The efficiency of the Dutch labour market in matching unemployment and vacancies

van Ours, J. C.

Published in:
De Economist

Publication date:
1991

DE ECONOMIST 139, NR. 3, 1991

THE EFFICIENCY OF THE DUTCH LABOUR MARKET IN MATCHING UNEMPLOYMENT AND VACANCIES

BY

J.C. VAN OURS*

1 INTRODUCTION

Employers searching for new employees and unemployed job-seekers need some time to find each other. Even in a non-segmented labour market unemployment and job vacancies coexist because of a time-consuming matching process, which eventually leads to filled vacancies. This matching process can be described by a matching function in which the flow of filled job vacancies depends on the size of the stocks of unemployed and vacancies. At a given flow of filled vacancies the matching function is equivalent to the well-known UV-curve, which describes the relation between stocks of unemployment and stocks of vacancies.[1] A lot of international research has been done on the UV-relation. Recent publications emphasize the importance of the relation in understanding the functioning of labour markets (see for example: Schager (1985), Blanchard and Diamond (1989), Jackman, Layard and Pissarides (1989), Budd, and Levine and Smith (1989)) and indicate that UV-analysis is still very much alive.

In traditional UV-analysis, changes in aggregate demand lead to movements along a given UV-curve: a high demand is compatible with many vacancies and few unemployed and *vice versa*. If the UV-curve shifts outward at a given level of aggregate demand there is an increasing inflexibility or maladjustment in the labour market: there are more unemployed at the same level of job vacancies. If however a UV-curve is an iso-vacancy flow matching function, then shifts of

* Free University, Department of Economics, Applied Labour Economics Research Team, P.O. Box 7161, 1007 MC Amsterdam. The author wishes to thank Frank den Butter, Bernard Compaijen, Geert Ridder, Klaas Arie Springer and anonymous referees for their comments on a previous version of this article.

1 There are generally two theoretical explanations for the phenomenon of the UV-curve: search (Holt, 1970) and segmentation (Hansen, 1970). In the latter, labour market is considered to be the sum of many imperfectly connected homogeneous submarkets, some of them with vacancies, others with unemployed. The segmentation of the labour market leads to the coexistence of vacancies and unemployment at the aggregate level. We will restrict ourselves to the search version of the UV-curve.

the UV-curve may reflect fluctuations in the flow of filled vacancies and not a decreased efficiency of the labour market.

In this study the relationship between unemployment and vacancies is analyzed from a search-theoretic point of view. This means that rather than a UV-curve a matching function which describes the interaction between unemployed and vacancies is established. This matching function is estimated using Dutch labour market data. It appears that the matching function is best described by a Cobb-Douglas function with constant returns to scale and coefficients of 0.4 on unemployment and 0.6 on vacancies. By estimating the matching function the development of the efficiency of the Dutch labour market is also analyzed. Contrary to the results of traditional UV-analysis the matching function analysis indicates that the efficiency of the Dutch labour market has not decreased in the seventies and eighties.

This study is set up as follows. In section 2 the dynamics of labour markets and the relation between the matching function and the UV-curve is discussed. Section 3 contains a description of recent developments in stocks and duration of unemployment and vacancies in The Netherlands. Section 4 presents a brief survey of traditional UV-studies on the Dutch UV-curve. Section 5 discusses the specifications of the matching function and contains the estimation results. Section 6 contains the conclusion.

2 MATCHING UNEMPLOYMENT AND VACANCIES

2.1 *Search Theory and the Matching Function*

The functioning of the labour market is governed by flows of workers to and from stocks of employment, unemployment and non-participation. In theory there are flows from unemployment to a job and *vice versa*, flows from non-participation to a job (school-leavers) and *vice versa* (retiring workers), flows between unemployment and non-participation and there is the flow from job to job.

For reasons of simplicity we will assume that there is no flow from non-participation to a job nor from unemployment to non-participation. The first assumption means that people who enter the labour market will be unemployed before finding a job. The second assumption implicates that the only way out of unemployment is by finding and accepting a job. The relevant stocks in our analysis are unemployment (U), Vacancies (V) and workers searching for another job (S) and the flows are from unemployment to job (F_u), job to job (F_s) and the flow of filled vacancies (F_v). The sum of the flows of unemployed and job-seekers is – by definition – equal to the flow of filled vacancies:

$$F_u + F_s = F_v \tag{2.1}$$

Employers and job-seekers are searching for each other. This search process eventually leads to vacancies that are filled. Vacancies originate because workers

leave the labour market or change jobs with different employers or because employment grows. Vacancies are filled by unemployed or by workers who change jobs. We assume that the searching results in a number of contacts C generated between job-seekers and employers:

$$C = (U+S)^{\alpha} \cdot V^{\beta}/T_m \tag{2.2}$$

in which: T_m = average time between contacts
α, β = scale parameters

$1/T_m$ is the rate at which potential contacts materialize or the 'clock-speed' of the labour market, *i.e.* the rate at which job-seekers and employers meet. The vacancy flow F_v is equal to:

$$F_v = [(U+S)^{\alpha} \cdot V^{\beta}/T_m] \cdot P_c \tag{2.3}$$

in which: P_c = probability a contact results in a job

We define:

$$k = P_c/T_m \tag{2.4}$$

where k is an indicator of the efficiency of the labour market.[2] Then we can write (2.3) as:

$$F_v = k \cdot (U+S)^{\alpha} \cdot V^{\beta} \tag{2.5}$$

Equation (2.5) is the matching function for the labour market, a production function which describes the relation between the flow of filled vacancies and the stocks of job-seekers and vacancies.[3] The coefficients α and β are scale parameters, if $\{\alpha+\beta\}<1$ then there are decreasing returns to scale, an increase in the size of the labour market stocks leads to a less than proportional increase in the flow of filled job vacancies. If $\{\alpha+\beta\}>1$ then there are increasing returns to scale. If $\{\alpha+\beta\}=1$, there are constant returns to scale: the flow of filled vacancies is proportional to the size of the labour market stocks.

If, like Jackman, Layard and Pissarides (1989), we assume constant returns to scale and assume that the stock of job-seekers $\{U+S\}$ is equal to $\{F_v \cdot T_u\}$,[4]

2 Or the 'efficiency search parameter' as Duffy (1984) calls it.

3 The concept of the matching function goes back to Holt (1970). Holt stresses the importance of search on labour markets, but does not allow for employed job-seekers.

4 This result is obtained by assuming that the average period of search for an employed worker is equal to the average period of search for an unemployed worker: $T_s = T_u$.

we can rewrite (2.5) under conditions of a steady-state labour market as[5]:

$$F_v = k(F_v \cdot T_u)^{\alpha} \cdot (F_v \cdot T_v)^{1-\alpha} \tag{2.6}$$

which can be respecified as:

$$1 = k \cdot T_u^{\alpha} \cdot T_v^{1-\alpha} \tag{2.7}$$

Instead of a relation between stocks of unemployed and vacancies we now have a relation between durations of unemployment and vacancies. From (2.7) it appears that in a Cobb-Douglas matching function with constant returns to scale the efficiency parameter k is a geometric weighted average of unemployment and vacancy duration.

2.2. *The Matching Function and the UV-curve*

Instead of assuming equality between the durations of search of unemployed and employed, we may ignore the stock of employed job-seekers. Then, with constant returns to scale, we have the following matching function[6]:

$$F_{vt} = k \cdot U_t^{\alpha} \cdot V_t^{1-\alpha} \tag{2.8}$$

in which: t = an index of time

With equation (2.8) we can illustrate the relationship between the matching function and the UV-curve. We assume that the net growth rate of the labour force is equal to δ_1 and the net growth rate of jobs is equal to δ_2, so:

$$\begin{aligned} \Delta L_t / L_{t-1} &= \delta_1 \\ \Delta X_t / X_{t-1} &= \delta_2 \end{aligned} \tag{2.9}$$

in which: L = labour force: number of workers

X = number of jobs

5 In a steady-state labour market where flows into stocks of unemployment, vacancies and employed job-seekers equal flows out of these stocks, stocks are the product of flows and average duration: $S = F_s \cdot T_s$; $U = F_u \cdot T_u$; $V = F_v \cdot T_v$; in which: T_s = average duration of job searching for an employed worker; T_u = average duration of unemployment; T_v = average duration of a job vacancy. Outside of the steady state average duration is approximately equal to the quotient of stock and flow. In this article we will ignore this difference.

6 Pissarides (1987) justifies constant returns to scale by the fact that size does not appear to have a systematic influence on an economy's equilibrium unemployment rate.

Total labour force is equal to the sum of employed and unemployed workers and the total number of jobs is equal to the sum of employed workers and job vacancies:

$$L_t = E_t + U_t$$
$$X_t = E_t + V_t \qquad (2.10)$$

in which: E = number of employed workers

The change in unemployment is equal to the difference between inflow and outflow, where the inflow equals the sum of net growth of the labour force and the number of dismissals and the outflow is determined by the matching function:

$$\Delta U_t = \Delta L_t + \mu \cdot E_t - F_{vt} \qquad (2.11)$$

in which: μ = fraction of employed workers losing their job.

We assume that for every job lost in one part of the economy a new job is created in another part of the economy. Then the change in the number of vacancies is equal to:

$$\Delta V_t = \Delta X_t + \mu \cdot E_t - F_{vt} \qquad (2.12)$$

The unemployment rate is on its steady-state level if:

$$U_t/L_t = U_{t-1}/L_{t-1} = U/L \qquad (2.13)$$

Using (2.9) and (2.11) we can write (2.13) as:

$$U/L = (U + \delta_1 \cdot L + \mu \cdot E - F_v)/(L + \delta_1 \cdot L) \qquad (2.14)$$

which, using (2.10), can be rewritten as:

$$F_v/E = \delta_1 + \mu \qquad (2.15)$$

In the same way we can derive that the vacancy rate (V/X) is on its steady-state level if:

$$F_v/E = \delta_2 + \mu \qquad (2.16)$$

So both the vacancy rate and the unemployment rate are on their steady-state level if: $\delta_1 = \delta_2 = \delta$, which is intuitively clear: as long as the net growth of the labour force equals the net growth of jobs, unemployment and vacancy rates do not change. There is a flow equilibrium on the labour market if:

$$F_v/E = k \cdot (U/E)^{\alpha} \cdot (V/E)^{1-\alpha} = \delta + \mu \tag{2.17}$$

According to (2.17) a stable relation between stocks of unemployed and vacancies requires that the flow of vacancies is constant. To illustrate the relation between the matching function and the UV-curve we rewrite (2.17) as:

$$(U/E)^{\alpha} = (1/k) \cdot (\delta + \mu) \cdot (V/E)^{\alpha - 1} \tag{2.18}$$

A traditional UV-curve as in (2.18) is in reality an 'iso-vacancy flow' matching function. There are two causes for shifts in this UV-curve:

- a change in the efficiency parameter k, in which case the matching function also shifts;
- fluctuations in the flow of filled job vacancies due to a change in the dismissal rate μ or the economy and labour force growth rate δ. If $(\delta + \mu)$ increases there is an outward shift of the UV-curve. The latter cause leads to shifts in the UV-curve, while the matching function remains stable.

An upward shift in the traditional UV-curve is interpreted as a worsening of the labour market's functioning. This interpretation is consistent with equation (2.18) only if the efficiency parameter k gets smaller: in that case a worsening of the labour market's functioning is equivalent to a decreasing efficiency. However, equation (2.18) shows that a different interpretation is possible. If the flow of filled job vacancies increases with constant efficiency the UV-curve shifts upwards as well. It is even possible that the UV-curve shifts upwards with increasing efficiency, as long as the flow of filled vacancies increases relatively more than the efficiency increases.

Hence an upward shift in the traditional UV-curve is not necessarily equivalent to a worsening of the labour market's functioning.

If the fluctuations in the flow of filled job vacancies due to changes in $(\delta + \mu)$ are temporary, there are loops around the steady-state UV-curve. Suppose, for example, that point A in Figure 1 is on the steady-state UV-curve. If the growth of jobs temporarily declines, the inflow of vacancies decreases during a period of time. Then in the first instance the stock of vacancies decreases, the number of matchings decreases and the outflow of unemployed decreases, which will increase the number of unemployed. After the original growth rate of jobs has been restored and the net growth of the labour force has been equalized, the labour market will come to a new equilibrium in point B with the same number of matchings per period but with a lower vacancy rate and a higher unemployment rate. The new flow equilibrium lies again on the iso-flow matching function. The adjustment path in Figure 1 from A to B lies below the steady-state UV-curve. If the cause of the change from A to B is a temporary increase in the inflow into unemployment, the adjustment path lies above the steady-state UV-curve (see Van Ours (1990) for some simulations).

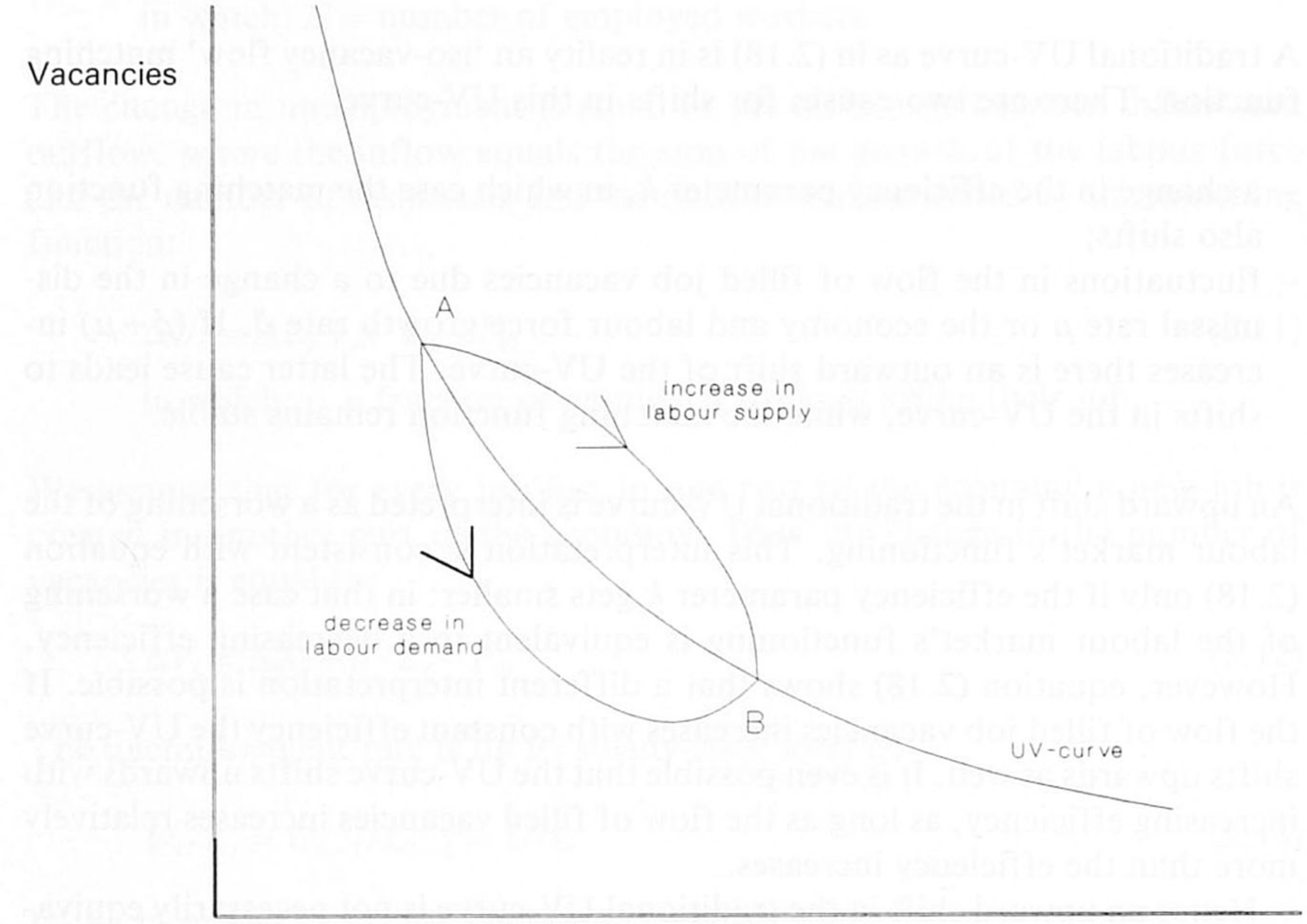


Figure 1 – Loops around the UV-curve

Generally, temporary changes in the growth rate of jobs lead to anti-clockwise loops around the UV-curve (Jackman, Layard, Pissarides, 1989), while temporary changes in the growth of the labour force lead to clockwise loops around the UV-curve. Whether or not the labour market will eventually return to the original flow equilibrium depends on the wage formation, which we ignore in this article.[7]

7 Pissarides (1987) for example developed a theoretical model in which there are cyclical loops around the UV-curve caused by business cycles, but unemployment and vacancies always return to their original equilibrium. A key element in this model is the wage equation, which absorbs output shocks completely.

3 UNEMPLOYMENT AND VACANCIES IN THE NETHERLANDS

There is discussion in The Netherlands about the actual number of unemployed. Unemployment is registered at public employment exchanges. According to recent estimates due to registration problems actual unemployment is some 40% lower than registered unemployment. The main problem is that the public unemployment offices are not notified in time that unemployed workers have found jobs.

There are also registration problems concerning job vacancies. If employers have vacancies they can use various recruitment methods in order to fill their vacancies. To obtain an initial pool of applicants the employer will actively solicit applications. Though some job-seekers may apply without prior knowledge of the existence of a vacancy, an employer generally has to recruit actively. He can use formal recruitment channels like the public unemployment offices or an advertisement in a newspaper, but he may also use an informal recruitment channel such as employee referral. Employers often have a strong preference for using informal recruitment channels, for a variety of reasons: they do not cost much, they provide good initial screening and they attract applicants from the neighbourhood in which the firm is located. Furthermore, they give potential applicants more information than an ad in a newspaper, which may improve the quality of the match between workers and jobs. A lot of employers, however, use formal recruitment channels. These formal channels have their own advantages and disadvantages. Public employment services work free of charge but there are frequent complaints about sluggishness and poor screening. Most of the regular information about job vacancies in The Netherlands, however, consists of vacancies notified to the public employment services. As in most EC countries, Dutch employers have no obligation to notify the public employment services, so notified vacancies are only a part of the actual number of vacancies. There is a vacancy survey of the Central Statistical Office (CBS), but this only started in 1980. From this vacancy survey it appears that in 1988 36% of the job vacancies were reported to public unemployment offices.

As we only have information on registered unemployment and registered vacancies we have to use this information in our discussions and empirical analyses. On the one hand this means that we have to be careful in drawing firm conclusions. On the other hand, traditional UV-analysis in The Netherlands is – apart from the flow and duration figures – based on the same data, so the use of these data enables us to compare our conclusions with those from traditional UV-analysis.

The developments in the Dutch UV-curve are shown in Figure 2. Until the late sixties The Netherlands experienced a tight labour market characterized by a low and stable rate of unemployment, fluctuating around 1% (35,000 unemployed), and a high vacancy rate of about 3.5% (120,000 vacancies). In the early seventies the small open economy of The Netherlands met with the conse-

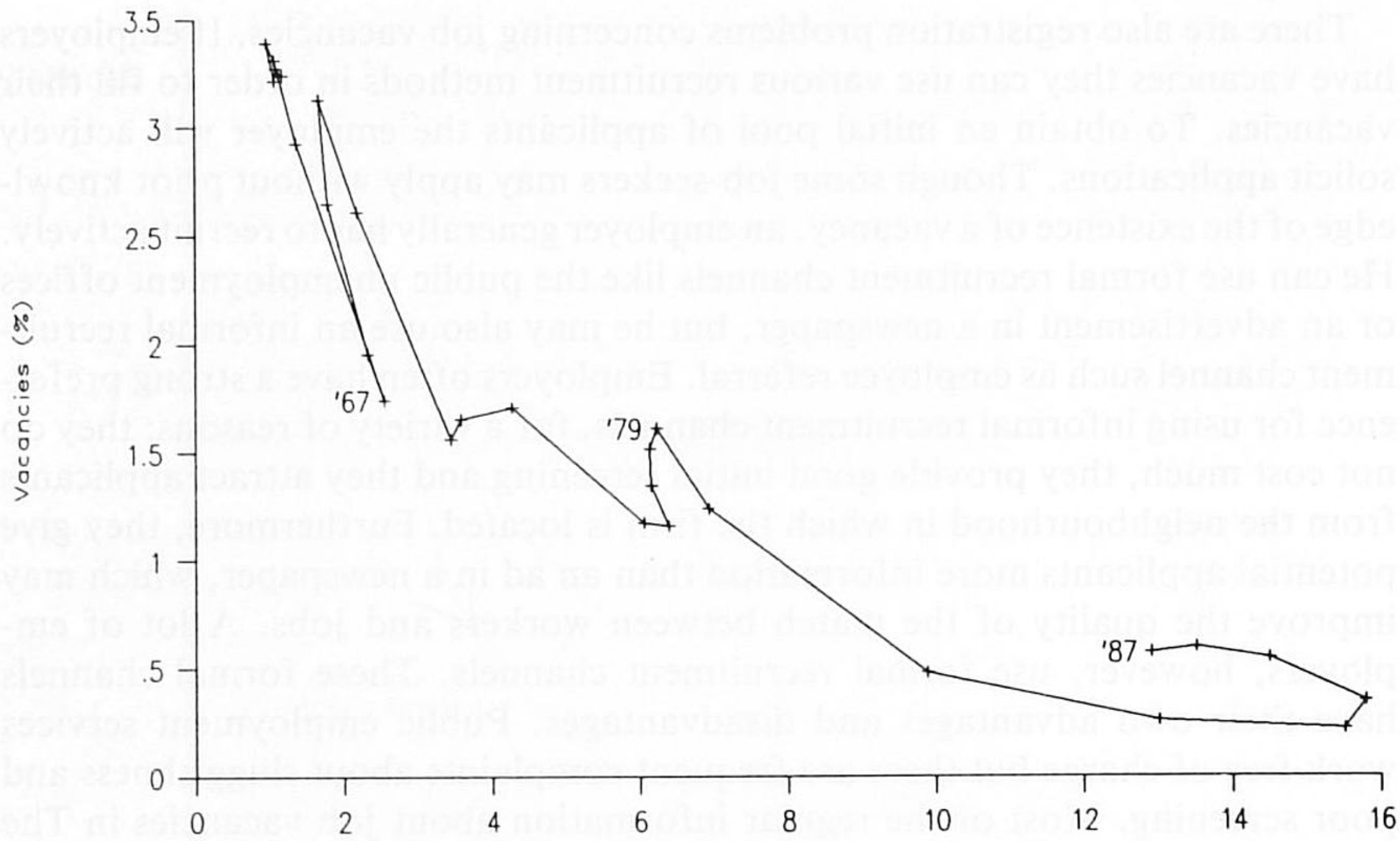


Figure 2 – Unemployment and vacancies; 1961–1987 (% of the labour force)

quences of the first oil crisis: unemployment rates reached 6%, while the vacancy rate declined to 1.5%. In the early eighties unemployment grew explosively due to a combination of shrinking employment and increasing labour supply. The unemployment rate increased to 16% in 1984 (800,000 unemployed), while the vacancy decreased to less than 0.5% (10,000 vacancies). It is difficult to see from Figure 2 whether the UV-curve has shifted outward or whether there are cyclical fluctuations in the location of the UV-curve.

As stated before, an important aspect of the labour market is the search of employers on the one hand and both employed and unemployed workers on the other hand. This simultaneous process results in a flow of filled job vacancies. There are practically no published data about total vacancy flows or vacancy durations in The Netherlands. The flow of vacancies reported to the public unemployment offices is available until 1978 (Hartog, 1980). From the CBS vacancy survey we have information about elapsed vacancy durations over the period 1980–1987. Applying the method as described in Van Ours and Ridder (1991) we calculated completed vacancy durations over this period. Using this

information and the information on the vacancy flows towards the public unemployment offices we constructed a 1961–1987 series of vacancy durations and flows of filled job vacancies.[8] Furthermore, we used information from the public unemployment offices to construct a 1961–1987 series of unemployment durations. The relationship between unemployment and vacancy durations is shown in Figure 3, which resembles Figure 2 very much.

In the early sixties average vacancy duration was about 4 months and average unemployment duration was about 1 month. In the course of the seventies and eighties average vacancy duration declined to 1 month, while average unemployment duration increased to more than 1 year in 1984 and decreased since then to about 10 months in 1987.

4 UV-ANALYSIS IN THE NETHERLANDS

Many researchers have claimed that in The Netherlands and other European

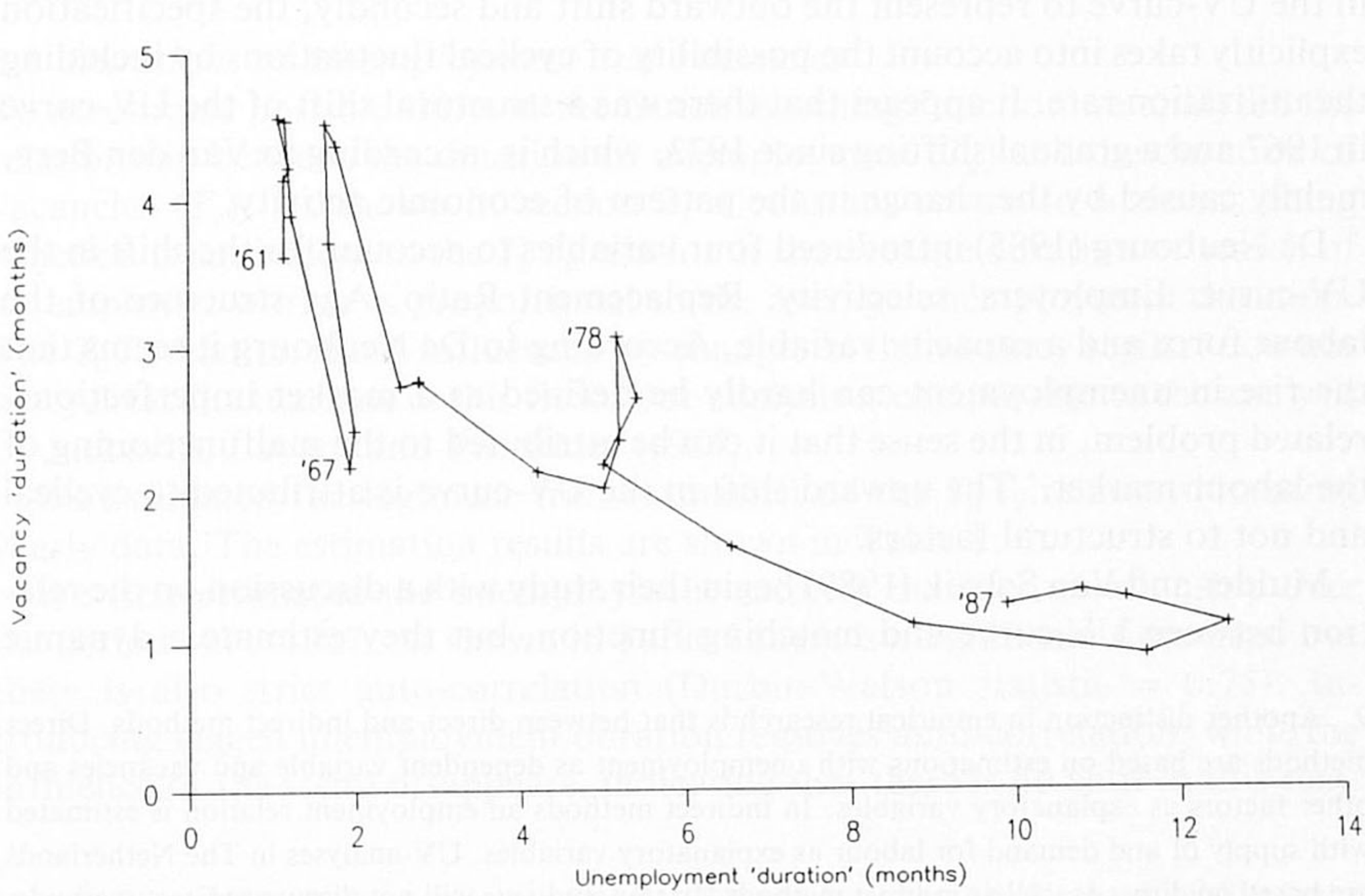


Figure 3 – Durations of unemployment and vacancies; 1961–1987 (months)

8 The duration of job vacancies notified to the public unemployment office is equal to the average vacancy duration (Van Ours, 1990). See Appendix 1 for details on the data.

countries the UV-relationship has shifted outward during the second half of the sixties and the seventies, indicating an increasing malfunctioning of the labour market.

In most studies on the UV-relationship in The Netherlands flows on the labour market are neglected due to a lack of data. In these studies stocks of unemployment and vacancies are usually related to each other one way or another.[9] To give an impression of the results of the Dutch studies we will briefly survey some of them.[10] Most of the studies use a loglinear UV-relation with one or more variables added to it, to account for possible shifts.

Kuipers and Buddenberg (1978) used a loglinear UV-relation, with a trend variable to account for the possibility of a shifting UV-curve. According to Kuipers and Buddenberg 'the unemployment as a result of imperfection of the labour market as a proportion of the total working population rose from 1.4% in 1956 to 1.7% in 1975.' This increasing labour market imperfection is ascribed mainly to the increasing heterogeneity of the labour market within occupational groups.

Van den Berg (1982) notices in his article that most of the UV-specifications, comparable to the one used by Kuipers and Buddenberg, change when the estimation period is extended to 1979. Van den Berg proposes two ways to improve the specification of the UV-curve, to obtain satisfactory statistical results for the whole postwar period up to 1979. Firstly, a dummy structure is included in the UV-curve to represent the outward shift and secondly, the specification explicitly takes into account the possibility of cyclical fluctuations by including the utilization rate. It appears that there was a structural shift of the UV-curve in 1967 and a gradual shifting since 1973, which is, according to Van den Berg, mainly caused by the change in the pattern of economic activity.

De Neubourg (1985) introduced four variables to account for the shift in the UV-curve: Employers' selectivity, Replacement Ratio, Age structure of the labour force and a capacity variable. According to De Neubourg it seems that the rise in unemployment can hardly be defined as a market imperfections-related problem, in the sense that it can be attributed to the malfunctioning of the labour market.' The upward shift in the UV-curve is attributed to cyclical and not to structural factors.

Mulder and Van Schaik (1989) begin their study with a discussion on the relation between UV-curve and matching function, but they estimate a dynamic

9 Another distinction in empirical research is that between direct and indirect methods. Direct methods are based on estimations with unemployment as dependent variable and vacancies and other factors as explanatory variables. In indirect methods an employment relation is estimated with supply of and demand for labour as explanatory variables. UV-analyses in The Netherlands are based on direct as well as indirect methods. In this study we will not discuss indirect methods.

10 Studies by Driehuis (1978), Muysken, De Neubourg and Van der Burg (1982), Van Ours (1982) and several other studies are not discussed here because their results hardly differ from the studies discussed here. See for a survey of Dutch studies: De Grip (1987). Muysken and Meijers (1988) reject the loglinear specification of the UV-curve because of its instability.

UV-curve, specified as a semi-logarithmic function of the stocks of unemployed and job vacancies without using flow information. The replacement ratio and the number of long-term unemployed appear to be significant explanatory variables in this UV-relation. They conclude that labour market imperfections increased in the seventies and eighties.

Belderbos and Teulings (1988) analyze a matching function by using regional data from the two-yearly Dutch labour force surveys 1979–1985 and by performing a pooled cross-section time-series analysis. Their Cobb-Douglas matching function has constant returns to scale with a coefficient on unemployment of 0.6 and a coefficient on vacancies of 0.4. Belderbos and Teulings conclude that changes in the UV-relation are cyclical with no changes in labour market imperfections.

Apart from this last study the general conclusion of the Dutch UV-studies is that the UV-curve has shifted substantially in 1967 and shifted steadily after that year, indicating increasing labour market imperfections.[11] There is no thorough explanation for the shift in 1967[12] and the explanations for the gradual shift after 1967 differ: increasing heterogeneity due to structural changes in labour supply or labour demand, decreasing search intensity of jobseekers, increasing employers' selectivity and so on.

5 ESTIMATION RESULTS

5.1 *Durations of Unemployment and Vacancies*

To investigate possible shifts in the Dutch matching function we analyzed the relationship between the duration of unemployment (T_u) and the duration of vacancies (T_v). As shown in section 2, a constant return to scale matching function is equivalent to the $T_u T_v$ relation if the average duration of search of an employed worker is proportional to the average unemployment duration. The $T_u T_v$ relation is not influenced by changes in the vacancy registration nor by cyclical fluctuations in this flow. Our analysis is comparable to the analysis of Jackman, Layard and Pissarides (1989).

We estimated the loglinear transformation of the $T_u T_v$ relationship using yearly data. The estimation results are shown in Table 1.

We first estimated the unemployment-vacancy duration relationship over the period 1971–1987. As shown in Table 1 there is a significant time trend but there is also strict auto-correlation (Durbin-Watson statistic = 0.75). Introducing lagged unemployment duration removes auto-correlation, while the influence of the trend disappears, indicating that there is no shift in this rela-

11 Muysken (1989). Budd, Levine and Smith (1987) conclude that there has been no shift in the Dutch UV-curve in the seventies and the early eighties.

12 A similar shift in the UV-curve in 1966–67 occurred in the UK. There is a variety of explanations for this shift: changes in the social security system, labour hoarding, structural changes in demand for labour between regions and occupational groups (Muysken, 1989).

TABLE 1 – ESTIMATION RESULTS FOR THE UNEMPLOYMENT DURATION-VACANCY DURATION CURVE

Dependent variable: $log(T_u)$

Period	Const.	$log(T_v)$	$log(T_u(-1))$	t	R^2	Method
1971–87	0.65	−0.51		0.074	0.94	OLS
	(1.8)	(3.2)		(5.4)		
	1.13	−0.51	0.67	−0.008	0.97	OLS
	(4.3)	(4.8)	(4.3)	(0.4)		
	1.06	−0.49	0.61		0.98	OLS
	(6.5)	(5.2)	(9.4)			
	1.03	−0.48	0.62		0.98	IV
	(4.7)	(3.7)	(7.4)			

Period	Const.	$log(T_v)$	$log(T_u(-1))$	d6168	R^2	Method
1961–87	1.12	−0.58	0.60	−0.24	0.98	OLS
	(6.7)	(6.2)	(8.7)	(3.4)		
	1.57	−0.78	0.41	−0.43	0.97	IV
	(2.6)	(2.3)	(1.7)	(2.7)		

t-values between parenthesis; R^2 adjusted for degrees of freedom; IV = instrumental variables, with instruments: $log(GDP)$, log(volume world trade), government deficit (%), $log(T_v(-1))$

tion.[13] The third estimate in Table 1 confirms that the trend variable is not important: the estimation results hardly change if we remove the trend variable.[14] To account for simultaneity we also estimated the $T_u T_v$ relationship using instrumental variables. Except for the lower t-values this does not influence the estimation results.

Having established that there is no shift in the matching function in the seventies and eighties we investigated whether or not there was a shift in the sixties. A Chow test indicated that the $T_u T_v$ relation is not stable over the period 1961–1987. Therefore we introduced a dummy variable in the fifth estimate for the period 1961–1968. As is shown, this dummy variable is significantly negative, which means that the matching function shifted outward in 1969. Estimating the $T_u T_v$ relation with instrumental variables does not influence the estimation results substantially.

Our conclusion from the estimation results in Table 1 is that the matching function shifted at the end of the sixties indicating a lower efficiency of the

13 Jackman, Layard and Pissarides (1989) found, using UK data, that after introduction of lagged unemployment duration as explanatory variable the trend variable is still significant. So while the T_u–T_v relation in the UK has shifted outward, in The Netherlands it did not.

14 The coefficient of −0.49 on the vacancy duration and 0.61 on lagged unemployment relation imply that the coefficient α from the original matching function is equal to 0.44.

labour market, which confirms the conclusions from previous UV-analyses summarized in section 4. In the seventies and eighties there are cyclical fluctuations around the long-term matching function but the matching function itself did not shift. This conclusion challenges the conclusions from previous UV-analyses that the efficiency of the Dutch labour market decreased in the seventies and eighties.

5.2 *Flows of Filled Job Vacancies*

We also estimated a matching function for the flow of filled job vacancies, registered at the public unemployment offices, as dependent variable. We have two reasons for doing so. Firstly, we want to compare our results with those from traditional UV-analyses using the same data on stocks of unemployed and job vacancies except for the vacancy flow data. Secondly, we will try to explain the fluctuations of the matching function.

We specified the matching function as in (2.8) except for the constant returns to scale assumption. In order to estimate this matching function we assume that the public unemployment office flow of vacancies is proportional to the total flow of job vacancies.[15] To adjust for changes in the scale of the labour market we specified stocks and flows as percentages of the labour force:

$$f_{vt}^{*} = k' [u_t]^{\alpha} \cdot [v_t^{*}]^{\beta} \tag{4.1}$$

in which: $f_v^{*} = Fv^{*}/(U+E)$
$u = U/(U+E)$
$v^{*} = V^{*}/(U+E)$
F_v^{*} = public unemployment office vacancy flow
V^{*} = public unemployment office vacancy stock
$\sigma = F_v^{*}/F_v = V^{*}/V$; $k' = k(\sigma)^{1-\beta}$

As shown in section 2, the efficiency parameter k is the product of the probability that a job-seeker and an employer meet and the probability that this contact results in a job. This means that the efficiency is influenced by the search intensity of employers and employees, by the willingness of employers to accept job-seekers and by the willingness of job-seekers to accept a job offer.

We use the replacement ratio and the share of long-term unemployed as proxies for the search intensity and willingness of both employers and especially unemployed job-seekers. The first variable may influence search behaviour of unemployed job-seekers: the higher the replacement ratio the lower the search intensity. The replacement ratio may also influence reservation wages of job-seekers: the higher the replacement ratio the higher the reservation wage and thus the smaller the probability a job-seeker will accept a job. The relation

15 In the course of the eighties the share of vacancies notified to the public unemployment offices decreased from 72% in October 1980 to 36% in January 1988. To investigate the influence of this phenomenon for some estimates we used adjusted vacancy data.

between replacement ratio and the behaviour of employed job-seekers is less straightforward. But even if only unemployed job-seekers are influenced by the replacement ratio we expect a negative relation between labour market efficiency and replacement ratio, due to the effect on unemployed job-seekers. The share of long-term unemployed may also influence overall search behaviour: Long-term unemployed may search less intensive, or employers may be less willing to hire long-term unemployed. Both effects will reduce overall labour market efficiency.

Apart from some fluctuations the replacement ratio increased in the period 1960–1976 and has decreased since then. So, if there is a negative relation between the replacement ratio and labour market efficiency, the replacement ratio decreased efficiency in the sixties and the first half of the seventies, but increased efficiency later on.[16]

The share of long-term unemployed remained quite stable in the sixties and seventies and increased rapidly in the early eighties. If there is a negative influence of the share of unemployed on the efficiency of the labour market, it is most evident in the early eighties.

We estimated the loglinear transformation of (4.1) using yearly data. The estimation results are shown in Table 2.

The first estimate over the period 1971–1987 shows that the coefficient of long-term unemployment is significantly negative and the sign of the replacement ratio is negative as expected, though not significantly so at the 5%-level. The coefficients of the matching function are significant and sum up to 1.15. To analyze whether or not there are constant returns to scale we restricted the sum of α and β to be equal to 1 in our second estimate. The estimation results are approximately the same and from the application of an F-test it appears that the hypothesis of constant returns to scale cannot be rejected. The third estimate shows the results if we use data adjusted for the decrease in registration rate in the eighties. Again the estimation results do not change very much except for the coefficient of the replacement ratio. The fourth estimate shows the results if we use instrumental variables to account for simultaneity. The estimation results are almost the same as those of the second estimate.

Finally, we investigated whether or not the matching function shifted at the end of the sixties, by estimating the period 1961–1987. A Chow test indicated that the matching function is not stable over the period 1961–1987. Therefore we introduced a dummy variable for the period 1961–1968 like we did in the $T_u T_v$ relation. This dummy variable is significantly positive, which means that the matching function shifted outward in 1969. Estimating the matching function using the adjusted data series for vacancies or using instrumental variables does not substantially influence the estimation results.

16 Duffy (1984) states that the replacement ratio is the prime mover in the outward shift of the UV-curve in the UK in the late sixties, but this variable has caused this curve to move inward again since then.

TABLE 2 - ESTIMATION RESULTS FOR THE MATCHING FUNCTION

Dependent variable: $log(f_v^*)$; f_v^* = flow of registered job vacancies in % of the labour force

Period	Const.	$log(u)$	$log(v^*)$	$log(RR)$	$log(Lu)$	$d6168$	R^2	DW	Method
1971–87	2.31	0.48	0.67	−0.35	−0.28		0.93	1.85	OLS
	(2.0)	(2.8)	(7.4)	(1.7)	(2.4)				
	1.67	0.38	0.62	−0.32	−0.22		0.93	1.76	OLS
	(10.3)	(14.0)	(–)	(1.6)	(3.4)				
	1.55	0.39	0.61	−0.84	−0.17		0.94	1.51	OLS[a]
	(7.9)	(11.0)	(–)	(3.4)	(2.0)				
	1.52	0.35	0.65	−0.28	−0.16		0.96	1.73	IV
	(8.0)	(10.4)	(–)	(0.8)	(1.9)				
1961–87	1.66	0.37	0.63	−0.31	−0.21	0.30	0.95	1.68	OLS
	(13.4)	(23.5)	(–)	(1.8)	(4.4)	(4.9)			
	1.61	0.40	0.60	−0.79	−0.18	0.21	0.96	1.64	OLS[a]
	(11.0)	(19.5)	(–)	(3.7)	(3.2)	(3.0)			
	1.63	0.37	0.63	−0.30	−0.20	0.32	0.97	1.79	IV
	(6.8)	(12.8)	(–)	(0.7)	(1.9)	(2.8)			

t-values between parenthesis; R^2 corrected for degrees of freedom; DW = Durbin-Watson statistic
IV = instrumental variables, with instruments: $log(GDP)$, log(volume world trade), government deficit (%), $log(T_v(-1))$
[a] Estimate using vacancy data adjusted for the decline in the share of vacancies reported to the public unemployment offices (see Appendix 1)

We used the coefficients of the fifth estimate of Table 2 to investigate the development of the efficiency parameter k of the Dutch labour market, which is shown in Figure 4.

This figure indicates that in the sixties, seventies and eighties there have been fluctuations in the efficiency of the Dutch labour market, but no clear trend. The most striking result is the obvious decrease in efficiency at the end of the sixties.

Our conclusion from the empirical analysis is, that there is a matching function in the Dutch labour market, which is specified as a Cobb-Douglas function with constant returns to scale. The matching function has a coefficient of 0.4 with respect to unemployment and a coefficient of 0.6 with respect to vacancies.[17] Fluctuations in the efficiency of the labour market can be explained by fluctuations in the share of long-term unemployed and fluctuations in the

17 Blanchard and Diamond (1989) find the same coefficients for the matching function in the American labour market.

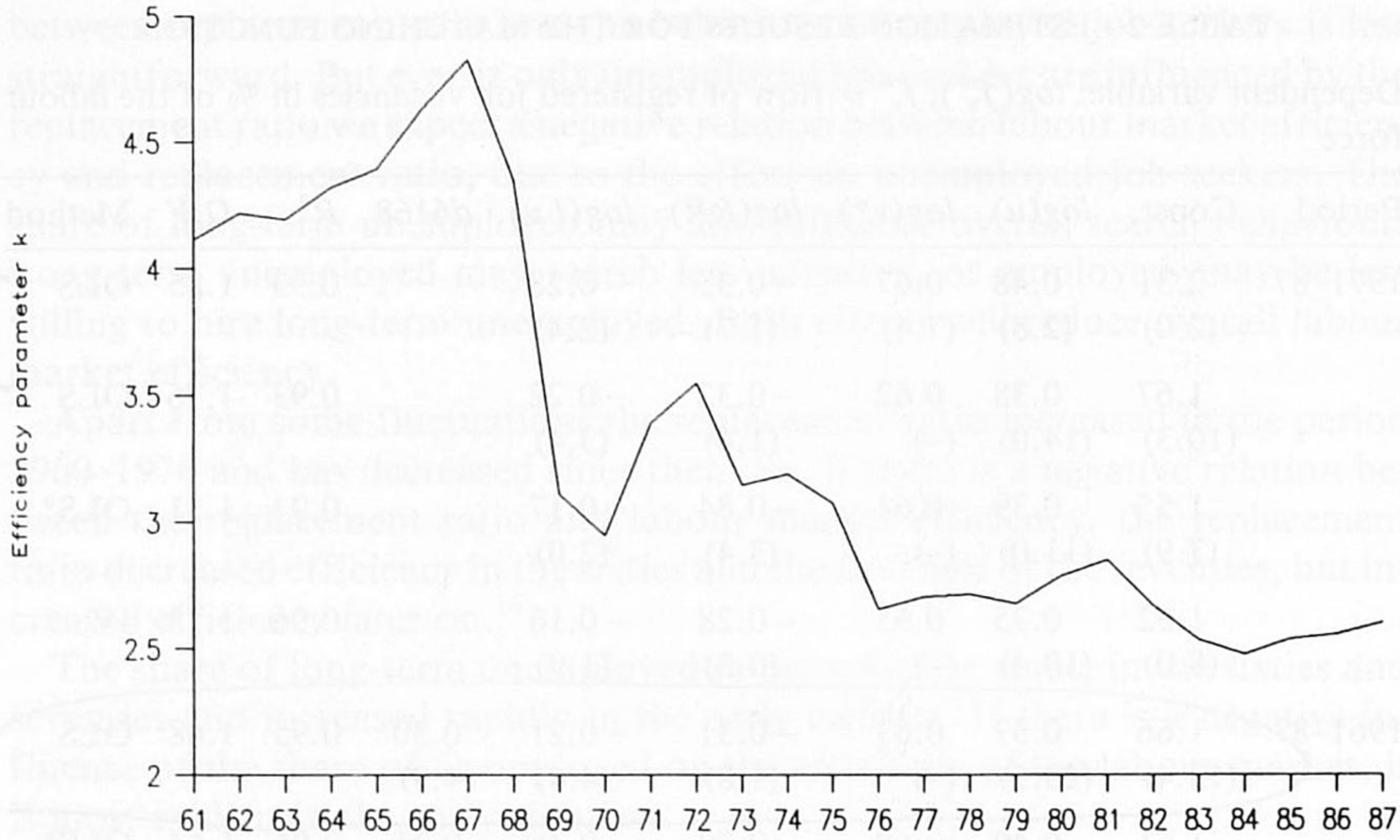


Figure 4 – Development of efficiency parameter k

replacement ratio. The matching function has shifted at the end of the sixties and remained quite stable later on.

6 CONCLUSIONS

On the basis of UV-analysis many authors claim that in The Netherlands in the late sixties and seventies unemployment increased substantially due to labour market imperfections. This study challenges that conclusion.

This article specifies and estimates a matching function in the Dutch labour market. It appears that this matching function can be approximated by a Cobb-Douglas function with constant returns to scale and coefficients of 0.4 on unemployment and 0.6 on vacancies. Furthermore it appears that the matching function has shifted at the end of the sixties. The Dutch labour market in the sixties was more efficient than in the seventies and eighties. This conclusion confirms the results of previous UV-analyses. The reason for the shift at the end of the sixties is not clear, however.

In the course of the seventies and eighties the efficiency of the Dutch labour market remained quite stable, despite the influence of replacement ratio and the share of long-term unemployed. Therefore the huge increase in unemployment in the early eighties can not be attributed to the deterioration of the functioning of the labour market. With a higher level of unemployment and lower level of job vacancies the Dutch labour market today is apparently as efficient in generating a flow of filled vacancies as it was in the seventies.

APPENDIX

APPENDIX 1 – DEFINITION AND ORIGIN OF THE DATA

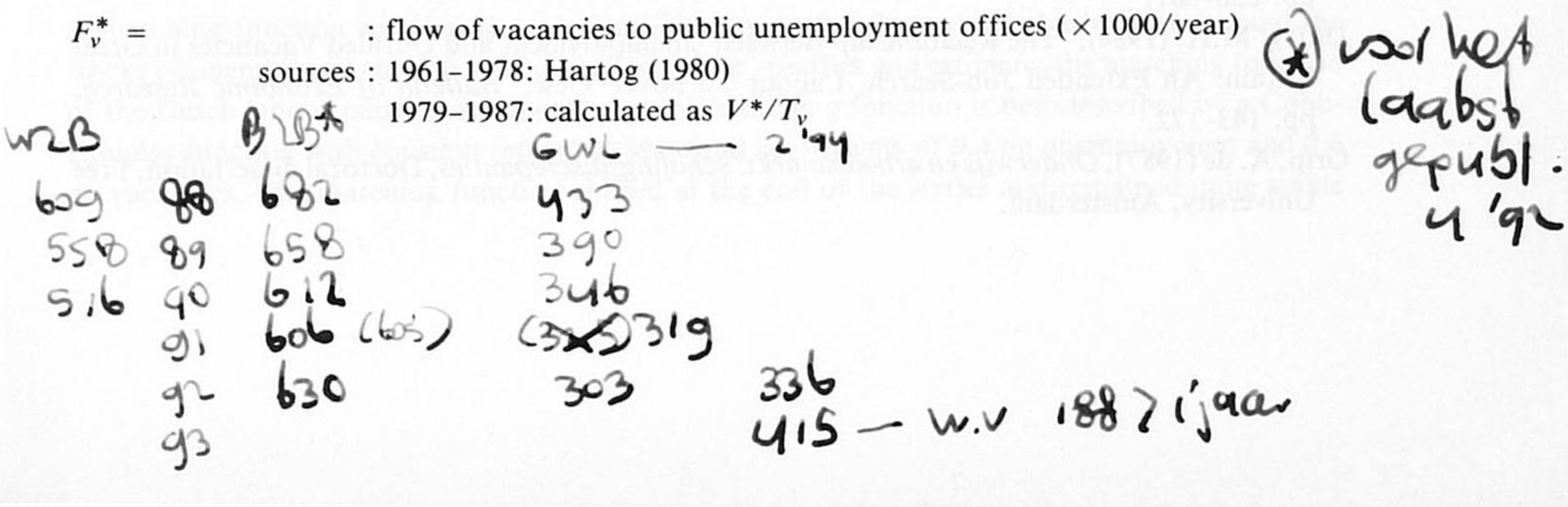
Data used in the analysis

year	U	V^*	F_v^*	T_v	RR	T_u	E	Lu
61	44	119	392	3.6	.655	1.2	3660	.251
62	41	122	353	4.2	.616	1.2	3733	.244
63	41	122	345	4.2	.657	1.2	3785	.228
64	38	131	344	4.6	.623	1.1	3862	.215
65	42	129	341	4.5	.655	1.2	3898	.184
66	54	115	353	3.9	.657	1.2	3926	.143
67	102	68	373	2.2	.747	1.9	3914	.097
68	94	77	380	2.4	.699	2.0	3955	.175
69	73	106	343	3.7	.732	1.7	4015	.194
70	69	127	337	4.5	.848	1.7	4064	.202
71	91	107	292	4.4	.753	1.8	4083	.123
72	145	63	277	2.7	.816	2.6	4060	.088
73	151	67	290	2.8	.861	2.8	4060	.144
74	181	69	299	2.8	.875	2.8	4060	.132
75	260	47	262	2.2	.947	4.2	4033	.140
76	278	47	275	2.1	.977	5.0	4064	.268
77	271	55	280	2.4	.910	5.2	4130	.273
78	273	63	247	3.1	.880	5.2	4175	.283
79	281	68	307	2.7	.920	5.4	4229	.283
80	325	54	293	2.2	.874	5.0	4362	.252
81	480	21	152	1.6	.841	6.6	4374	.240
82	655	11	121	1.1	.850	8.8	4377	.323
83	801	10	124	0.9	.781	11.6	4364	.467
84	822	15	164	1.1	.742	12.5	4385	.562
85	761	24	226	1.3	.673	11.3	4488	.578
86	711	27	241	1.4	.653	10.8	4552	.586
87	686	27	254	1.3	.622	9.9	4630	.579

U = Unemployment: registered unemployed ($\times 1000$)
source : Central Planning Bureau

V^* = Vacancies : number of job vacancies reported at the public unemployment offices ($\times 1000$)
source : Central Statistical Office

F_v^* = : flow of vacancies to public unemployment offices ($\times 1000$/year)
sources : 1961–1978: Hartog (1980)
1979–1987: calculated as V^*/T_v



T_v = : average duration of a job vacancy (months)
sources : 1961–1978: calculated as V^*/F_v^*
1980–1987: calculated using CBS vacancy survey data and applying the method described in: Van Ours/Ridder (1991)
1979: interpolation of 1978 and 1980

RR = : replacement ratio
source : Mulder and Van Schaik (1989)

T_u = : duration of unemployment (months); calculated on the basis of data on the inflows and stocks of job-seekers registered at the public unemployment offices
source : Ministry for Social Affairs and Employment

E = : number of employees ($\times 1000$)
source : OECD, Labour force statistics and author's calculations

Lu = : share of long-term unemployed (more than 1 year)
source : Ministry for Social Affairs and Employment

To adjust for the decline of the share of vacancies notified to the public unemployment offices we also used adjusted vacancy data for the eighties. These data are adjusted using information from the CBS vacancy surveys. The CBS vacancy surveys are from October 1980, 1981, 1982, 1983, September 1984, January 1986, 1987, 1988. By interpolating we calculated the average share of notified vacancies for the years 1980–1987. We assumed that for the period 1961–1979 this share was equal to the share of 1980.

REFERENCES

Belderbos, R. and C. Teulings (1988), *A New Empirical Specification of the UV-Relation with an Application to The Netherlands*, Stichting voor Economisch Onderzoek der Universiteit van Amsterdam.

Berg, D.J. van den (1982), 'Specification and Estimation of the Unemployment-Vacancy Curve in the Period 1956–1979,' *De Economist*, 130, pp. 397–419.

Blanchard, J.O. and P. Diamond (1989), 'The Beveridge Curve,' *Brookings Papers on Economic Activity*, pp. 1–76.

Budd, A., P. Levine and P. Smith (1987), 'Unemployment and the Shifting UV-Curve,' *European Economic Review*, 31, pp. 296–305.

Budd, A., P. Levine and P. Smith (1989), 'Unemployment, Vacancies and the Long-Term Unemployed,' *Economic Journal*, 99, pp. 1071–1091.

Driehuis, W. (1978), 'Labour Market Imbalances and Structural Unemployment,' *Kyklos*, 31, pp. 638–661.

Duffy, M.H. (1984), 'The Relationship Between Unemployment and Unfilled Vacancies in Great Britain: An Extended Job-Search, Labour Turnover View,' *Bulletin of Economic Research*, pp. 143–172.

Grip, A. de (1987), *Onderwijs en arbeidsmarkt: scholingsdiscrepanties*, Doctoral dissertation, Free University, Amsterdam.

Hansen, B. (1970), 'Excess Demand, Unemployment, Vacancies and Wages,' *Quarterly Journal of Economics*, 84, pp. 1–23.

Hartog, J. (1980), *Tussen vraag en aanbod*, Leiden-Antwerpen.

Holt, C.C. (1970), 'How can the Phillips Curve Be Moved to Reduce both Inflation and Unemployment?,' in: E.S. Phelps *et al.*, *Microeconomic Foundations of Employment and Inflation Theory*, London and Basingstoke, pp. 224–256.

Jackman, R., R. Layard and C. Pissarides (1989), 'On Vacancies,' *Oxford Bulletin of Economics and Statistics*, 51, pp. 377–394.

Kuipers, S.K. and F.H. Buddenberg (1978), 'Unemployment on Account of Market Imperfections in The Netherlands since the Second World War,' *De Economist*, 126, pp. 380–412.

Muysken, J., C. de Neubourg and H. van der Burg (1982), 'Qualitative Structural Unemployment in The Netherlands 1955–1980,' in: H. van der Burg *et al.*, *The Volume and Composition of Structural Unemployment in The Netherlands, 1955–1980*, N.P.A.O. Publication nr. 11, 's-Gravenhage, pp. 51–83.

Muysken, J. and H. Meijers (1988), *A Post-Mortem on UV-Analysis*, Research Memorandum, University of Limburg.

Muysken, J. (1989), 'Classification of Unemployment: Analytical and Policy Relevance,' *De Economist*, 137, pp. 397–424.

Mulder, C.B. and A.B.T.M. van Schaik (1989), *Een nieuwe kijk op structuurwerkloosheid*, Research Memorandum, University of Brabant, Tilburg.

Neubourg, C. de (1985), 'The Origin and Insignificance of Labour Market Imperfections in The Netherlands: Another Note on the Specification of the UV-Curve 1955–1980,' *De Economist*, 133, pp. 64–77.

Ours, J.C. van (1982), 'De wisselwerking tussen schaarsteverhoudingen en beloningsstructuur; een empirische analyse voor drie bedrijfstakken,' in: *De wisselwerking tussen schaarsteverhoudingen en beloningsstructuur*, Wetenschappelijke Raad voor het Regeringsbeleid, Voorstudie nr. V26, 's-Gravenhage.

Ours, J.C. van and G. Ridder (1991), 'Cyclical Variation in Vacancy Duration and Vacancy Flows: An Empirical Analysis,' to be published in *European Economic Review*.

Ours, J.C. van (1989), 'Durations of Dutch Job Vacancies,' *De Economist*, 137, pp. 309–327.

Ours, J.C. van (1990), 'Matching Unemployment and Vacancies: The Efficiency of the Dutch Labour Market,' Free University, *Research Memorandum*, 1990-11, Amsterdam.

Pissarides, C.A. (1987), 'Search, Wage Bargains and Cycles,' *Review of Economic Studies*, 54, pp. 473–483.

Schager, N.H. (1985), *The Replacement of the UV-curve with a New Measure of Hiring Efficiency*, Stockholm, The Industrial Institute for Economic and Social Research.

Summary

THE EFFICIENCY OF THE DUTCH LABOUR MARKET IN MATCHING UNEMPLOYMENT AND VACANCIES

A matching function specifies the relationship between the flow of filled job vacancies and the stocks of unemployed and job vacancies. This paper specifies and estimates the matching function of the Dutch labour market. It appears that this matching function is best described by a Cobb-Douglas function with constant returns to scale and coefficients of 0.4 on unemployment and 0.6 on vacancies. The matching function shifted at the end of the sixties and remained quite stable

afterwards. This indicates that with a higher level of unemployment and lower level of job vacancies the Dutch labour market today is as efficient in generating a flow of filled vacancies as it was in the seventies.