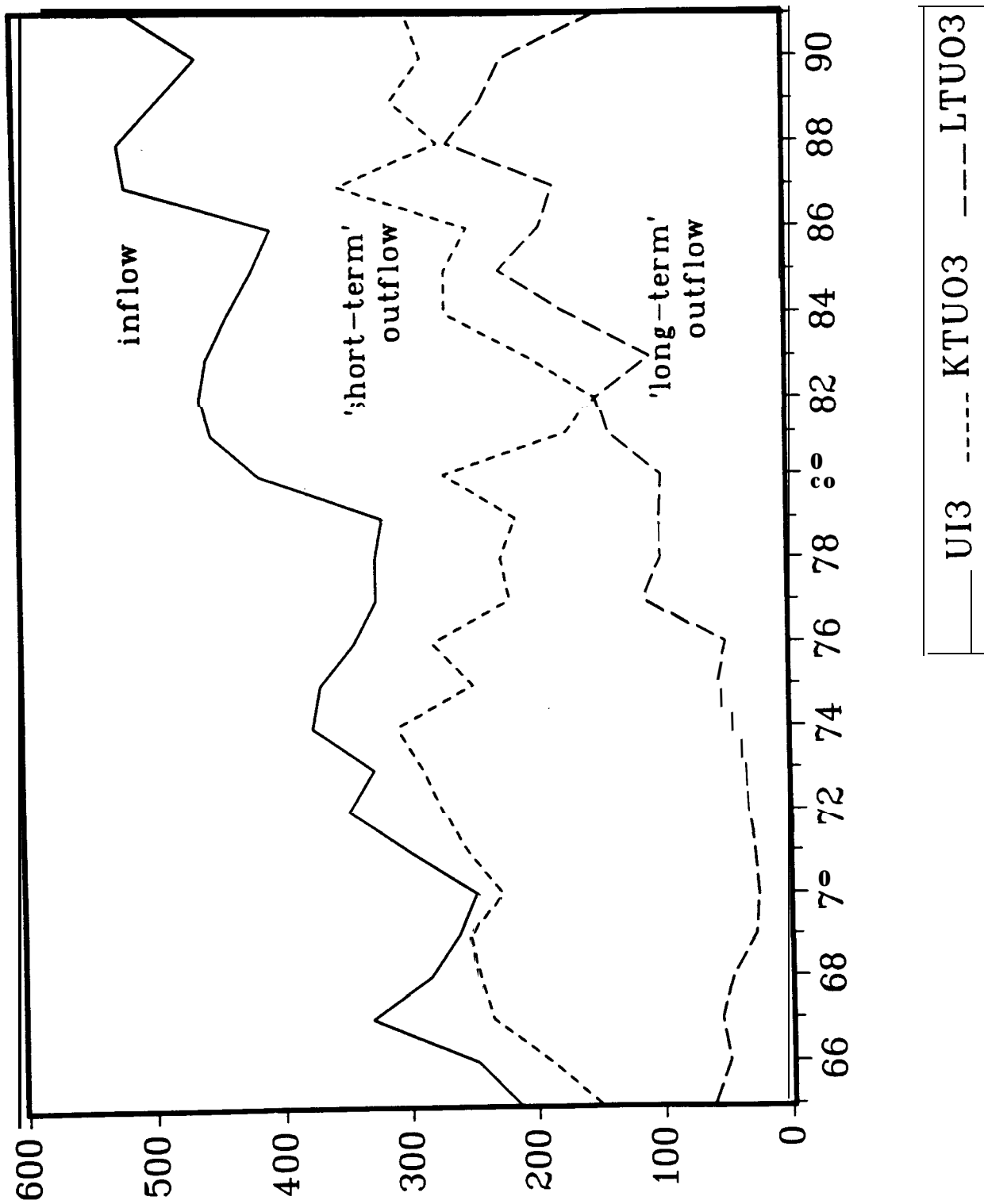


Figure 4. Hiring rate elasticity, with 2 standard error boundaries, of the model of long-term unemployment outflow.

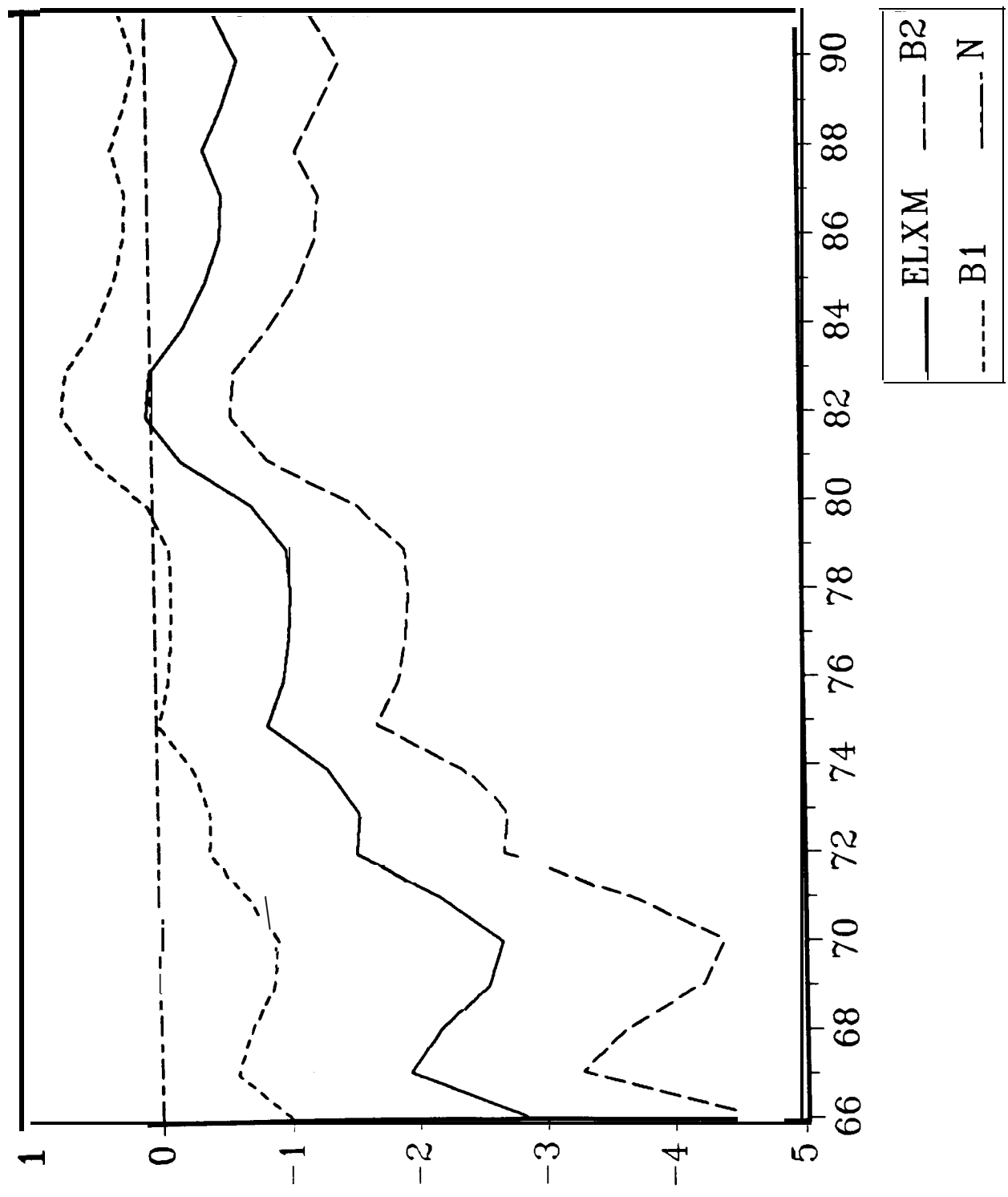


Figure 5. Short-term unemployment elasticity, with 2 standard error boundaries, of the model of long-term unemployment outflow.

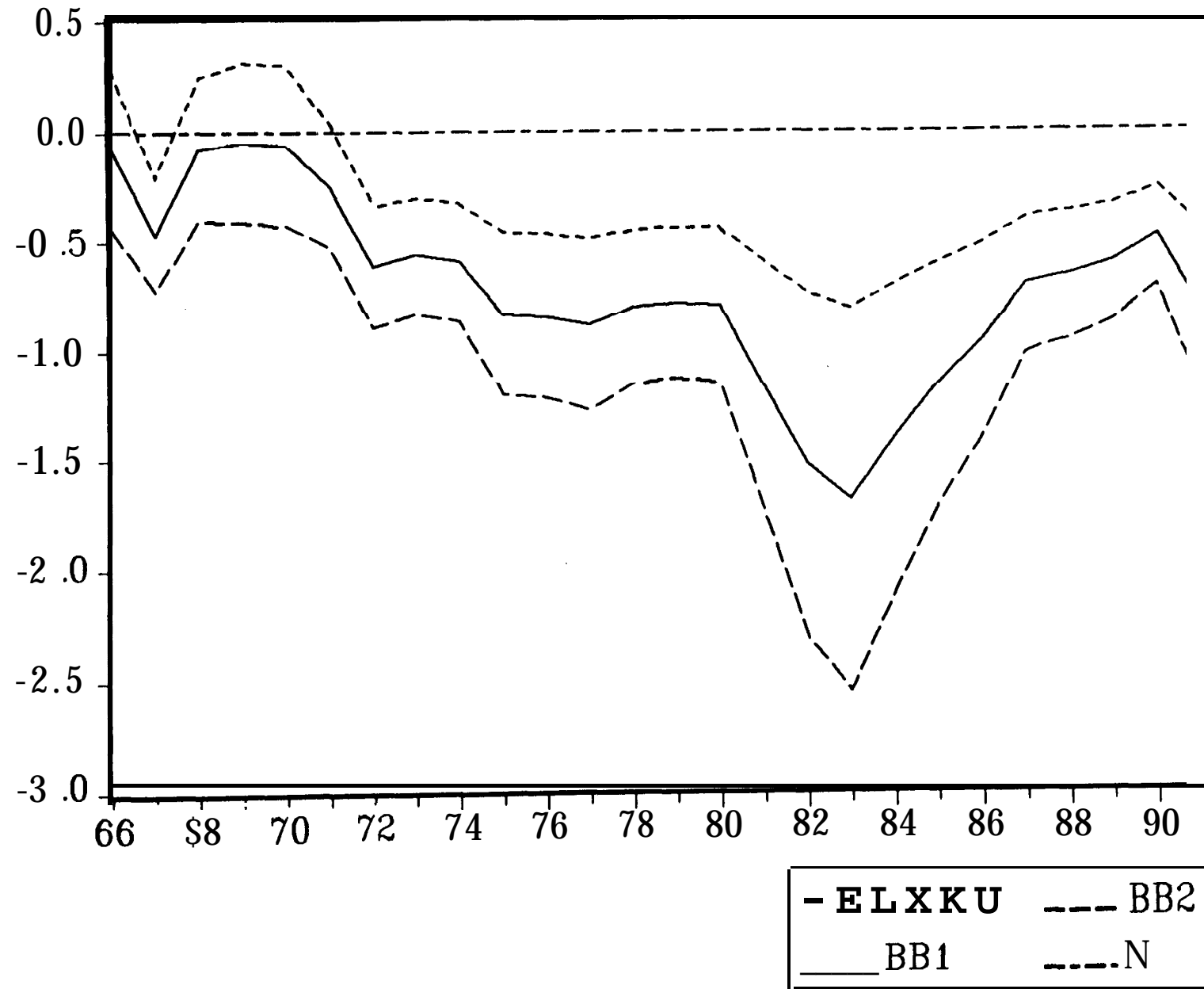


Figure 6. Hiring rate elasticity, with 2 standard error boundaries, of the model of short-term unemployment outflow.

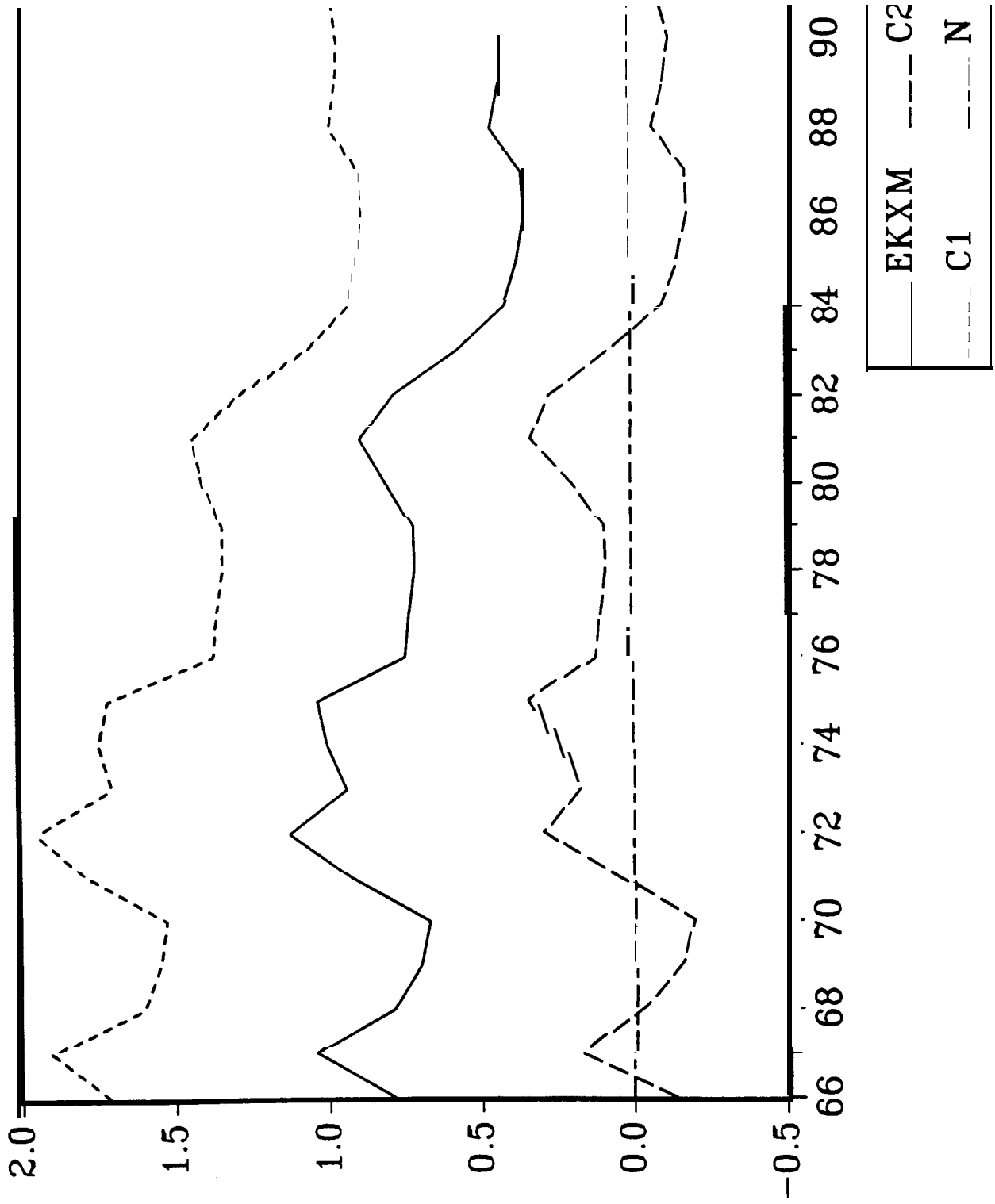


Figure 7. Short-term unemployment elasticity, with 2 standard error boundaries, of the model of short-term unemployment outflow.

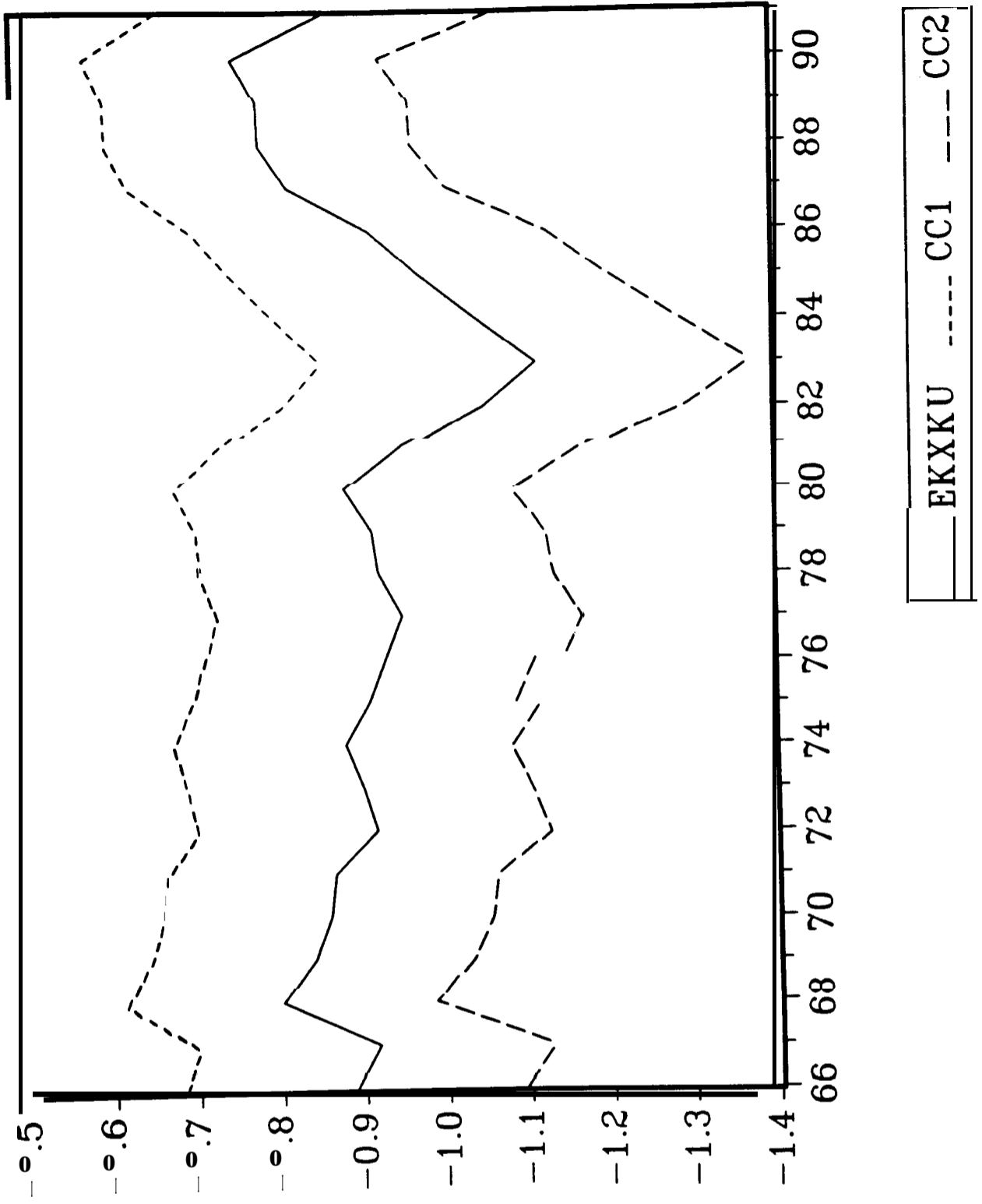
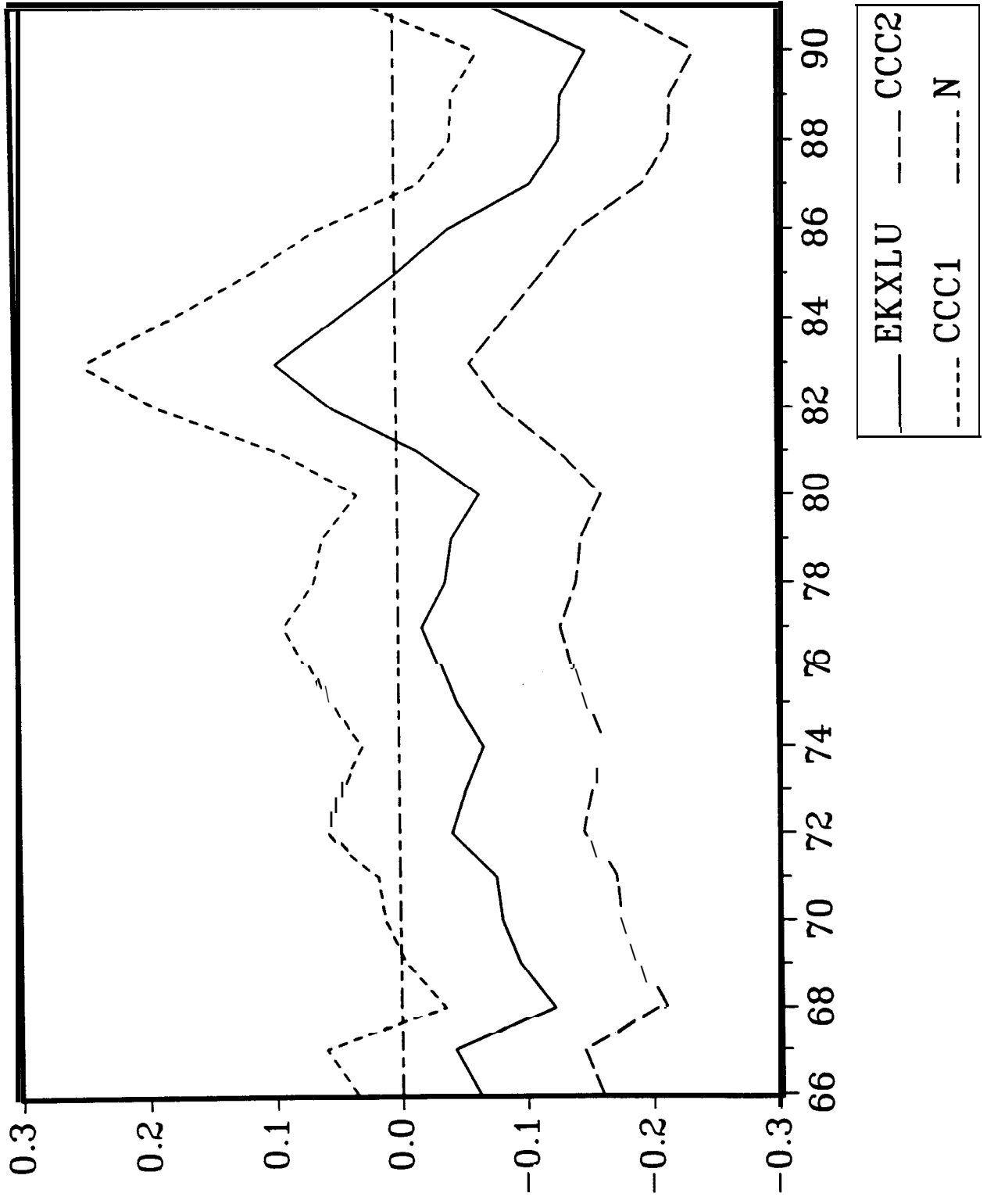


Figure 8. Long-term unemployment elasticity, with 2 standard error boundaries, of the model of short-term unemployment outflow.



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APPENDIX. DATA

Abbreviations

CBS: Netherlands Central Bureau of Statistics

CPB: Netherlands Central Planning Bureau

OECD: Organization of Economic Cooperation and Development

Definitions and sources

x_t : outflow rate out of long-term unemployment: $X_t/U_{t,-1}$

$x_{t,}$: the outflow of the number of long-term unemployed.

X_t is calculated as

$$X_t = F_{su,tu} - \Delta U_t,$$

where $F_{su,tu}$ is the inflow into long-term unemployment, which is calculated as the product of last periods probability of remaining unemployed for more than one year and the total unemployment inflow of the previous period, hence

$$F_{su,tu} = \text{Pr}_{-1}(U > 1 \text{ year})U_{in,-1}$$

$\text{Pr}(U > 1 \text{ year})$ can be calculated from unemployment duration figures, where the number of unemployed with duration 12-24 months in period t is divided by the number of unemployed with duration 0-12 months in period $t-1$.

source: CBS, *Sociale maandstatistieken*

Ministry of Social Affairs, unpublished series.

U_{in} : the inflow into unemployment, which consists of inflow of the number of persons receiving unemployment insurance benefit (WW) and inflow of persons on unemployment support (RWW). Or: the inflow from non-participation ($F_{n,u}$) and employment ($F_{e,u}$).

The inflow of persons receiving an unemployment insurance benefit is directly observable.

source: Sociale Verzekeringsraad, *Kroniek van de sociale verzekeringen*, 1992.

The inflow of persons into unemployment support is approximated by half the flow of school-leavers. See also Broersma (1994).

source: CBS, *Het onderwijs vanaf* 1950

CBS, Statistisch Jaarboek, 1992, 1993.

Ministry of Social Affairs, *Rapportage Arbeidsmarkt*.

U_t : the number of unemployed job searchers with an unemployment duration of more than one year

source: van Ours (1991).

CPB, *Lange reeksen*.

- x_s : outflow rate out of short-term unemployment: $X_s/U_{s,-1}$
- X_s : outflow of the number of short-term unemployed into employment, calculated as $X_s = X - X_1$.
- X : outflow rate out of total unemployment: $X = U_{in} - AU$.
- U_s : the number of unemployed job searchers with an unemployment duration of less than one year. This is calculated as $U_s = U - U_1$.
- U : the number of unemployed job searchers.

source: CPB, *Lange reeksen*.

- E : total employment in 1000 persons

source: CPB, *Lange reeksen*.

- u_l : long-term unemployment rate: $U_l/(E + U)$

- u_s : short-term unemployment rate: $U_s/(E + U)$

- m : hiring rate: $(H + JJ)/(E_{-1} + U_{-1})$,

- H : the gross inflow into employment, save job-to-job movers, calculated as $H = \Delta E + F_{out}$.

- F_{out} : persons moving from employment to unemployment and non-participation

source: Broersma (1995)

- JJ : the number of employed persons moving from one job to another.

source: Hartog et al. (1988)

CBS, *Arbeidskrachtentelling*

Ministry of Social Affairs, *Kwartaalbericht Arbeidsmarkt*

and author's own calculations.

- rr : replacement ratio, defined as the weighted average of the weekly net unemployment insurance benefit and the weekly unemployment support benefit, divided by the average weekly net pay in manufacturing

source: Sociale Verzekeringsraad, *Kroniek van de sociale verzekeringen*, 1992.

CBS, *80 jaar statistiek in tijdreeksen*.

CBS, *Sociaal - economische maandstatistiek* 1993.

Ministry of Social Affairs, *Rapportage arbeidsmarkt*.

- mml : regional mismatch index of the eleven Dutch provinces.

It is calculated as the absolute value of the forecast error of the individual W-curves, hence

$$U_i = \alpha_0 + \alpha_1 V_i + \varepsilon_i,$$

and $mm1 = \sum_{i=1}^{11} |\varepsilon_i|$.

source: **CBS, Sociaal – economische maandstatistiek.**
CBS, Statistisch Zakboek.

mm2: sectoral mismatch index for six Dutch sectors, due to Lilien (1982).

It is calculated as

$$mm2 = \left\{ \sum_{i=1}^6 (E_i/E) [\Delta \log E_i - \Delta \log E]^2 \right\}^{1/2}.$$

source: calculated from **CBS, Statistisch Zakboek.**

E_i : employment in six sectors in The Netherlands.

source: **CBS, sociaal – economische maandstatistiek.**

ξ_{1624} : fraction of employed persons between 16 and 24 years old.

source: calculated from **CBS, Statistisch Zakboek.**

ξ_{5564} : fraction of employed persons between 55 and 64 years old.

source: calculated from **CBS, Statistisch Zakboek.**

ψ_{25} : ratio of unemployed below 25 and employed below 25.

source: calculated from **CBS, Statistisch Zakboek.**

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