Faculteit der Economische Wetenschappen en Econometrie

Serie research memoranda

Competition Between Unemployed and Non-Participants, and Unemployment Hysteresis

Frank A.C. den Butter
Egbert L.W. Jongen
Udo Kock

Research Memorandum 1999-13

February 1999

/a/l/e/r/t/

applied
labour
economics
research
team

vrije Universiteit amsterdam

Competition Between Unemployed and Non-Participants, and Unemployment Hysteresis

Frank A.G. den Butter?, Egbert L.W. Jongen[†] and Udo Kock[§]

January 1999

Abstract

This paper considers labour supply and demand shocks in a simple flow model of the labour market. We explicitly model the propagation of shocks and the adjustment mechanisms. By way of simulations we explore the extent of labour market hysteresis arising from negative duration dependence and the so-called entitlement effect that arises when social security provisions become more generous. The main findings of our modelling exercise are: (i) the extent of hysteresis depends very much on the way labour demand reacts to labour supply, (ii) negative duration dependence adds to unemployment hysteresis, and, (iii) the degree of hysteresis depends on the type of the shock.

Keywords: unemployment persistence, labour market flows

[‡] Corresponding author: Scientific Council for Government Policy, Tinbergen Institute and Free University, Applied Labor Economics Research Team (ALERT), Department of Economics: De Boelelaan 1105, 108 1 HV Amsterdam, The Netherlands, email: fbutter@econ.vu.nl, tel. 003 l-20-4446047, fax: 003 1-20-4446005.

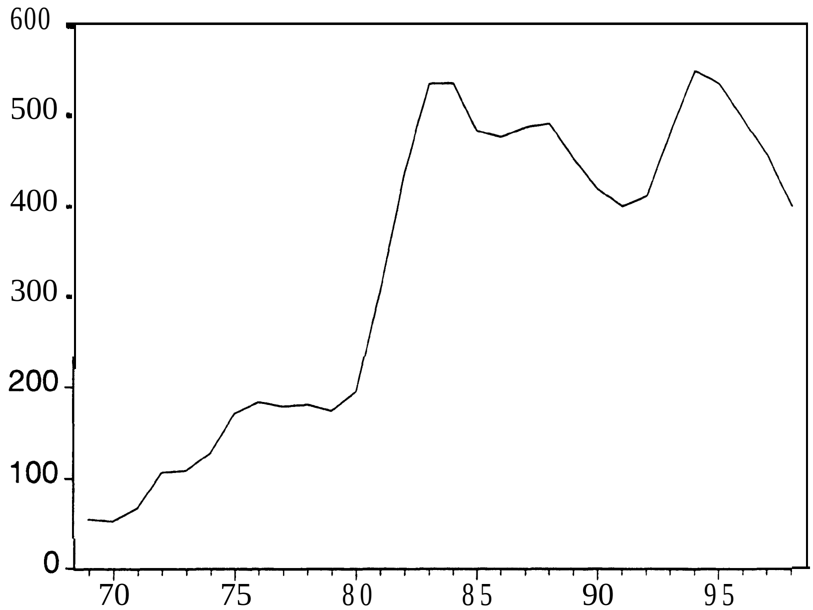
[†] Tinbergen Institute and Free University, Applied Labor Economics Research Team (ALERT), Department of Economics: De Boelelaan 1105, 1081 HV Amsterdam, The Netherlands, email: jongen@tinbinst.nl.

[§] Tinbergen Institute and Free University, Applied Labor Economics Research Team (ALERT), Department of Economics: De Boelelaan 1105, 1081 HV Amsterdam, The Netherlands, email: kock@tinbinst.nl.

1. Introduction

During the 1970s and 1980s the Netherlands, like most other European countries, witnessed a dramatic rise in the unemployment rate (see Figure 1 below). This rise was characterised by a number of upward jumps; steady state unemployment seemed to move to a higher level after each cyclical downturn (see e.g. Bean (1994)). This pattern in unemployment rates suggests that there is unemployment persistence in the Netherlands (see e.g. Hartog and Theeuwes (1993), Graafland (1988)).

Figure 1 Unemployment in the Netherlands (x 1000 persons)



Source: CPB Netherlands Bureau for Economic Policy Analysis.

Due to shocks to labour supply and demand unemployment may deviate from its unique long-run balanced growth level. Several factors may prevent a quick return to its long-run balanced growth level, e.g. adjustment costs, wage-price staggering effects, insider-outsider effects, hazardous welfare state dynamics and a loss of skills in unemployment (see e.g. Bean (1994), Lindbeck (1995), Snower (1997)). In this paper we focus on negative duration dependence and on the entitlement effect of social security as possible causes of unemployment persistence.

A loss of skills in unemployment which reduces the stock of human capital in the labour market may cause negative duration dependence in the exit rate out of unemployment. A loss of skills in unemployment may hamper the process by which unemployed job seekers are matched to vacant jobs (see e.g. Layard *et al.* (1991), Pissarides (1992), Ljunqvist and Sargent (1998)). On the demand side, firms may close down part of their vacancies if the fall in the stock of human capital is unaccompanied by an equiproportionate fall in wage and search costs per unit of human capital. On the supply side, a loss of skills may reduce the search effort over the unemployment spell. The returns from job search may fall due to a reduced ability to locate vacant job slots or via a downward shift in the relevant wage offer distribution. More in general, negative duration dependence may also arise because of discouragement, getting accustomed to live on unemployment benefits and shifting moral standards which even lead some of the unemployed to seek employment in the underground economy (see e.g. Lindbeck (1995)).

These latter causes of negative duration dependence are related to the "entitlement effect of social security". In the seventies the social security system in The Netherlands became increasingly generous. As a result more persons from the working age population learned how to become eligible for social security provisions. Estimation of the entitlement effect as a residual trend in social security provisions which can not be explained by demand (see Den Butter (1993)) shows that it may have led to an autonomous increase in social security provisions of about 300 000 labour years. The resulting increase in social security contributions may lower the utility derived in the state of employment relative to unemployment.

In this paper we consider how the "entitlement effect" and negative duration dependence affect a stylized model of the Dutch labour market. Specifically, we consider the persistence of unemployment deviations from its long-run balanced growth level in a simple flow model of the labour market. On the demand side of the model we have firms that post vacancies. On the supply side we have short- and long-term unemployed job-searchers and a stock of non-participants that actively search for a job. The speed at which demand and supply come together is determined by an aggregate matching function. The number of job-worker separations is fixed.

The paper has the following outline. Section 2 presents the flow model. Section 3 considers the impact of labour supply shocks on unemployment. Section 4 considers the impact of labour demand shocks on unemployment. Section 5 concludes.

2. The model

Individuals in the working age population can be in one of four states on the labour market: employment, E, short-term unemployment, U_s, long-term unemployment, U_l, and non-participation, N. Jobs in the labour market can be either filled and producing, E, or vacant and searching, V.

The distribution of workers and jobs over the different states depends on the flows between them. In this paper we focus on worker flows. Specifically, we consider the endogenous determination of the flow from unemployment to employment, the flow from non-participation to employment and the flow from short- to long-term unemployment. All other flows are exogenous in the model.

The core of the model is a constant-returns-to-scale Cobb-Douglas matching function. This specification is typically not rejected in empirical work on the Dutch labour market (see e.g. Broersma and Van Ours (1998)). The matching function can be viewed as a neo-classical production function that relates the number of matches (output), M, to the number of effective job-seekers and vacancies (inputs). The effective number of job seekers is a weighted sum of the number of short- and long-term unemployed, and non-participants. The aggregate number of matches is given by

$$M = cV^{\alpha}(U_s + \theta U_l + \rho N)^{1-\alpha},$$

where c and α denote search technology parameters. We multiply the long-term unemployed by a factor θ ($0 < \theta \leq 1$). θ reflects negative duration dependence in the escape rate from unemployment due to a loss of skills or other reasons for negative duration dependence at the micro level mentioned in the introduction. Furthermore, we weigh the number of non-participants by ρ ($\rho > 0$), ρ reflects a differing effective input of non-participants in the aggregate matching process (search intensity, acceptance probability) relative to the short-term unemployed.

The outflow rates into employment from short-term unemployment, π^*_s, long-term unemployment, π^*_l, and from non-participation, π_n, are given by

$$\pi_s^* = M_s / U_s = M / (U_s + \theta U_l + \rho N),$$

$$\pi_l^* = \theta \pi_s^*,$$

and

$$\pi_n = \pi_s^*,$$

respectively. The overall escape rates from unemployment for short- and long-term unemployed are given by

$$\pi_s = \pi_s^* + UO_{ex} / (U_s + \theta U_l),$$

and

$$\pi_l = \theta \pi_s,$$

where UO_{ex} denotes the exogenous outflow from unemployment, that is, individuals flowing from unemployment to non-participation and individuals flowing from unemployment to employment without filling a vacancy (i.e. unemployed individuals filling a latent vacancy).

The model is specified in monthly periods. Short-term unemployment at time t is defined as the sum of the first 12 duration classes of unemployment at time t

$$U_{s,t} = \sum_{k=1}^{12} U_{k,t} .$$

The first duration class in short-term unemployment is assumed to be equal to the inflow into unemployment, UZ. The number of individuals in the subsequent duration classes k in short-term unemployment at time t are given by

$$U_{k,t} = (1-\pi_s)U_{k-1,t-1}.$$

Long-term unemployment at time t is given by

$$U_{l,t} = (1-\pi_s)U_{12,t-1} + (1-\pi_l)U_{l,t-1}.$$

The model explicitly describes the flows through the various duration classes of unemployment and hence the propagation of shocks through time (see Den Butter and Van Dijk (1998) for a related model). This feature of the model is essential for calculating unemployment persistence during the period that unemployment deviates from its equilibrium value after a shock.

Having discussed the endogenous flows in our model of the labour market we complete the model by considering the relation between the stocks and flows. Unemployment evolves according to the law of motion

$$U_t = U_{t-1} + UI_t - UO_t = U_{t-1} + (F_{eu,t} + F_{nu,t}) - (F_{uev,t} + F_{uej,t} + F_{un,t}),$$

where UI denotes the inflow in unemployment, UO denotes the outflow from unemployment, F_{eu} is the exogenous flow from employment to unemployment associated with job destruction, Fnu is the exogenous inflow from non-participation into unemployment, F_{uev} is the number of matches for the unemployed, F_{uej} is the exogenous number of unemployed that fill a latent vacancy and F_{un} is the exogenous outflow from unemployment to non-participation.
Employment evolves according to the law of motion

$$E_t = E_{t-1} + EI_t - EO_t = E_{t-1} + (F_{uev,t} + F_{uej,t} + F_{nev,t} + F_{nej,t}) - (F_{eu,t} + F_{en,t}).$$

EI denotes the inflow into employment, EO denotes the outflow from employment, F_{nev} denotes the endogenous number of non-participants that fills a vacancy, F_{nej} denotes the exogenous number of non-participants that fills a latent vacancy and F_{en} denotes the exogenous outflow from employment to non-participation. In the base projection of the model we assume that the inflow of vacancies and non-participants equals the respective outflow from these states.

In the base projection of the model we use the average flows observed in the Dutch labour market over the period 1970-1995. For the construction of these data see Kock (1998).[1] The efficiency parameter c is calibrated so as to let the average outflow from unemployment and non-participation accord with the data. Furthermore, the weights of vacancies and unemployment in the aggregate matching function, a and $(1-\alpha)$, are set in accordance with the findings of Broersma and Van Ours (1998) on Dutch data.

3. Labour supply shocks

In this section we consider how unemployment evolves after a shock to labour supply, under various assumptions. We present two sets of simulations. In the first set of simulations (Section 3.1) we assume that labour demand reacts so as to keep the ratio between vacancies and the effective number of job-seekers unchanged (in line with search theory, see e.g. Pissarides (1990, Chapter 3)). In the second set of simulations (Section 3.2) we assume that the number of job slots is fixed ('lump-of-labour-fallacy'). Specifically, we assume that inflow of vacancies is independent of the number of effective job-seekers.

The shock to labour supply is modelled as a temporary change in F_{nu} or ρN by 7.5 thousand persons in the first 12 months of the simulation. When the labour supply shock is modelled as a change in F_{nu} unmatched additional labour supply joins the unemployment pool. When the labour supply shock is modelled as a change in ρN unmatched additional labour supply remains in the state of non-participation.

---

[1] Part of the flows are data. The unknown flows are constructed under the assumption that over the period 1970-1995 inflow into the various states was equal to the outflow over the period considered.

3.1 Flexible number of job slots

In this set of simulations we assume that the number of vacancies in the market is given by

$$V_t = V^* + \xi(U_{s,t} + \theta U_{l,t} + \rho N_t - U_s^* + \theta U_l^* + \rho N^*),$$

where V^*, U_s^*, θU_l^* and ρN^* denote the number of vacancies, short-term unemployed, the effective number of long-term unemployed and the effective number of non-participants searching for a job in the steady-state equilibrium, respectively. ξ denotes a positive parameter. In line with the model of Pissarides (1990, Chapter 3) we assume that the ratio of vacanices over the number of effective job-seekers remains unchanged after a labour supply shock (ξ is set at the ratio between vacancies and the effective supply of labour in the steady-state). In response to a positive (negative) shock to labour supply vacancies jump above (below) their steady-state level.

Simulation results of a positive and a negative shock to the inflow from non-participation into unemployment are given in Table 1 below.

Table 1 Effect on unemployment of a change in F_{nu}, VI flexible

Specification	Effect on unemployment as a percentage of the shock after			
	1 year	3 years	10 years	∞
Positive shock				
θ = 1	73.2	21.9	03.	0
θ = 0.5	84.2	43.9	45.	0
Negative shock				
θ = 1	-73.2	-21.9	-0.3	0
θ = 0.5	-84.2	-43.9	-4.5	0

In the first specification we assume no duration dependence in the escape rate from unemployment (8 = 1 (see Section 2)). In the second specification we assume that there is (negative) duration dependence (θ = 0.5).

The first thing to note from Table 1 is that unemployment changes in response to the increased inflow. Indeed, even though vacancies rise (decline) in proportion with the increase (decrease) in the number of effective job seekers, unemployment stays above its equilibrium level for quite some time. The matching technology accommodates only part of the shock in a given period.

Second, the initial impact of a shock on unemployment is larger when there is duration dependence in the exit rate from unemployment. The increased (decreased) inflow pushes unemployment above (below) its equilibrium level. Consequently, the share of long-term unemployed individuals increases (decreases), reducing the effective supply of labour at given unemployment. This hampers the ability of the matching process to equilibrate the market. Whereas the shock has virtually vanished after 10 years when there is no duration dependence, still 5 per cent of the shock is in the system after 10 years when there is duration dependence in the exit rate.

Finally, we observe that the impact of a positive and negative shock to the inflow into unemployment on unemployment is symmetric.

We do not report simulation results on shocks to ρN on unemployment. Indeed, as vacancies adjust so as to keep the ratio between vacancies and the effective number of unemployed unchanged the outflow rates from short- and long-term unemployed are unchanged. As neither the in- nor the outflow from unemployment changes when there is a change in the effective number of non-participants looking for a job, the impact on unemployment is nil when vacancies are fully flexible.

3.2 The second set of simulations

In the second set of simulations we assume that the change in labour supply does not induce a response in labour demand. Specifically, we assume that the number of job slots (vacant and filled jobs) remains unaltered when labour supply changes ('lump-of-labour-fallacy'). We model this as a fixed inflow in the number of vacancies which is set equal to the exogenous outflow from employment (i.e. a world with a fixed number of job slots).

We present four simulations. In the first two simulations we shock the inflow from non-participation into unemployment, F_{nu}. Simulation results are reported in Table 2.

Table 2 Effect on unemployment of a change in F_{nu}, VI fixed

Specification	Effect on unemployment as a percentage of the shock after			
	1 year	3 years	10 years	∞
Positive shock				
$\theta = 1$	87.1	65.1	27.6	0
$\theta = 0.5$	85.3	68.4	35.1	0
Negative shock				
$\theta = 1$	-84.9	-57.7	-21.9	0
$\theta = 0.5$	-82.7	-61.5	-28.6	0

In Table 2 we present simulation results on positive and negative shocks to the flow from non-participation into unemployment. We assume that unmatched non-participants join the pool of unemployed. The simulation with a positive shock may represent the entitlement effect where the increase in labour supply does not alter the costs of opening a vacancy and therefore does not affect labour demand.

Once again we note that unemployment changes in response to the change in the inflow into unemployment. However, when the number of job slots is assumed to be fixed, shocks are far more persistent. Furthermore, unemployment persistence depends positively on the extent of (negative) duration dependence. Finally, note that the impact of shocks is (more) asymmetric when vacancies are fixed (which reflects the decreasing marginal 'output' from additional job-seekers in the matching function).

In the third and fourth simulation we shock the number of non-participants that offer their labour, where unmatched non-participants do not flow into unemployment but remain in the state of non-participation. Simulation results are given in Table 3 below.

Table 3 Effect on unemployment of a change in ρN, VI fixed

Specification	Effect on unemployment as a percentage of the shock after			
	1 year	3 years	10 years	∞
Positive shock				
e = 1	25.	24.	10.	0
e = 0.5	30.	31.	15.	0
Negative shock				
e = 1	-2.6	-2.5	-1.0	0
e = 0.5	-3.1	-3.2	-1.6	0

Changes in the number of non-participants that offer their labour do affect unemployment when the stock of job slots, vacancies plus employment, is fixed (note: the effect was nil when vacancies were fully flexible). Indeed, an unchanged stock of jobs has to be divided among more candidates. Unemployment eventually returns to its equilibrium level. After the shock the number of matches is above its equilibrium level as long as the inputs (unemployment) in the matching function are above their equilibrium level, pushing unemployment down. Note that with duration dependence the impact on unemployment is larger after 3 years than after 1 year, whereas the effect eventually falls to zero. The unemployed temporarily face more (less) competition from non-participants, whereas the inflow of vacancies is fixed. After the shock has ended, the stock of vacancies will be below (above) its equilibrium level, pushing unemployment further away from its equilibrium level. However, there is a steady inflow of new vacancies. Hence, the stock of vacancies eventually recovers after the initial shock, and so does the outflow from unemployment (in our model there is only one equilibrium level of unemployment).

Furthermore, note that impact of either shock on unemployment is limited when unmatched non-participants do not join the unemployment pool. Hence, if a labour supply shock is to have a large effect on unemployment, the additional labour supply has to be counted as unemployed. Finally, note that the impact of positive and negative shocks on unemployment is virtually identical.

From the supply shock simulations we conclude that the impact of labour supply shocks depends negatively on the flexibility of labour demand, and positively on the degree of unemployment persistence. The impact on unemployment is most pronounced when the unabsorbed change in labour supply joins the unemployment pool.

4. Labour demand shocks

In this section we briefly consider the relation between competition between unemployed and non-participants and labour demand shocks. We implement labour demand shocks as a temporary change in the stock of vacancies in the market. Specifically, the number of vacancies decreases (increases) by 50 per cent during the first year of the simulation. We consider the impact of changes in the number of vacancies on unemployment in the presence and absence of competition from non-participants.

Simulation results in the absence and presence of competing non-participants are given in Tables 4 and 5 below, respectively.

Table 4 Effect on unemployment of a change in *V*, $\rho = 0$

Specification	Effect on unemployment as a percentage of the shock after			
	1 year	3 years	10 years	∞
Positive shock				
$\theta = 1$	-7.6	-4.1	-0.5	0
$\theta = 0.5$	-8.3	-5.9	-19 .	0
Negative shock				
$\theta = 1$	10.6	59 .	07 .	0
$\theta = 0.5$	11.2	81 .	26 .	0

Table 5 Effect on unemployment of a change in *V*, *ρ* > *0*

Specification	Effect on unemployment as a percentage of the shock after			
	1 year	3 years	10 years	∞
Positive shock				
e= 1	-7.2	-3.3	-0.2	0
e= 0.5	-8.1	-5.3	-1.3	0
Negative shock				
e= 1	10.3	49.	04.	0
e= 0.5	11.0	74.	18.	0

From Table 4 and 5 we observe that the presence of competing non-participants reduces the responsiveness of unemployment to shocks to labour demand, i.e. changes in vacancies. Positive shocks to labour demand are partly absorbed by non-participants, reducing the number of additional job slots available for unemployed job seekers. Negative shocks to labour demand are partly absorbed by non-participants, once again softening the impact on unemployment.

Furthermore, we observe that the impact of demand shocks on unemployment is asymmetric. Positive shocks reduce unemployment by more than negative shocks raise it (due to the diminishing returns to the inputs in the aggregate matching function).

5. Concluding remarks

In this paper we consider labour supply and demand shocks in a simple reduced-form flow model of the labour market. The model simulations aim at investigating the extent of labour market hysteresis which can be ascribed to negative duration dependence and to the social security system becoming more generous so that changes occur in the pattern of competition between the various groups who are searching for a job.

The main findings of our modelling exercise are:

1. When the shock to labour supply is modelled as a change in the inflow from non-participation into unemployment, unemployment is pushed above its equilibrium level.
2. The impact on unemployment is larger when the exit rate from unemployment is subject to negative duration dependence. Hence negative duration dependence contributes to the hysteresis of unemployment after a labour supply shock
3. The impact on unemployment is larger if the number of vacancies does not respond to the change in the supply of labour.
4. When we model the shock of labour supply as a change in the number of non-participants, i.e. they are not registered as unemployed and therefore do not flow into unemployment, the effect on unemployment is limited. Indeed, when the ratio between vacancies and the effective supply of labour does not change in response to the shock, the effect on unemployment is zero.
5. Competition from non-participants in search for jobs softens the impact of shocks upon unemployment.

References

BEAN, C.R. (1994), 'European unemployment: a survey', *Journal of Economic Literature*, 573-619.

BROERSMA, L. AND J.C. VAN OURS (1998), 'Job searchers, job matches and the elasticity of matching', Center research memorandum, 9872.

BUTTER, F.A.G. DEN (1993), "Supply of social security as a cause of low labour participation in The Netherlands; a cliometric analysis", Free University research memorandum, 1993-56.

BUTTER, F.A.G. DEN, AND M. VAN DIJK (1998), 'The pace of job creation and destruction, cyclical shocks and employment dynamics', *LABOUR*, 12, pp. 613-631.

GRAAFLAND, J.J. (1988), 'Hysteresis in unemployment in the Netherlands', *De Economist*, 136 (4), 508-523.

HARTOG, J. AND J. THEEUWES (1993), 'Post-war unemployment in The Netherlands', *European Journal of Political Economy, 9,734 12.*

KOCK, U. (1998), 'Constructing labour market flows for The Netherlands using macro data from social security provisions; 1970-1995', Free University research memorandum, 1998-40.

LAYARD, R., NICKELL, *S. AND* R. JACKMAN (1991), *'Unemployment',* Oxford; Oxford University Press.

LINDBECK, A. (1995), 'Hazardous welfare state dynamics', *American Economic Review, 85* (2), Papers and Proceedings, 9-15.

LJUNGQVIST, L. AND T.J. SARGENT (1998), 'The European Unemployment Dilemma', *Journal of Political Economy,* 106 (3), 514-550.

PISSARIDES, C.A. (1990), *Unemployment Equilibrium Theory,* Oxford: Basic Blackwell.

PISSARIDES, C.A (1992), 'Loss of skills during unemployment and the persistence of employment shocks', *Quarterly Journal of Economics,* 137 1- 1391.

SNOWER, D.J., 1997, 'Evaluating unemployment policies: what do underlying theories tell us?', in D.J. Snower en G. de la Dehesa (red.), ***Unemployment policy: Government options for*** *the labour market,* CEPR, Cambridge University Press.